MORGAN AND MORECAMBE OFFSHORE WIND FARMS: TRANSMISSION ASSETS

Environmental Statement

Volume 3, Chapter 8: Noise and vibration

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Glossary

Term	Meaning
400 kV grid connection cables	Cables that will connect the proposed onshore substations to the existing National Grid Penwortham substation.
400 kV grid connection cable corridor	The corridor within which the 400 kV grid connection cables will be located.
A-weighting	A frequency weighting devised to attempt to account for the fact that human response to sound is not equally sensitive to all frequencies. It consists of an electronic filter in a sound level meter which attempts to build this variability into the indicative sound level reading so that it will correlate, approximately, with the human response.
Ambient sound level, $L_a = L_{Aeq,T}$	The steady sound level which, over a period of time *T*, contains the same amount of A-weighted sound energy as the time varying sound over the same period. Also known as the equivalent continuous sound pressure level.
Applicants	Morgan Offshore Wind Limited (Morgan OWL) and Morecambe Offshore Windfarm Ltd (Morecambe OWL).
Background sound level, $L_{A90,T}$	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 fast time-weighting, F, and quoted to the nearest whole number of decibels.
Baseline	The status of the environment without the Transmission Assets in place.
Best Practicable Means	Adopting the best available methods to reasonably control noise and vibration. Section 72 of the Control of Pollution Act (CoPA, 1974) and Environmental Protection Act Part III (EPA, 1990) states the following: "In that expression “practicable” means reasonably practicable having regard among other things to local conditions and circumstances, to the current state of technical knowledge and to the financial implications. The means to be employed include the design, installation, maintenance and manner and periods of operation of plant and machinery, and the design, construction and maintenance of buildings and acoustic structures."
Basic Noise Level	A measure of traffic source noise prior to development. It is calculated from traffic flows, road speed, and Heavy Goods Vehicle (HGV) percentage.
Code of Construction Practice	A document detailing the overarching principles of construction, contractor protocols, construction-related environmental management measures, pollution prevention measures, the selection of appropriate construction techniques and monitoring processes.
Commitment	This term is used interchangeably with mitigation and enhancement measures. The purpose of commitments is to avoid, prevent, reduce or, if possible, offset significant adverse environmental effects. Primary and tertiary commitments are taken into account and embedded within the assessment set out in this Environmental Statement. Secondary commitments are incorporated to reduce effects to environmentally acceptable levels following initial assessment.

Term	Meaning
Cumulative Effects	The combined effect of the Transmission Assets in combination with the effects from other proposed developments, on the same receptor or resource.
Decibel	A unit used to measure or compare the intensity of a sound by comparing it with a given reference level on a logarithmic scale.
Development Consent Order	An order made under the Planning Act 2008, as amended, granting development consent.
Effect	The term used to express the consequence of an impact. The significance of effect is determined by correlating magnitude of the impact with the importance, or sensitivity, of the receptor or resource in accordance with defined significance criteria.
Environmental Impact Assessment	The process of identifying and assessing the significant effects likely to arise from a project. This requires consideration of the likely changes to the environment, where these arise as a consequence of a project, through comparison with the existing and projected future baseline conditions.
EIA Scoping Report	A report setting out the proposed scope of the Environmental Impact Assessment process. The Transmission Assets Scoping Report was submitted to The Planning Inspectorate (on behalf of the Secretary of State) for the Morgan and Morecambe Offshore Windfarms Transmission Assets in October 2022.
Environmental Statement	The document presenting the results of the Environmental Impact Assessment process.
Expert Working Group	A forum for targeted engagement with regulators and interested stakeholders through the Evidence Plan process.
Free-field	A situation in which the radiation from a sound source is entirely unaffected by the presence of any reflective boundaries.
Generation Assets	The generation assets associated with the Morgan Offshore Wind Project and the Morecambe Offshore Windfarm include the offshore wind turbines, inter-array cables, offshore substation platforms and platform link (interconnector) cables to connect offshore substations.
Impact	Change that is caused by an action/proposed development, e.g., land clearing (action) during construction which results in habitat loss (impact).
Impulsivity	A measure of the sharpness of sudden nature of a sound which is short in duration such as a gunshot or a blast.
Intermittency	A measure of the ‘on/off’ nature of a sound source.
Inter-related effects	Inter-related effects arise where an impact acts on a receptor repeatedly over time to produce a potential additive effect or where a number of separate impacts, such as noise and habitat loss, affect a single receptor.
Landfall	The area in which the offshore export cables make landfall (come on shore) and the transitional area between the offshore cabling and the onshore cabling. This term applies to the entire landfall area at Lytham St. Annes between Mean Low Water Springs and the transition joint bays inclusive of all construction works, including the offshore and onshore cable routes, intertidal working area and landfall compound(s).

Term	Meaning
Local Authority	A body empowered by law to exercise various statutory functions for a particular area of the United Kingdom. This includes County Councils, District Councils and County Borough Councils.
Local Planning Authority	The local government body (e.g., Borough Council, District Council, etc.) responsible for determining planning applications within a specific area.
Logarithmic averaging	A method by which sound levels in decibels (dB) can be averaged. This allows us to account for the fact that higher levels of sound will always dominate in the presence of lower sound levels.
Maximum design scenario	The realistic worst case scenario, selected on a topic-specific and impact specific basis, from a range of potential parameters for the Transmission Assets.
Mean Low Water Springs	The height of mean low water during spring tides in a year.
Morecambe Offshore Windfarm: Generation Assets	The offshore generation assets and associated activities for the Morecambe Offshore Windfarm.
Morgan and Morecambe Offshore Wind Farms: Transmission Assets	The offshore and onshore infrastructure connecting the Morgan Offshore Wind Project and the Morecambe Offshore Windfarm to the national grid. This includes the offshore export cables, landfall site, onshore export cables, onshore substations, 400 kV grid connection cables and associated grid connection infrastructure such as circuit breaker compounds. Also referred to in this report as the Transmission Assets, for ease of reading.
Morgan Offshore Wind Project: Generation Assets	The offshore generation assets and associated activities for the Morgan Offshore Wind Project.
National Grid Penwortham substation	The existing National Grid substation at Penwortham, Lancashire.
National Policy Statements	The current national policy statements published by the Department for Energy Security and Net Zero in 2023 and adopted in 2024.
Natural Tranquillity Method	A method for measuring and assessing the impacts of a development on the tranquillity of an area in the context of noise.
Noise	An unwanted or unexpected sound.
Onshore export cables	The cables which would bring electricity from the landfall to the onshore substations.
Onshore Infrastructure Area	The area within the Transmission Assets Order Limits landward of Mean High Water Springs. Comprising the offshore export cables from Mean High Water Springs to the transition joint bays, onshore export cables, onshore substations and 400 kV grid connection cables , and associated temporary and permanent infrastructure including temporary and permanent compound areas and accesses. Those parts of the Transmission Assets Order Limits proposed only for ecological mitigation/biodiversity benefit are excluded from this area.
Onshore substations	The onshore substations will include a substation for the Morgan Offshore Wind Project: Transmission Assets and a substation for the Morecambe Offshore Windfarm: Transmission Assets. These will each comprise a compound containing the electrical components for transforming the power supplied from the generation assets to 400 kV

Term	Meaning
	and to adjust the power quality and power factor, as required to meet the UK Grid Code for supply to the National Grid.
Peak Particle Velocity	An indicator of the magnitude of ground vibration which refers to the movement of molecular particles within the ground.
Preliminary Environmental Information Report	A report that provides preliminary environmental information in accordance with the Infrastructure Planning (Environmental Impact Assessment) Regulations 2017. This is information that enables consultees to understand the likely significant environmental effects of a project and which helps to inform consultation responses.
Residual sound level, $L_r = L_{Aeq,T}$	The ambient sound level at a receptor in the absence of influence from the sound source under assessment.
Scoping Opinion	Sets out the Planning Inspectorate's response (on behalf of the Secretary of State) to the Scoping Report prepared by the Applicants. The Scoping Opinion contains the range of issues that the Planning Inspectorate, in consultation with statutory stakeholders, has identified should be considered within the Environmental Impact Assessment process.
Sound	Fluctuations of pressure within a medium (gas, solid or fluid) within the audible range of loudness and frequencies which excite the sensation of hearing.
Sound power level, L_w	The total sound energy emitted by a source per unit time.
Sound Pressure Level, L_p	The amount of force a sound wave exerts on a surface area perpendicular to the direction of travel. A measure of the variation of sound level over a distance.
Specific sound level, $L_{s,} = L_{Aeq,Tr}$	The equivalent continuous A-weighted sound pressure level produced by the specific noise source at the assessment location over a given reference time internal.
Study area	This is an area which is defined for each environmental topic which includes the Transmission Assets Order Limits as well as potential spatial and temporal considerations of the impacts on relevant receptors. The study area for each topic is intended to cover the area within which an impact can be reasonably expected.
Substation	Part of an electrical transmission and distribution system. Substations transform voltage from high to low, or the reverse by means of electrical transformers.
The Secretary of State for Energy Security and Net Zero	The decision maker with regards to the application for development consent for the Transmission Assets.
Tonality	A measure of sound quality that correlates to how humans perceive certain frequencies of sound. A sound is considered tonal if the frequency spectrum contains a lot of sound energy at a single frequency.
Traffic Flows	Traffic flow describes the number of vehicles passing a reference point per unit of time (e.g., vehicles per hour).
Transboundary effects	Effects from a project within one state that affect the environment of another state(s).
Transmission Assets	See Morgan and Morecambe Offshore Wind Farms: Transmission Assets (above)

Term	Meaning
Transmission Assets Order Limits	The area within which all components of the Transmission Assets will be located, including areas required on a temporary basis during construction and/or decommissioning

Acronyms

Acronym	Meaning
BNL	Basic Noise Level
BPM	Best Practicable Means
BS	British Standard
CEA	Cumulative Effects Assessment
CoCP	Code of Construction Practice
CoPA	Control of Pollution Act
DCO	Development Consent Order
DMRB	Design Manual for Roads and Bridges
DRPC	Dynamic Reactive Power Compensator
EIA	Environmental Impact Assessment
EPA	Environmental Protection Act
EPP	Evidence Plan Process
ES	Environmental Statement
EWG	Expert Working Group
HDD	Horizontal Directional Drilling
HGV	Heavy Goods Vehicle
HVAC	Heating, ventilation and air conditioning
LOAEL	Lowest Observed Adverse Effect Level
LT	Long-term
MDS	Maximum design scenario
MHWS	Mean High Water Springs
MLWS	Mean Low Water Springs
NPPF	National Planning Policy Framework
NPS	National Policy Statement
NPSE	Noise Policy Statement for England
NTM	Natural Tranquillity Method
OS	Ordnance Survey

Acronym	Meaning
PEIR	Preliminary Environmental Information Report
PPG	Planning Practice Guidance
PPV	Peak Particle Velocity
SOAEL	Significant Observed Adverse Effect Level

Units

Unit	Description
%	Percentage
dB	Decibel
mm/s	Millimetres per second
nm	Nautical miles
km	Kilometre
m	Metre
h	Hours
ha	Hectare
ms	Milliseconds

8 Noise and vibration

8.1 Introduction

8.1.1.1 This chapter of the Environmental Statement (ES) presents the findings of the Environmental Impact Assessment (EIA) work undertaken for the Morgan and Morecambe Offshore Wind Farms: Transmission Assets. For ease of reference, the Morgan and Morecambe Offshore Wind Farms Transmission Assets are referred to in this chapter as the 'Transmission Assets'. This ES accompanies the application to the Planning Inspectorate for development consent for the Transmission Assets.

8.1.1.2 The purpose of the Transmission Assets is to connect the Morgan Offshore Wind Project: Generation Assets and Morecambe Offshore Windfarm: Generation Assets (referred to collectively as the 'Generation Assets') to the National Grid. A description of the Transmission Assets can be found in Volume 1, Chapter 3: Project description of the ES.

8.1.1.3 This chapter considers the likely noise and vibration impacts and effects of the Transmission Assets on human receptors during the construction, operation and maintenance, and decommissioning phases. Specifically, it relates to the onshore and intertidal elements of the Transmission Assets landward of Mean Low Water Springs (MLWS).

8.1.1.4 Underwater sound arising from construction of the Transmission Assets, including the offshore export cable, is considered within Volume 1, Annex 5.2: Underwater sound technical report of the ES. The Transmission Assets application does not include any sources of offshore airborne noise, such as offshore substation platforms or wind turbines. The noise impacts arising from these are assessed within the applications for the Generation Assets.

8.1.1.5 Noise impacts on onshore ecology and onshore and intertidal ornithology are assessed in the following chapters of the ES:

- Volume 3, Chapter 3: Onshore ecology and nature conservation of the ES; and
- Volume 3, Chapter 4: Onshore and intertidal ornithology of the ES.

8.1.1.6 Where relevant, noise impacts on heritage assets are assessed in Volume 3, Chapter 5: Historic environment of the ES.

8.1.1.7 This ES chapter:

- identifies the key legislation, policy and guidance relevant to noise and vibration;
- details the EIA Scoping and consultation process undertaken for noise and vibration;
- confirms the study area for the assessment, the methodology used to identify the baseline environmental conditions and sets out the existing and future environmental baseline conditions, established from desk studies, surveys and consultation;

- identifies the scope of the assessment;
- details the mitigation and/or monitoring measures that are proposed to prevent, minimise, reduce or offset the possible environmental effects identified in the EIA process;
- defines the project design parameters used to inform the impact assessment;
- identifies the impact assessment methodology and presents an assessment of the likely impacts and effects in relation to the construction, operation and maintenance and decommissioning phases of the Transmission Assets on noise and vibration (and, where relevant, the impacts and effects of noise and vibration on the Transmission Assets): and
- identifies any cumulative, transboundary and/or inter-related effects in relation to the construction, operation and maintenance and decommissioning phases of the Transmission Assets on noise and vibration.

8.1.1.8 The assessment of noise impacts due to construction traffic is informed by baseline traffic flows and construction traffic flows presented in Volume 3, Chapter 7: Traffic and transport of the ES.

8.1.1.9 This chapter also draws upon additional information to support the assessment contained within:

- Volume 3, Annex 8.1: Baseline sound survey of the ES;
- Volume 3, Annex 8.2: Construction noise and vibration of the ES; and
- Volume 3, Annex 8.3: Operational noise of the ES.

8.1.1.10 The information contained within this chapter has been used to inform the assessment of noise and vibration impacts on human health in Volume 1, Annex 5.1: Human health of the ES.

8.2 Legislation, policy and guidance

8.2.1 Legislation

Control of Pollution Act (CoPA) 1974

8.2.1.1 Section 60, Part III of the CoPA refers to the control of noise on construction sites. It outlines legislation by which local authorities can control noise from construction sites and prevent noise disturbance.

8.2.1.2 The CoPA provides a local authority with the power to serve a notice imposing requirements for the way in which construction works are to be carried out in their jurisdiction. This notice can specify:

- the plant or machinery permitted for use;
- the hours during which construction work may be undertaken;
- limits for the emission levels of noise and vibration due to the works at any time or spatial position on site; and

- any other change in circumstance.

8.2.1.3 Section 61, Part III of the CoPA refers to prior consent for work on construction sites. It provides a method by which a contractor can apply for consent to undertake construction works in advance.

8.2.1.4 Section 71, Part III of the CoPA refers to the preparation and approval of codes of practice for minimising noise.

8.2.1.5 British Standards (BS) 5228-1:2009+A1:2014 and BS 5228 2:2009+A1:2014 were approved within The Control of Noise (Code of Practice for Construction and Open Sites) Order 2015 as suitable guidance on appropriate methods for the control of noise and vibration respectively from construction and open sites in exercise of the powers conferred on the Secretary of State by sections 71(1)(b), (2) and (3) of the CoPA.

8.2.1.6 Section 72, Part III of the CoPA refers to Best Practicable Means (BPM), which is defined as:

'In that expression, 'practicable' means reasonably practicable, having regards among other things to local conditions and circumstances, to the current state of technical knowledge and to the financial implications'. Whilst 'Means' includes 'the design, installation, maintenance and manner and periods of operation of plant and machinery, and the design, construction and maintenance of buildings and acoustic structures.'

Environmental Protection Act (EPA) 1990

8.2.1.7 Section 79, Part III of the EPA contains a list of matters that amount to statutory nuisances and places a duty on local authorities to regularly inspect areas in their jurisdiction to determine where statutory nuisances may exist.

8.2.1.8 This section also considers and defines the concept of BPM which originates from Section 72, Part III of the CoPA.

8.2.1.9 The local authority must serve an abatement notice where it is satisfied that a statutory nuisance does exist or is likely to occur/recur. Section 80, Part III of the EPA provides local authorities with the power to serve an abatement to prohibit or restrict its occurrence or recurrence; and to carry out works or other actions necessary to abate the nuisance.

8.2.1.10 Section 82, Part III of the EPA allows a Magistrates' court to act on a complaint made by any person on the grounds that they are aggrieved by a statutory nuisance, such as noise.

8.2.1.11 The procedures for appeals against abatement notices are detailed in the Statutory Nuisance (Appeals) Regulations 1995.

8.2.1.12 A statutory nuisance statement is provided as part of the application (document reference J29).

8.2.2 Planning policy context

8.2.2.1 The Transmission Assets will be located in English offshore waters (beyond 12 nautical miles (nm) from the English coast) and inshore waters (within 12 nm from the English coast), with the onshore infrastructure located wholly

within England. As set out in Volume 1, Chapter 1: Introduction of this ES, the Secretary of State for Energy Security and Net Zero (formerly Business, Energy and Industrial Strategy) has directed that the Transmission Assets are to be treated as development for which development consent is required under Section 35 the Planning Act 2008, as amended. Planning policy is outlined in full in Volume 1, Chapter 2: Policy and legislation context.

National Policy Statements

8.2.2.2 There are currently six energy National Policy Statements (NPSs), three of which contain policy relevant to offshore wind development and the Transmission Assets, specifically:

- Overarching NPS for Energy (NPS EN-1) which sets out the UK Government's policy for the delivery of major energy infrastructure (Department for Energy Security & Net Zero 2023a);
- NPS for Renewable Energy Infrastructure (NPS EN-3) (Department for Energy Security & Net Zero 2023b); and
- NPS for Electricity Networks Infrastructure (NPS EN-5) (Department for Energy Security & Net Zero 2023c).

8.2.2.3 **Table 8.1** sets out a summary of the policies within the current NPSs, relevant to noise and vibration.

8.2.2.4 The policies within the current NPSs relevant to all topics in the ES can be viewed in the National Policy Statement tracker (document reference J26) and Planning Statement (document reference J28), submitted with the Application.

Table 8.1: Summary of the NPS EN-1, NPS EN-3, NPS EN-5 requirements relevant to this chapter

Summary of NPS provision	How and where considered in the ES
NPS EN-1	
At the application stage of an energy NSIP, possible sources of nuisance under section 79(1) of the EPA 1990 and how they may be mitigated or limited should be identified by the applicant so that appropriate requirements can be included in any subsequent order granting development consent (see Section 5.7 [of NPS EN-1] on dust, odour, artificial light etc. and Section 5.12 [of NPS EN-1] on noise and vibration). [Paragraph 4.15.5 of NPS-EN-1]	An assessment of the noise and vibration impacts during the construction phase of the Transmission Assets is presented in Volume 3, Annex 8.2: Construction noise and vibration of the ES. The noise sources and example mitigation measures are presented for each construction activity to be undertaken. The noise impacts during the operational phase of the Transmission Assets are assessed in Volume 3, Annex 8.3: Operational noise of the ES. This annex includes details of the proposed plant strategy and potential noise mitigation measures to be incorporated as part of the design. An assessment of the significance of the effects due to noise and vibration is presented in **section 8.11** of this chapter.
At the application stage of an energy NSIP, possible sources of nuisance under section 79(1) of the EPA 1990 and how they may be mitigated or limited should be considered by the Secretary of State so that appropriate requirements can be included in any subsequent order granting	An assessment of the noise and vibration impacts during the construction phase of the Transmission Assets is presented in Volume 3, Annex 8.2: Construction noise and vibration of the ES. The noise and vibration sources which may cause nuisance and example mitigation measures are presented for each construction activity to be undertaken.

Summary of NPS provision	How and where considered in the ES
development consent (see Section 5.7 [of NPS EN-1] on dust, odour, artificial light etc. and Section 5.12 [of NPS EN-1] on noise and vibration). [Paragraph 4.15.6 of NPS-EN-1]	Details of the embedded mitigation and commitments to be adopted as part of the Transmission Assets are presented in **Table 8.13** of this chapter. The noise impacts during the operational phase of the Transmission Assets are assessed in Volume 3, Annex 8.3: Operational noise of the ES. This annex includes details of the proposed plant strategy and potential noise mitigation measures to be incorporated as part of the design. An assessment of the significance of the effects due to noise and vibration is presented in **section 8.11** of this chapter.
The Secretary of State should note that the defence of statutory authority is subject to any contrary provision made by the Secretary of State in any particular case in a Development Consent Order (section 158(3) of the Planning Act 2008). Therefore, subject to Section 5.7 and Section 5.12 [of NPS EN-1], the Secretary of State can disapply the defence of statutory authority, in whole or in part, in any particular case, but in so doing should have regard to whether any particular nuisance is an inevitable consequence of the development. [Paragraph 4.15.7 of NPS-EN-1]	Noise and vibration impacts, and thereby the risk of nuisance, during the construction, operation and maintenance, and decommissioning phases of the Transmission Assets will be controlled as best as reasonably practicable such that significant adverse effects are avoided, and adverse effects are minimised. Details of the assessment of noise and vibration effects are outlined in **section 8.11**, with details of embedded mitigation measures provided in **section 8.8** of this chapter.
The nature and extent of the noise assessment should be proportionate to the likely noise impact. [Paragraph 5.12.7 of NPS-EN-1]	A proportionate assessment of the noise impacts during the construction, operation, and decommissioning phases of the Transmission Assets has been undertaken to ensure all impacts are mitigated such that significant adverse effects are avoided, and adverse effects are minimised as best as reasonably practicable. Emphasis is placed on night-time impacts due to trenchless techniques as part of the construction phase, as well as operational noise impacts due to the operation of the onshore substations. The assessment of operational noise has been undertaken to ensure that noise impacts due to the concurrent operation of the Morgan and Morecambe onshore substations are mitigated sufficiently. Details of the assessment of noise and vibration effects are outlined in **section 8.11**, with details of embedded mitigation measures provided in **section 8.8** of this chapter.
Applicants should consider the noise impact of ancillary activities associated with the development, such as increased road and rail traffic movements, or other forms of transportation. [Paragraph 5.12.8 of NPS-EN-1]	An assessment of noise impacts due to increased traffic flows on local highway networks during the construction phase of the Transmission Assets is considered in Volume 3, Annex 8.2: Construction noise and vibration of the ES. The significance of the resultant effects is considered in **section 8.11** of this chapter.
Operational noise, with respect to human receptors, should be assessed using the principles of the relevant British Standards and other guidance. Further information on	The construction, operation and maintenance, and decommissioning phases of the Transmission Assets have

Summary of NPS provision	How and where considered in the ES
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. [Paragraph 5.12.9 of NPS-EN-1]	been assessed using the principles in the relevant BS and nationally accepted guidance. Construction, operation and maintenance, and decommissioning noise and vibration effects are assessed in **section 8.11** of this chapter. In accordance with best practice, the noise and vibration assessment has been undertaken with reference to the following: • BS 4142:2014+A1:2019 – 'Methods for rating and assessing industrial and commercial sound' (British Standards Institution, 2019); • BS 5228-1:2009+A1:2014 – 'Code of practice for noise and vibration control on construction and open sites – Part 1: Noise' (British Standards Institution, 2014a); • BS 5228-2:2009+A1:2014 – 'Code of practice for noise and vibration control on construction and open sites – Part 2: Vibration' (British Standards Institution, 2014b); • BS 7445:2003 – 'Description and measurement of environmental noise' (British Standards Institution, 2003); • BS 8233:2014 – 'Guidance on sound insulation and noise reduction for buildings' (British Standards Institution, 2014c); • Calculation of Road Traffic Noise (CRTN) (Department for Transport, 1988); • DMRB– LA111 – Noise and vibration (Highways England, Transport *et a*l., 2020); and • ISO 9613-2:1996 – Acoustics – 'Attenuation of sound during propagation outdoors – Part 2: General method of calculation' (International Organisation for Standards, 1996). Details of the potential noise reduction achieved via BPM during the construction and decommissioning phases of the Transmission Assets can be found in Volume 3, Annex 8.2: Construction noise and vibration of the ES. These measures are outlined in the Outline Construction Noise and Vibration Management Plan (document reference J1.3). Operational Noise Management Plan(s) for the onshore substations will be prepared and submitted for approval prior to the commencement of operations. The Plan(s) will identify the noise limits for the operation of the onshore substations and the measures for how these limits would be monitored. Details of proposed mitigation are provided in **section 8.8** of this chapter. The assessment outlined in Volume 3, Annex 8.3: Operational noise of the ES includes an iteration of the 3D acoustic modelling which predicts the level of noise reduction required from example mitigation measures which may be included as part of the design to ensure compliance.
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.	The Environment Agency (EA) provided a response during the statutory consultation process which is detailed in **Table 8.7** of this chapter.

Summary of NPS provision	How and where considered in the ES
physical design and location of development). The applicant should consult the EA and/or the SNCB, and other relevant bodies, such the MMO or NRW, as necessary, and in particular regarding 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 considered. [Paragraph 5.12.10 of NPS-EN-1]	Emphasis is placed on a request for consideration of operational noise impacts from the substations. An assessment is provided in Volume 3, Annex 8.3: Operational noise of the ES. An assessment of the significance of effects is provided in **section 8.11** of this chapter. Noise impacts on ecological receptors are assessed in the following chapters: • Volume 3, Chapter 3: Onshore ecology and nature conservation of the ES; and • Volume 3, Chapter 4: Onshore and intertidal ornithology of the ES.
In the marine environment, applicants should consider noise impacts on protected species, as well as other noise sensitive receptors, both at the individual project level and in-combination with other marine activities. [Paragraph 5.12.11 of NPS-EN-1]	Underwater sound arising from construction of the Transmission Assets, including the offshore export cable, is considered within Volume 1, Annex 5.2: Underwater sound technical report of the ES. The Transmission Assets application does not include any sources of offshore airborne noise, such as offshore substation platforms, or wind turbines. The noise and vibration impacts arising from these are assessed within the applications for the Generation Assets.
Applicants should submit a detailed impact assessment and mitigation plan as part of any development plan, including the use of noise mitigation and noise abatement technologies during construction and operation. [Paragraph 5.12.12 of NPS-EN-1]	Details of the potential noise reduction achieved via BPM during the construction and decommissioning phases of the Transmission Assets can be found in Volume 3, Annex 8.2: Construction noise and vibration of the ES. These measures are outlined in the Outline Construction Noise and Vibration Management Plan (document reference J1.3) Operational Noise Management Plan(s) for the onshore substations will be prepared and submitted for approval prior to the commencement of operations. The Plan(s) will identify the noise limits for the operation of the onshore substations and the measures for how these limits would be monitored. Details of proposed mitigation are provided in **section 8.8** of this chapter. The assessment outlined in Volume 3, Annex 8.3: Operational noise of the ES includes an iteration of the 3D acoustic modelling which predicts the level of noise reduction required from example mitigation measures which may be included as part of the design to ensure compliance. An assessment of the significance of the effects due to noise and vibration is presented in **section 8.11** of this chapter.
The Secretary of State should consider whether mitigation measures are needed both for operational and construction noise over and above any which may form part of the project application. In doing so the Secretary of State may wish to impose mitigation measures. Any such mitigation measures should take account of the NPPF or any successor to it and the Planning Practice Guidance on Noise. [Paragraph 5.12.13 of NPS-EN-1]	Details of the embedded mitigation measures adopted as part of the Transmission Assets during the construction and operational phase are presented in **Table 8.13** of this chapter.
Mitigation measures may include one or more of the following:	The measures (commitments) to be adopted as part of the Transmission Assets are detailed in **Table 8.13** of this chapter. Details of the potential noise reduction achieved via

Summary of NPS provision	How and where considered in the ES
• engineering: reducing the noise generated at source and/or containing the noise generated • lay-out: where possible, optimising the distance between the source and noise-sensitive receptors and/or incorporating good design to minimise noise transmission through the use of screening by natural or purpose-built barriers, or other buildings • administrative: using planning conditions/obligations to restrict activities allowed on the site at certain times and/or specifying permissible noise limits/noise levels, differentiating as appropriate between different times of day, such as evenings and late at night, and taking into account seasonality of wildlife in nearby designated sites • insulation: mitigating the impact on areas likely to be affected by noise including through noise insulation when the impact is on a building. [Paragraph 5.12.14 of NPS-EN-1]	BPM during the construction and decommissioning phases of the Transmission Assets can be found in Volume 3, Annex 8.2: Construction noise and vibration of the ES. These measures are outlined in the Outline Construction Noise and Vibration Management Plan (document reference J1.3). Operational Noise Management Plan(s) for the onshore substations will be prepared and submitted for approval prior to the commencement of operations. The Plan(s) will identify the noise limits for the operation of the onshore substations and the measures for how these limits would be monitored. Details of proposed mitigation are provided in **section 8.8** of this chapter. The assessment outlined in Volume 3, Annex 8.3: Operational noise of the ES includes an iteration of the 3D acoustic modelling which predicts the level of noise reduction required from example mitigation measures which may be included as part of the design to ensure compliance.
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). [Paragraph 5.12.15 of NPS-EN-1]	The Applicants are committed to good design principles to be adopted through the detailed design phase (refer to the Outline Design Principles document (document reference J3)). Where the EIA process identifies any measures required to reduce noise, these have been (and will continue to be) identified and set out as commitments (see **section 8.8** of this chapter).
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. [Paragraph 5.12.16 of NPS-EN-1]	The noise impact criteria for each phase of the Transmission Assets have been derived considering the requirements of the National Planning Policy Framework (NPPF) and the Noise Policy Statement for England (NPSE). Details of the relevant sections are provided in **section 8.2.2** of this chapter.
The Secretary of State should not grant development consent unless they are satisfied that the proposals will meet the following aims, through the effective management and control of noise: • Avoid significant adverse impacts on health and quality of life from noise	Noise mitigation measures are provided in **section 8.8** of this chapter and the Commitments Register (Volume 1, Annex 5.3: Commitments Register of the ES). Indicative mitigation measures which may be adopted to control noise during the construction and operation phases of the Transmission Assets are outlined in:

Summary of NPS provision	How and where considered in the ES
• Mitigate and minimise other adverse impacts on health and quality of life from noise • Where possible, contribute to improvements to health and quality of life through the effective management and control of noise. [Paragraph 5.12.17 of NPS EN-1]	• Volume 3, Annex 8.2: Construction noise and vibration; and • Volume 3, Annex 8.3: Operational noise of the ES. Operational Noise Management Plan(s) for the onshore substations will be prepared and submitted for approval prior to the commencement of operations. The Plan(s) will identify the noise limits for the operation of the onshore substations and the measures for how these limits would be monitored. Details of proposed mitigation are provided in **section 8.8** of this chapter. An assessment of the significance of the effects due to noise and vibration is presented in **section 8.11** of this chapter.
When preparing the Development Consent Order, the Secretary of State should consider including measurable requirements or specifying the mitigation measures to be put in place to ensure that noise levels do not exceed any limits specified in the development consent. These requirements or mitigation measures may apply to the construction, operation, and decommissioning of the energy infrastructure development. [Paragraph 5.12.18 of NPS EN-1	Details of the potential noise reduction achieved via BPM during the construction and decommissioning phases of the Transmission Assets can be found in Volume 3, Annex 8.2: Construction noise and vibration of the ES. The construction threshold values have been derived in accordance with BS 5228-1:2009+A1:2014 (British Standards Institution, 2014a). These measures are outlined in the Outline Construction Noise and Vibration Management Plan (document reference J1.3). Operational Noise Management Plan(s) for the onshore substations will be prepared and submitted for approval prior to the commencement of operations. The Plan(s) will identify the noise limits for the operation of the onshore substations and the measures for how these limits would be monitored. Details of proposed mitigation are provided in **section 8.8** of this chapter. The assessment outlined in Volume 3, Annex 8.3: Operational noise of the ES includes an iteration of the 3D acoustic modelling which predicts the level of noise reduction required from example mitigation measures which may be included as part of the design to ensure compliance.
NPS EN-3	
Proposals for renewable energy infrastructure should demonstrate good design, particularly in respect of landscape and visual amenity, opportunities for co-existence/co-location with other marine uses, and in the design of the project to mitigate impacts such as noise and effects on ecology and heritage. [Paragraph 2.5.2 of NPS EN-3]	The Applicants will commit to good design principles to be adopted through the detailed design phase. Where the EIA process identifies any measures required to reduce noise, these have been (and will continue to be) identified and set out as Commitments (see **Table 8.13** of this chapter). Noise impacts on wildlife are assessed in the following chapters of the ES: • Volume 3, Chapter 3: Onshore ecology and nature conservation of the ES; and • Volume 3, Chapter 4: Onshore and intertidal ornithology of the ES.
Applicants should include in an Environmental Statement a noise assessment of the impacts on amenity in the case of excessive noise from a project in line with guidance set out in Section 5.12 in EN-1. [Paragraph 2.7.40 of NPS EN-3]	The construction, operation and maintenance, and decommissioning phases of the Transmission Assets have been assessed using the principles in the relevant BS. The assessment of noise and vibration impacts and effects arising from the of the onshore elements of the Transmission Assets is presented in **section 8.11** with details provided in

Summary of NPS provision	How and where considered in the ES
	Volume 3, Annex 8.2: Construction noise and vibration of the ES, and Volume 3, Annex 8.3: Operational noise of the ES. Noise impacts on wildlife are assessed in the following chapters of the ES: • Volume 3, Chapter 3: Onshore ecology and nature conservation of the ES; and • Volume 3, Chapter 4: Onshore and intertidal ornithology of the ES. Mitigation measures are considered in **Table 8.13** and the inter-related effects are considered in Volume 4, Chapter 3: Inter-relationships of the ES.
The Secretary of State should consider the noise and vibration impacts according to Section 5.12 in EN-1 and be satisfied that noise and vibration will be adequately mitigated through requirements attached to the consent. [Paragraph 2.7.98 of NPS EN-3] The Secretary of State should not grant development consent unless it is satisfied that the proposals will meet the aims set out in 5.12 of EN-1. [Paragraph 2.7.100 of NPS EN-3]	The construction, operation and maintenance, and decommissioning phases of the Transmission Assets have been assessed using the principles in the relevant BS. Construction noise and vibration control measures are outlined in the Outline Construction Noise and Vibration Management Plan (document reference J1.3). Operational Noise Management Plan(s) for the onshore substations will be prepared and submitted for approval prior to the commencement of operations. The Plan(s) will identify the noise limits for the operation of the onshore substations and the measures for how these limits would be monitored. Details of proposed mitigation are provided in **section 8.8** of this chapter. Significant adverse effects from vibration during the operation of the onshore substations will be avoided through taking measures to control vibration at source during the design process. As a consequence, the assessment of operational vibration impacts has been scoped out. Details of the operational noise assessment and the derivation of these operational noise limits are outlined in Volume 3, Annex 8.3: Operational Noise of the ES. The significance of the effects following adoption of these measures is presented in **section 8.11** of this chapter.
NPS EN-5	
Audible noise effects can also arise from substation equipment such as transformers, quadrature boosters and mechanically switched capacitors. [Paragraph 2.9.37 of NPS EN-5]	All relevant noise emitting plant items have been assessed as part of the operational noise assessment detailed in Volume 3, Annex 8.3: Operational noise of the ES. The assessment has been undertaken assuming upper-range sound power levels for all plant items. The significance of the effects is presented in **section 8.11** of this chapter.
Transformers are installed at many substations and generate low frequency hum. Whether the noise can be heard outside a substation depends on a number of factors, including transformer type and the level of noise attenuation present (either engineered intentionally or provided by other structures). [Paragraph 2.9.38 of NPS EN-5]	The tonality at low frequency arising from the operation of super grid transformers and other high voltage plant has been considered within the assessment. A noise emission spectrum for the transformers in 1/3-octave bands has been adopted to ensure the tonality at 100 Hz (and subsequent harmonics) is properly considered within the assessment, as per the guidance in NANR45 (see section **8.2.3**) . Full details are provided in Volume 3, Annex 8.3: Operational noise of the ES.

Summary of NPS provision	How and where considered in the ES
For the assessment of noise from substations, standard methods of assessment and interpretation using the principles of the relevant British Standards are satisfactory. [Paragraph 2.9.39 of NPS EN-5]	The assessment of operational noise impacts has been undertaken using the principles outlined in BS 4142:2014+A1:2019 – Methods for rating and assessing industrial and commercial sound (British Standards Institution, 2019). Details of the assessment can be found in Volume 3, Annex 8.3: Operational noise of the ES. The significance of the effects is presented in **section 8.11** of this chapter.
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 to assessing the impact on noise-sensitive receptors. [Paragraph 2.9.40 of NPS EN-5]	No overhead lines are proposed as part of the Transmission Assets. All cables are proposed to be installed underground.
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, such as an ISO 9613-2 or Technical Report TR(T)94. [Paragraph 2.9.41 of NPS EN-5]	No overhead lines are proposed as part of the Transmission Assets. All cables are proposed to be installed underground.
The Secretary of State should ensure that appropriate assessment methodologies have been used in the evidence presented to it, and that the appropriate mitigation options have been considered and adopted. Where the applicant can demonstrate that appropriate mitigation measures will be put in place, the residual noise impacts are unlikely to be significant. [Paragraph 2.11.7 of NPS EN-5]	The construction, operation and maintenance, and decommissioning phases of the Transmission Assets have been assessed using the principles in the relevant BS. Construction noise and vibration control measures are outlined in the Outline Construction Noise and Vibration Management Plan (document reference J1.3). Operational Noise Management Plan(s) for the onshore substations will be prepared and submitted for approval prior to the commencement of operations. The Plan(s) will identify the noise limits for the operation of the onshore substations and the measures for how these limits would be monitored. The significance of the effects following adoption of these measures is presented in **section 8.11** of this chapter.

The National Planning Policy Framework

8.2.2.5 The National Planning Policy Framework (NPPF) was published in 2012 and updated in 2018, 2019, 2021 and 2023 (Department for Levelling Up, Housing and Communities, 2023). The NPPF sets out the Government's planning policies for England.

8.2.2.6 The Government has published proposed reforms to the NPPF for consultation on 30 July 2024, with the consultation period ending on 24 September 2024 (Ministry of Housing, Communities and Local Government, 2024). Following consultation, the NPPF will be updated.

8.2.2.7 The NPPF does not contain any specific policy or criteria relating to noise and vibration. Instead, it provides a framework for local authorities to produce

local and neighbourhood plans to reflect the needs and priorities of communities within their jurisdiction.

8.2.2.8 Paragraph 180(e) of the NPPF states the following:

'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 or land instability.

[…]'

8.2.2.9 Paragraph 191 of Section 15 of the NPPF states the following:

"'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[69];

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; and

c) limit the impact of light pollution from artificial light on local amenity, intrinsically dark landscapes and nature conservation.

[…]'

[69] See Explanatory Note to the Noise Policy Statement for England (Department for Environment, Food & Rural Affairs, 2010).'

8.2.2.10 The consultation draft includes similar provisions as the designated NPPF. The consultation draft NPPF has been reviewed and there are no material updates for noise and vibration.

8.2.2.11 The Planning Practice Guidance (PPG) (Department for Levelling Up, Housing and Communities and Ministry of Housing, Communities and Local Government, 2019) supports the NPPF and provides guidance across a range of topic areas.

8.2.2.12 The noise section of the PPG provides outline guidance and refers to general guidance on noise policy and assessment methodology detailed in the NPPF, the NPSE, and BS. The NPSE sets out noise management policy in the form of the Government's long-term vision to manage noise and improve health and quality of life.

8.2.2.13 The following guidance is presented within the PPG on how noise impacts may be determined:

'Plan-making and decision making need to take account of the acoustic environment and in doing so consider:

- *whether or not a significant adverse effect is occurring or likely to occur;*
- *whether or not an adverse effect is occurring or likely to occur; and*
- *whether or not a standard of amenity can be achieved*.'

8.2.2.14 A noise exposure hierarchy is provided as supplementary guidance in tabular form and is recreated in **Table 8.2** below. The guidance outlines the need to avoid and prevent the occurrence of significant adverse effects due to noise.

Table 8.2: Summary of noise exposure hierarchy from NPSE and PPG

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

Local planning policy

8.2.2.15 The onshore elements of the Transmission Assets are located within the administrative areas of Fylde Council, Blackpool Council, South Ribble Borough Council and Preston City Council (and Lancashire County Council at the County level).

8.2.2.16 The relevant local planning policies applicable to noise and vibration based on the extent of the study areas for this assessment are summarised in **Table 8.3**.

Table 8.3: Summary of local planning policy relevant to this chapter

Policy	Key provisions	How and where considered in the ES
The Preston Local Plan 2012-26 (Adopted 2 July 2015) (Preston City Council, 2015)		
Policy AD1 (a)	Development within (or in close proximity to) the existing residential area will be permitted provided that it meets with the criteria listed below. … b) there would be no adverse impact on residential amenity, particularly by reason of noise, general disturbance and loss of privacy due to the activity under consideration or the vehicular/pedestrian movement it generates…	The noise and vibration impacts due to the construction, operation and maintenance, and decommissioning of the Transmission Assets have been assessed with reference to the principles outlined in the relevant BS. An assessment of the noise impacts due to construction traffic has been undertaken in line with the guidance within DMRB LA 111 (Highways England *et al.,* 2020). The assessment is presented in **section 8.11** with full details of the methodology and results provided in the following annexes: • Volume 3, Annex 8.2: Construction noise and vibration of the ES; and • Volume 3, Annex 8.3: Operational noise of the ES.
Factsheet 40: Environmental Protection – Construction and Demolition Works	Noisy activities are not expected on Sundays, Bank Holidays, or outside of the following. • 08:00 to 18.00 hours Monday to Friday. • 08:00 to 13.00 hours Saturdays. Efforts must be made to communicate and liaise with local residents to ensure any adverse impacts are avoided.	The core working hours for the construction of the Transmission Assets are outlined in **Table 8.13** of this chapter. The core working hours for the construction of the landfall and onshore elements will be: • Monday to Saturday: 07:00 - 19:00 hours; • up to one hour before and after core working hours for mobilisation (“mobilisation period”) i.e. 06:00 to 20:00. Activities carried out during the mobilisation period will not generate significant noise levels (such as piling, or other such noisy activities). In circumstances outside of core working practices, specific works may have to be undertaken outside the core working hours. This will include, but is not limited to, works being undertaken within and/or adjacent to Blackpool Airport and cable installation at landfall and at the River Ribble. Advance notice of such works will be given to the relevant planning authority. BPM will be adopted for all methods of construction and a Code of Construction Practice (CoCP) will be implemented as part of the construction phase for the Transmission Assets. An Outline CoCP is provided as part of the application for development consent (document reference J1). This includes liaising with local residents and businesses to keep them informed of construction activities and working hours as outlined in

Policy	Key provisions	How and where considered in the ES
		the Outline Construction Noise and Vibration Management Plan (document reference J1.3)
Adopted Fylde Local Plan to 2032 (incorporating Partial Review) (Adopted December 2021) (Fylde Council, 2021)		
Strategic Policy CL3	Proposed renewable or low carbon energy developments will be assessed in relation to: • the noise impacts on local residents and ecological receptors; and • the cumulative impact of the development within Blackpool and Preston.	The noise and vibration impacts due to the construction, operation, and decommissioning of the Transmission Assets have been assessed with reference to the principles outlined in the relevant BS. An assessment of the noise impacts due to construction traffic has been undertaken in line with the guidance within DMRB LA 111 (Highways England *et al.,* 2020). The assessment is presented in **section 8.11** with full details of the methodology and results provided in the following annexes: • Volume 3, Annex 8.2: Construction noise and vibration of the ES; and • Volume 3, Annex 8.3: Operational noise of the ES. A cumulative effects assessment with other developments has been undertaken in **section 8.13**. An assessment of the impacts on ecological receptors is provided in the following: • Volume 3, Chapter 3: Onshore ecology and nature conservation of the ES; and • Volume 3, Chapter 4: Onshore and intertidal ornithology of the ES.
South Ribble Local Plan 2012-2026 (Adopted July 2015) (South Ribble Borough Council, 2015)		
Policy B1	Proposals for the re-use of undeveloped land and unused land and buildings, or for redevelopment, will be permitted provided that the development will not adversely affect the amenities of nearby residents.	The noise and vibration impacts due to the construction, operation and maintenance, and decommissioning of the Transmission Assets have been assessed with reference to the principles outlined in the relevant BS. An assessment of the noise impacts due to construction traffic has been undertaken in line with the guidance within DMRB LA 111 (Highways England *et al.,* 2020). The assessment is presented in **section 8.11** with full details of the methodology and results provided in the following annexes: • Volume 3, Annex 8.2: Construction noise and vibration of the ES; and • Volume 3, Annex 8.3: Operational noise of the ES.
Blackpool Local Plan Part 1: Core Strategy 2012-2017 (Adopted January 2016) (Blackpool Council, 2016)		
Policy CS7	Developments which cause unacceptable effects on local character or amenity due to noise and vibration will not be permitted.	The noise and vibration impacts due to the construction, operation and maintenance, and decommissioning of the Transmission Assets have been assessed with reference to the principles outlined in the relevant BS. An assessment of the noise impacts due to construction traffic has been undertaken in line with the guidance within DMRB LA 111 (Highways England *et al*., 2020).
Policy CS10	Renewable and low carbon energy developments must be	

Policy	Key provisions	How and where considered in the ES
	mitigated such that any potential noise impacts do not cause unacceptable impacts on the environment or local amenity.	The assessment is presented in **section 8.11** with full details of the methodology and results provided in the following annexes. • Volume 3, Annex 8.2: Construction noise and vibration of the ES. • Volume 3, Annex 8.3: Operational noise of the ES. The measures (commitments) to be adopted as part of the Transmission Assets are detailed in **Table 8.13** of this chapter. Details of the potential noise reduction achieved via BPM during the construction and decommissioning phases of the Transmission Assets can be found in Volume 3, Annex 8.2: Construction noise and vibration of the ES. These measures will be outlined in the Outline Construction Noise and Vibration Management Plan (document reference J1.3). Operational Noise Management Plan(s) for the onshore substations will be prepared and submitted for approval prior to the commencement of operations. The Plan(s) will identify the noise limits for the operation of the onshore substations and the measures for how these limits would be monitored. The assessment outlined in Volume 3, Annex 8.3: Operational noise of the ES includes an iteration of the 3D acoustic modelling which predicts the level of noise reduction required from example mitigation measures which may be included as part of the design to ensure compliance.
Blackpool Local Plan Part 2: Site Allocations and Development Management Policies (Blackpool Council, 2022)		
DM36	1. Development will be permitted where in isolation or in conjunction with other planned or committed developments it can be demonstrated that the development: a. Will be compatible with adjacent existing uses and would not lead to unacceptable adverse effects on health, amenity, safety and the operation of surrounding uses and for occupants, users of the development itself or designated sites of importance for biodiversity, with reference to noise, vibration, odour, light, dust, other pollution or nuisance. Applications will be required to be accompanied, where appropriate by relevant impact assessments and mitigation proposals; […]	The noise and vibration impacts due to the construction, operation and maintenance, and decommissioning of the Transmission Assets have been assessed with reference to the principles outlined in the relevant BS. An assessment of the noise impacts due to construction traffic has been undertaken in line with the guidance within DMRB LA 111 (Highways England *et al*., 2020). The assessment of significant effects is presented in **section 8.11** with full details of the methodology and results provided in the following annexes: • Volume 3, Annex 8.2: Construction noise and vibration of the ES; and • Volume 3, Annex 8.3: Operational noise of the ES. An assessment of the potential cumulative effects of the Transmission Assets with other development proposals is considered in **sections 8.12 and 8.13** of this chapter. Construction noise and vibration control measures will be outlined in the Outline Construction Noise and Vibration Management Plan (document reference J1.3). Operational Noise Management Plan(s) for the onshore substations will be prepared and submitted for approval prior to the commencement of operations. The Plan(s) will identify the noise limits for the operation of the onshore substations and the measures for how these

Policy	Key provisions	How and where considered in the ES
		limits would be monitored. Details of the operational noise assessment and the derivation of these operational noise limits are outlined in Volume 3, Annex 8.3: Operational Noise of the ES.
Central Lancashire Adopted Core Strategy – Local Development Framework (Preston City Council, South Ribble Borough Council and Chorley Council, 2012)		
Policy 28	Proposals for renewable and low carbon energy schemes will be supported and planning permission granted where the following criteria are met: […] (c) Any noise, odour, traffic or other impact of development is mitigated so as not to cause unacceptable detriment to local amenity; (d) Any significant adverse effects of the proposal are considered against the wider environmental, social and economic benefits, including scope for appropriate mitigation, adaptation and/or compensatory provisions.	The noise and vibration of impacts due to the construction, operation and maintenance, and decommissioning of the Transmission Assets have been assessed with reference to the principles outlined in the relevant BS. An assessment of the noise impacts due to construction traffic has been undertaken in line with the guidance within DMRB LA 111 (Highways England *et al.*, 2020). The assessment of significant effects is presented in **section 8.11** with full details of the methodology and results provided in the following annexes: • Volume 3, Annex 8.2: Construction noise and vibration of the ES; and • Volume 3, Annex 8.3: Operational noise of the ES. Construction noise and vibration control measures will be outlined in the Outline Construction Noise and Vibration Management Plan (document reference J1.3). Operational Noise Management Plan(s) for the onshore substations will be prepared and submitted for approval prior to the commencement of operations. The Plan(s) will identify the noise limits for the operation of the onshore substations and the measures for how these limits would be monitored. Details of proposed Details of the operational noise assessment and the derivation of these operational noise limits are outlined in Volume 3, Annex 8.3: Operational Noise of the ES. Inter-related effects are considered in Volume 4, Chapter 3: Inter-relationships of the ES.

8.2.3 Relevant guidance

British Standard 4142

8.2.3.1 BS 4142:2014+A1:2019 (British Standards Institution, 2019) provides a method for rating industrial and commercial sound and a method for assessing resulting impacts upon people. The method is applicable to fixed plant installations, sound from industrial and manufacturing process and other associated activities.

8.2.3.2 In summary, this Standard provides guidance on determining '*rating sound levels*' by correcting the '*specific sound level*' from the site or operations under consideration to account for any distinctive acoustic characteristics such as tonality, impulsivity, and intermittency. The Standard provides the following corrections to be applied where each is appropriate.

- *'Tonality - For sound ranging from not tonal to prominently tonal the Joint Nordic Method gives a correction of between 0 dB and +6 dB for tonality. Subjectively, this can be converted to a penalty of 2 dB for a tone which is just perceptible at the noise receptor, 4 dB where it is clearly perceptible, and 6 dB where it is highly perceptible.*
- *Impulsivity - A correction of up to +9 dB can be applied for sound that is highly impulsive, considering both the rapidity of the change in sound level and the overall change in sound level. Subjectively, this can be converted to a penalty of 3 dB for impulsivity which is just perceptible at the noise receptor, 6 dB where it is clearly perceptible, and 9 dB where it is highly perceptible.*
- *Intermittency - When the specific sound has identifiable on/off conditions, the specific sound level should be representative of the time period of length equal to the reference time interval which contains the greatest total amount of on time. … If the intermittency is readily distinctive against the residual acoustic environment, a penalty of 3 dB can be applied.*
- *Other sound characteristics - Where the specific sound features characteristics that are neither tonal nor impulsive, nor intermittent, though otherwise are readily distinctive against the residual acoustic environment, a penalty of 3 dB can be applied.'*

8.2.3.3 An initial estimate of the impact of the source is obtained by subtracting the measured background sound level from the rating sound level of the proposed plant at the nearest noise-sensitive receptors. The impact magnitude criteria are presented in **section 8.10.3**.

Procedure for the Assessment of Low Frequency Noise Disturbance (NANR45)

8.2.3.4 High voltage electrical equipment associated with renewable energy infrastructure can generate noise emissions with a distinct tone at low frequencies. Low frequency sound waves can travel long distances without losing energy and are not easily absorbed by obstacles such as buildings. Due to the complexities associated with low frequency noise control, it is important that consideration is given to any low frequency components in the noise emission spectra of electrical transmission equipment.

8.2.3.5 Subclause 1.3 of BS 4142:2014+A1:2019 states that the standard is not applicable to the assessment of low frequency noise and reference is made to Guidance Note NANR45: Procedure for the Assessment of Low Frequency Noise Disturbance (University of Salford, 2005).

8.2.3.6 This guidance was produced to provide a methodology and criteria to assist in the investigation of complaints due to low frequency noise. However, in the absence of other guidance, the reference curve for use in assessing low frequency noise is often used to identify where such noise exists that could result in complaints.

8.2.3.7 The NANR45 reference curve is presented in **Table 8.4** below in all 1/3-octave band frequencies between 10 Hz and 160 Hz. It should be noted that

the lower end of this range is below the range of normal human hearing and is included to present the range of frequencies only.

Table 8.4: NANR45 reference curve for low frequency noise.

NANR45 Reference L_{eq} (dB) at 1/3-Octave Band Frequency (Hz)												
10	**12.5**	**16**	**20**	**25**	**31.5**	**40**	**50**	**63**	**80**	**100**	**125**	**160**
92	87	83	74	64	56	49	43	42	40	38	36	34

British Standard 5228

8.2.3.8 This BS provides guidance, information, and procedures for the control of noise and vibration from demolition and construction sites and comprises the following two parts.

- BS 5228-1:2009+A1:2014 – 'Code of practice for noise and vibration control on construction and open sites' – Part 1: Noise.
- BS 5228-2:2009+A1:2014 – 'Code of practice for noise and vibration control on construction and open sites' – Part 2: Vibration.

8.2.3.9 There are no set standards for the definition of the significance of construction noise effects. However, noise example criteria are provided in BS 5228-1:2009+A1:2014 Annex E and vibration example criteria are provided in BS 5228-2:2009+A1:2014 Annex B.

8.2.3.10 BS 5228-1:2009+A1:2014 provides basic information and recommendations for methods of noise control relating to construction and open sites where work activities/operations generate significant noise levels. It includes sections on:

- community relations;
- noise and persons on site;
- neighbourhood nuisance;
- project supervision; and
- the control of noise.

8.2.3.11 The annexes include information on legislative background, noise sources, remedies and their effectiveness (mitigation options); current and historic sound level data for on-site equipment and site activities; significance of noise effects; calculation procedures estimating sound emissions from sites and sound level monitoring; types of piling; and air overpressure.

8.2.3.12 BS 5228-2:2009+A1:2014 contains information and recommendations for basic methods of vibration control arising from construction and open sites where work activities/operations generate significant levels of vibration. It includes sections on community relations; vibration and persons on site; neighbourhood nuisance; project supervision; control of vibration and measurement. BS 5228-2:2009+A1:2014 refers to BS ISO 4866:2010; BS 7385-2:1993; BS 6472-1:2008, and BS 6472-2:2008 for further advice on the significance of vibration.

Design Manual for Roads and Bridges (DMRB) – LA 111 – Noise and vibration

8.2.3.13 The DMRB LA 111 (Highways England *et al.,* 2020), provides guidance on methods for assessing noise and vibration from construction traffic.

8.2.3.14 The magnitude of noise impacts is assessed using the predicted change in the Basic Noise Level (BNL) on the closest public roads to a receptor following the introduction of construction traffic.

8.2.3.15 The noise change is calculated using the methods outlined in the *'Calculation of Road Traffic Noise'* (Department for Transport and Welsh Office, 1988) which considers:

- the change in traffic flow due to construction traffic;
- vehicle speed; and
- the percentage of Heavy Goods Vehicles (HGVs).

8.2.3.16 Paragraph 3.19 of DMRB LA 111 states the following:

'Construction noise and construction traffic noise shall constitute a significant effect where it is determined that a major or moderate magnitude of impact will occur for a duration exceeding:

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

8.2.3.17 Additional guidance is provided for the determination of construction noise impact criteria in terms of the LOAEL and the SOAEL. These are defined in **Table 8.2** and Volume 3, Annex 8.2: Construction noise and vibration of the ES.

World Health Organisation (WHO)

8.2.3.18 The World Health Organisation (WHO, 2018) environmental noise guidelines provide recommendations for protecting human health from long-term noise exposure due to various sources. The guidance states the following regarding industrial noise:

'The current environmental noise guidelines for the European Region supersede the CNG from 1999. Nevertheless, the GDG recommends that all CNG indoor guideline values any values not covered by the current guidelines (such as industrial noise and shopping areas) should remain valid.'

8.2.3.19 The previous WHO 1999 Community Noise Guidelines (WHO, 1999) may also be referred to for the consideration of the following.

- External daytime (7am-11pm) ambient noise limits with an upper limit of 55 dB $L_{Aeq,16h}$.
- External night-time (11pm-7am) ambient noise limits of 45 dB $L_{Aeq,8h}$, corresponding to the level at which sleep disturbance may occur with windows open.

8.2.3.20 The WHO night noise guidelines (WHO, 2009) define effect thresholds or 'lowest observed adverse health effect levels' for both long-term adverse health effects and short-term sleep disturbance as follows.

- No effects expected to occur: External L_{night} level of less than 30 dB(A).
- Adverse effects start to occur (night-time 'lowest observed adverse effect level (LOAEL): External L_{night} level of 40 dB(A).
- Adverse effects are likely to occur frequently: External L_{night} level of 55 dB(A).

Tranquil Spaces: Measuring the Tranquillity of Public Spaces

8.2.3.21 Tranquillity mapping studies, such as those undertaken by Campaign for Rural England (CPRE, 2006) focus on tranquillity in rural environments. Tranquil Spaces: Measuring the Tranquillity of Public Spaces (Bentley, 2019) outlines the Natural Tranquillity Method (NTM) which has been developed to provide an empirical, evidence-based formula which accounts for sound level and the character of the acoustic environment.

8.2.3.22 This method allows for a wider assessment of acoustics and tranquillity since more consideration is given to the presence and behaviour of people as well as noise sources other than road traffic noise.

8.2.3.23 The NTM depends on four key variables, set out below.

- NAMM: A number between one and five representing the proportion of natural and man-made sounds.
- PONS: The percentage of time during the survey period where only natural sounds are heard.
- L_{RR}: The contribution of road and rail noise to the tranquillity score. Rail noise must be reduced by 6 dB for this parameter and, when both are present, they should be added together (logarithmically).
- L_{AT}: The overall corrected ambient sound level. Generally, this will be the same as the measured $L_{Aeq,T}$ level over the measurement period.

8.2.3.24 A descriptor of the NAMM parameter values is provided in **Table 8.5** below.

Table 8.5: NAMM values

NAMM Parameter Value	Description
1	All or virtually all sound is from man-made sources.
2	Sounds are mainly from man-made sources but natural sounds are also present.
3	NAMM noise sources contribute equally to the overall sound level.
4	Sounds are mainly from natural sources but man-made sounds are also present.
5	All or virtually all sound is from natural sources.

8.2.3.25 Following completion of a site review and on-site measurements, the collected data and information can be used to predict a tranquillity score for each location. The output will be a numerical score and associated description as detailed in **Table 8.6** below.

Table 8.6: Tranquillity score

Tranquillity Score	Description
1	Frantic/chaotic/harsh
2	Busy/noisy
3	Unsettled/slightly busy
4	Not quite tranquil
5	Just tranquil
6	Fairly tranquil
7	Good tranquillity
8	Excellent tranquillity
9	Perfect tranquillity

8.3 Consultation

8.3.1 Scoping

8.3.1.1 On 28 October 2022, the Applicants submitted a Scoping Report to the Planning Inspectorate, which described the scope and methodology for the technical studies being undertaken to provide an assessment of any likely significant effects for the construction, operation and maintenance and decommissioning phases of the Transmission Assets.

8.3.1.2 Following consultation with the appropriate statutory bodies, the Planning Inspectorate (on behalf of the Secretary of State) provided a Scoping Opinion on 8 December 2022.

8.3.2 Evidence plan process

8.3.2.1 Following scoping, consultation and engagement with interested parties specific to noise and vibration has continued. An Evidence Plan Process

(EPP) has been developed for the Transmission Assets, seeking to ensure engagement with the relevant aspects of the EIA process throughout the pre-application phase. The development and monitoring of the Evidence Plan and its subsequent progress has been undertaken by the EPP Steering Group. The Steering Group comprises the Planning Inspectorate, the Applicants, the Marine Management Organisation, Natural England, Historic England, the Environment Agency and the Local Planning Authorities as the key regulatory and bodies.

8.3.2.2 As part of the EPP, Expert Working Groups (EWGs) were set up to discuss and agree topic specific matters with relevant stakeholders. Minutes of meetings held with the EWGs are set out within the Technical Engagement Plan (document reference E5).

8.3.2.3 Four EWGs pertinent to noise and vibration have been held to discuss the methodologies proposed for the baseline sound survey and construction and operational noise and vibration impact assessments. Details of the discussions are presented in **Table 8.7**.

8.3.3 Statutory consultation responses

8.3.3.1 The preliminary findings of the EIA process were published in the Preliminary Environmental Information Report (PEIR) in October 2023. The PEIR was prepared to provide the basis for formal consultation under the Planning Act 2008. This included consultation with statutory and non-statutory bodies under sections 42 and 47 of the Planning Act 2008, as presented in **Table 8.7**.

8.3.4 Summary of consultation responses received

8.3.4.1 A summary of the key items raised specific to noise and vibration is presented in **Table 8.7**, together with how these have been considered in the production of this chapter. It should be noted that formal responses are provided for all consultation responses received and can be accessed in the Consultation Report (document reference E1).

Table 8.7: Summary of key consultation comments raised during consultation activities undertaken for the Transmission Assets relevant to noise and vibration

Date	Consultee and type of response	Comment raised	Response to comment raised and/or where considered in this chapter
December 2022	Planning Inspectorate, Scoping Opinion	The Scoping Report states that the Transmission Assets are likely to be installed over a period of up to four years for Morgan Offshore Wind Farm (OWF) and up to three years for Morecambe OWF. To what degree the construction activities will occur concurrently is not explained. The ES should ensure that the realistic worst case construction period is assessed for the project as a whole. Additionally, the construction phasing should be detailed enough to establish which construction activities will be done collaboratively and simultaneously or at separate times.	Construction noise and vibration impacts have been assessed in Volume 3, Annex 8.2: Construction noise and vibration of the ES. The maximum design scenario for the construction phase of the Transmission Assets is presented in **Table 8.14**. The maximum design scenario for construction is represented by concurrent construction of the Morgan and Morecambe Transmission Assets, since this scenario results in receptors being exposed to the highest noise levels.
December 2022	Planning Inspectorate, Scoping Opinion	Any mitigation measures identified as necessary from the assessment should be clearly explained and the ES should set out how these would be secured through the DCO process.	Embedded and secondary mitigation measures adopted as part of the Transmission Assets are presented in **Table 8.13**.
December 2022	Planning Inspectorate, Scoping Opinion	Table 8.14 of the EIA Scoping Report contained proposals to scope out: • assessments of the vibration impacts on human and heritage assets from construction and decommissioning traffic; • assessments of the vibration impacts on human and heritage assets from operation and maintenance activities; and • assessments of the impact of noise and vibration generated during operation and maintenance of the Transmission Assets (excluding the onshore substations), including the onshore export cable and associated infrastructure. The Planning Inspectorate agreed that significant effects for these impacts are unlikely to occur and thus an assessment of the above may be scoped out.	These impacts have been scoped out of the ES, as agreed with the Planning Inspectorate (see **section 8.7**).

Date	Consultee and type of response	Comment raised	Response to comment raised and/or where considered in this chapter
December 2022	Planning Inspectorate, Scoping Opinion	The Inspectorate has considered the information in the Scoping Report regarding, substation equipment, and other onshore infrastructure as sources of ground-borne vibration. The Inspectorate agrees that significant effects are unlikely to occur and is content that operational vibration from the operation of the Proposed Development can be scoped out of the ES. The ES should detail any operational control measures for noise during operation and maintenance (for example an Operational Management Plan).	An assessment of operational noise impacts has been undertaken with reference to the guidance in: • BS 4142:2014+A1:2019 – 'Methods for rating and assessing industrial and commercial sound'. Details of the methodology, results, and the noise control measures required as part of the design are presented in Volume 3, Annex 8.3: Operational noise of the ES. Any required noise control measures are identified in terms of the required noise reduction to achieve the noise impact criteria at nearby receptors. Operational Noise Management Plan(s) for the onshore substations will be prepared and submitted for approval prior to the commencement of operations (see CoT80 **Table 8.13**). The Plan(s) will identify the noise limits for the operation of the onshore substations and the measures for how these limits would be monitored. Details of proposed mitigation are provided in **section 8.8** of this chapter.
December 2022	Planning Inspectorate, Scoping Opinion	The data collection column [within the Scoping Report] states that '*where existing baseline data coverage is insufficient, and where significant effects may occur, baseline sound levels will be obtained through sound monitoring surveys*.' Noise surveys should be compliant with the requirements of the relevant British Standard (e.g. BS 7445).	All baseline sound measurements have been undertaken in line with the guidance provided in: • BS 7445-1:2003 – 'Description and measurement of environmental noise – Part 1: Guide to environmental quantities and procedures'; and • BS 7445-2:1991 – 'Description and measurement of environmental noise –

Date	Consultee and type of response	Comment raised	Response to comment raised and/or where considered in this chapter
			Part 2: Guide to the acquisition of data pertinent to land use'. Details of the baseline survey methodology are presented in Volume 3, Annex 8.1: Baseline sound survey of the ES.
December 2022	Planning Inspectorate, Scoping Opinion	The Inspectorate considers that the list of inter-related effects should also include human health, land use and recreation and landscape and visual impacts (related to tranquillity).	Inter-related effects are considered in Volume 4, Chapter 3: Inter-relationships of the ES. The impacts of noise and vibration on human health are considered in Volume 1, Annex 5.1: Human health of the ES. An assessment of noise and vibration impacts on recreational receptors has been undertaken using the Natural Tranquillity Method. This is outlined in Volume 3, Annex 8.3: Operational noise of the ES with the assessment of effects provided in **section 8.11** of this chapter.
December 2022	Fylde Council, Scoping Opinion	Fylde Council request that consideration be given to impacts on ecological receptors within a dune system located in the coastal region of the borough.	An assessment of the impacts on ecological receptors is provided in the following: • Volume 3, Chapter 3: Onshore ecology and nature conservation of the ES; and • Volume 3, Chapter 4: Onshore and intertidal ornithology of the ES. Inter-related effects are considered in Volume 4, Chapter 3: Inter-relationships of the ES.
December 2022	United Utilities Water Ltd., statutory	United Utilities requests that the impact of the proposed development includes an assessment of any potential vibration on United Utilities' assets.	Discussions with United Utilities will be undertaken at the detailed design stage to confirm the location of infrastructure.

Date	Consultee and type of response	Comment raised	Response to comment raised and/or where considered in this chapter
	consultation response		
December 2022	South Ribble Borough Council, statutory consultation response	South Ribble Borough Council have expressed concerns regarding the study area adopted for the assessment of construction vibration impacts due to piling. They state that experience has shown the effects of piling can cause problems at receptors beyond 100 metres (m) and requested further clarification the study area adopted. Further clarification is requested whether operation and maintenance impacts are expected from the Penwortham Substation, and whether a Construction Management Plan is proposed as part of the development	A 100 m study area for the assessment of construction vibration impacts has been selected based upon the guidance in DMRB LA 111. This is outlined in **section 8.4** with the study area presented graphically in Figure 8.3 of Volume 3, Figures. No operation and maintenance impacts are expected at receptors near the existing Penwortham substation. . Operational noise impacts from the Morgan and Morecambe onshore substations are considered in **section 8.11.9**. An Outline Construction Noise and Vibration Management Plan (document J1.3) has been prepared as part of the application for development consent and is secured as a requirement of the DCO. This will be developed further and will form the basis of the final plan(s). Further details are provided in **section 8.8.**
November 2023	Freckleton Parish Council, statutory consultation response	The following comment was received: • *"No information has been provided regarding the possible acoustic issues that can surround substation equipment, which may produce a low frequency 50 Hz background hum which can be extremely annoying. This specific concern relates to those substations close to the residential areas, especially those close to Kirkham Rd. What information is available suggests that a noise level in excess of 35 dB above ambient is to be expected. This is intolerable to anyone living close to the development and experience suggests that in some weather conditions the noise footprint would be far wider than predicted."*	An assessment of noise impacts during the operational phase of the Transmission Assets is presented in Volume 3, Annex 8.3: Operational noise of the ES. Careful consideration has been given to the tonal components at low frequency which are present in the noise emission spectra of high voltage electricity transmission equipment such as transformers and shunt reactors. Acoustic character corrections have been applied to the predicted levels at

Date	Consultee and type of response	Comment raised	Response to comment raised and/or where considered in this chapter
			receptors where the tonal components are deemed to be perceptible in accordance with the definition in BS 4142:2014+A1:2019 (British Standards Institution, 2019). A separate assessment of the low frequency noise has been undertaken in line with the reference curve detailed in NANR45 (see **Table 8.4** of this chapter) An assessment of predicted effects due to noise and vibration is presented in **section 8.11** of this chapter.
November 2023	Fylde Council, statutory consultation response	The following comments were received: • *'The location of the substations in relative close proximity to established residential settlements and individual residential properties is of concern to the council and the lack of detailed information to allow an assessment of these impacts heightens that concern. It also seems that the opportunity for those property owners to fully appreciate the potential location and scale of the infrastructure relative to their property undermines the value of the consultation process at this stage.'* • *'The Council remains concerned that the impact of noise on local communities both during the construction phase and the long-term operation of the sub stations in particular. As the construction will largely take place in, and the substations will be located in, rural areas where the background noise levels are relatively low, there is clearly a greater potential for noise disturbance emanating from the development. It is essential that any impact of noise disturbance has regard to the impact on residential amenity rather than using higher WHO thresholds that are based on potential impact on Human Health. As details of the technology that will be utilised in the substations are clarified, the council would wish to be involved in further discussions in regard to potential noise impacts.'*	Indicative layouts have informed the assessment of noise impacts due the operation of the onshore substations. The plant list and noise levels assumed are in the upper range of those typically associated with the substation equipment to be adopted. The assessment of noise impacts during the operational phase of the Transmission Assets is presented in Volume 3, Annex 8.3: Operational noise of the ES. This assessment has been undertaken using the night-time background sound levels at the most-exposed receptors to operational noise which is This approach is in accordance with the method stated in BS 4142, which is appropriate for assessment of commercial/industrial noise impacts on residential premises and therefore considers potential effects on amenity. The WHO thresholds are typically less onerous than the BS4142 method.

Date	Consultee and type of response	Comment raised	Response to comment raised and/or where considered in this chapter
			An assessment of predicted effects due to noise and vibration is presented in **section 8.11** of this chapter.
November 2023	Treales, Roseacre & Wharles Parish Council, statutory consultation response	The following comments were received: • *'The developer's documentation has currently failed to evidence that they have given weight to, or mitigation of the adverse impacts on the local: residents, communities, economies and environments on:-* – *amenity (disruption & destruction of the rural character of the area, disruption due to construction & traffic),* – *health & well-being (including emissions giving rise to: respiratory impacts- in construction & restoration; aural impacts– throughout the 6 decade programme life cycle from activity, plant and equipments; and potentially, electro-magnetic impacts - in operation throughout the life of the programme.* – *highway safety (through inadequate specification & control of traffic. Plus proposed use of narrow rural lanes, also used for residential & leisure access with consequential severe impacts on all users).'* • '*There appears to be a failure to detail any meaningful mitigations of harmful impacts e.g.* – *Converter station 24x7 humming noise at a volume that would require ear protectors in a workplace. In a low lying, flat area with only low clipped hedges, the industrial noise will be noticeable and will travel, no mitigations mentioned. Noise pollution in particular is known to be harmful to health and well-being, it can create physical and psychological stress, cause high blood pressure, headaches etc.* – *The converter stations at 20 metres high will tower above the low lying, flat rural landscape, the harm to community is recognised in the brochure with a suggestion of mitigation. as per the brochure trees would be planted and in 20 years would reach maturity and provide some cover which is totally inadequate and just illustrates the inappropriateness of what is being planned in the location.*	Noise and vibration impacts (referred to as 'aural impacts' by the consultee) during the construction and decommissioning phases of the Transmission Assets are presented in Volume 3, Annex 8.2: Construction noise and vibration of the ES. This document includes an assessment of construction traffic noise, as well as an assessment of the noise and vibration impacts during each phase of construction required for the Transmission Assets. The assessment of operational noise impacts is presented in Volume 3, Annex 8.3: Operational noise of the ES and includes an assessment of noise impacts due to the plant equipment forming the electrical strategy for the onshore substations. Particular consideration is given to the tonal components at low frequency which are present in the noise emission spectra of high voltage electricity transmission equipment such as transformers and shunt reactors. Acoustic character corrections have been applied to the predicted levels at receptors where the tonal components are deemed to be perceptible in accordance with the definition in BS 4142:2014+A1:2019 (British Standards Institution, 2019). Mitigation measures have been specified

Date	Consultee and type of response	Comment raised	Response to comment raised and/or where considered in this chapter
		– *These apparently effectively unmitigated features do not seem to have sought the best practice from comparable projects where equivalent converter substations seem to be of a much smaller footprint and in more discrete locations.'*	where required and are included in **Table 8.13**. An assessment of predicted effects due to noise and vibration is presented in **section 8.11** of this chapter. The noise impacts on human health and wellbeing are considered in Volume 1, Annex 5.1: Human health of the ES.
November 2023	United Utilities, statutory consultation response	The following comment was received: • *'United Utilities requests that the impact of the proposed development includes an assessment of any potential settlement and vibration on United Utilities' assets. Similarly, any loading on United Utilities' assets during operation or during construction requires further consideration with United Utilities.'*	An assessment of vibration impacts is presented in Volume 3, Annex 8.3: Construction noise and vibration of the ES. An assessment of predicted effects due to noise and vibration is presented in **section 8.11** of this chapter. Discussions with United Utilities will be undertaken at the detailed design stage to confirm the location of infrastructure.
November 2023	Lancashire County Council, statutory consultation response	The following comments were received: • *'The proposal has the potential to cause significant disruption to residents throughout its construction phase, and it is imperative that this is minimised through the design and phasing of works and mitigated through adequate controls on working practices to control noise and vibration. In particular any roadworks are likely to have significant knock-on effects to the wider network resulting in congestion; this is especially the case in the area around Blackpool Airport. When laying the onshore cable, any road crossing should be undertaken with directional drilling unless the road is demonstrated to only carry minor volumes of traffic and that traffic can be easily diverted via alternative routes.'* • *'The Planning application should demonstrate that issues raised by consultees have been addressed. This includes (but is not limited to):* – *Natural England* – *The Environment Agency*	An assessment of noise and vibration impacts during the construction phase of the Transmission Assets is presented in Volume 3, Annex 8.3: Construction noise and vibration of the ES. The construction noise impact assessment includes an assessment of potential noise impacts due to increased vehicular movements on local highway networks as a result of construction traffic. The Outline Construction Traffic Management Plan (document reference J5) outlines methods to control construction traffic. The measures to be adopted to control construction traffic are presented in

Date	Consultee and type of response	Comment raised	Response to comment raised and/or where considered in this chapter
		– *Marine Management Organisation* – *Local Planning Authorities'* • *'Survey data submitted with the planning application should be current/up-to-date, in line with recognised guidelines (as summarised above).* *The survey area should include:* – *The intended location of the development footprint;* – *Potential working areas, compounds, storage areas and access routes;* – *Any land that may be used within the mitigation, compensation or biodiversity net gain proposals (on or off-site);* – *A suitable buffer distance, taking account of the likely zone of influence and relevant survey guidelines.'*	Volume 3, Chapter 7: Traffic and transport of the ES. Typical losses associated with BPM have been included in the assessment. An assessment of predicted effects due to noise and vibration is presented in **section 8.11** of this chapter. Consultation with all relevant stakeholders has been undertaken either via statutory consultation or EWGs. Baseline sound surveys have been undertaken in both 2023 and 2024 at locations representative of the nearest noise-sensitive receptors to the noise generating elements during the construction and operational phases of the Transmission Assets, presented in **section 8.6.2**. Full details are provided in Volume 3, Annex 8.1: Baseline sound survey of the ES.
November 2023	Newton with Clifton Parish Council, statutory consultation response	The following comments were received: • *"There are several proposed energy projects, solar and wind, at various pre-application stages of consideration that combine to significantly impact on Newton-with-Clifton parish, the Rural East ward of Fylde and the Lancashire county council Fylde East division. The singular or cumulative effects on the countryside, the character of the landscape, townscape, visual amenity, and the adverse impact on local residents arising from noise and other public nuisance issues result in a loss of amenity. It is recognised that while each application must be assessed on its own merits, and that none have been implemented to date it is unclear whether implementation of one affects whether other proposals will receive necessary development consents and permissions"*	An assessment of the noise and vibration impacts due to the Transmission Assets are presented in: • Volume 3, Annex 8.2: Construction noise and vibration of the ES; and • Volume 3, Annex 8.3: Operational noise of the ES. This includes an assessment of all construction activities required, as well as noise impacts due to construction traffic on the local highway network.

Date	Consultee and type of response	Comment raised	Response to comment raised and/or where considered in this chapter
		• *"There is minimal information of the impact on the community during the build stage of the project, measurable in years. The consultation seems to concentrate on the "as implemented" characteristics of the project and omits the development consequences on, among others, the local transport network and traffic flows (site access points have not yet been chosen), noise from traffic building, piling, trenching etc"* • *"Electromagnetic radiation, light pollution, noise, and vibration levels for residents generated by the substations should be specified and set at best practice levels. The maximum levels for those residential receptors in close proximity to the substations should be specified with appropriate monitoring and enforcement in place to ensure these levels are not breached. These levels should be identified both during construction and once construction is completed."*	The cumulative noise and vibration impacts with other proposed developments are considered in **section 8.13** of this chapter. An assessment of the noise impacts during the operational phase of the Transmission Assets is presented in Volume 3, Annex 8.3: Operational noise of the ES. An assessment of potential significant effects due to noise and vibration is presented in **section 8.11** of this chapter. Operational Noise Management Plan(s) for the onshore substations will be prepared and submitted for approval prior to the commencement of operations((see CoT80 **Table 8.13**). The Plan(s) will identify the noise limits for the operation of the onshore substations and the measures for how these limits would be monitored. Details of proposed mitigation are provided in **section 8.8** of this chapter. The assessment outlined in Volume 3, Annex 8.3: Operational noise of the ES includes an iteration of the 3D acoustic modelling which predicts the level of noise reduction required from example mitigation measures which may be included as part of the design to ensure compliance.
November 2023	National Infrastructure Team – Environment Agency, statutory consultation response	*The following comment was received:* • *'CoT35,* *An Outline Code of Construction Practice (CoCP) will be prepared and submitted with the application for development consent. CoCP(s) will be developed in accordance with the outline CoCP. The CoCP will include measures to maintain and address:*	The relative merits of typical BPM mitigation options in BS 5228:2009+A1:2014 have been considered as part of the construction noise and vibration assessment detailed in

Date	Consultee and type of response	Comment raised	Response to comment raised and/or where considered in this chapter
		– *flood protection and control measures;* – *drainage;* – *pollution prevention;* – *geology and ground conditions;* – *ecology and nature conservation (including protected species and invasive species);* – *historic environment;* – *soil management;* – *traffic and transport;* – *noise management measures;* – *air quality and dust management;* – *landscape and visual; and* – *bentonite breakout plan.* • *Issue* – *Measures required to manage environmental risks have yet to be fully addressed.* • *Impact* – *Risk to the environment* • *Solution* – *Outline versions of various Plans to manage environmental risks to be appended to Outline CoCP and secured in the DCO submission.'*	Volume 3, Annex 8.2: Construction noise and vibration of the ES. An Outline Construction Noise and Vibration Management Plan (document reference J1.3) is submitted as part of the application for development consent. These will be developed further and will form the basis of final Construction Noise and Vibration Management Plans secured as a requirement of the DCO. These documents outline general construction principles and commitments to implement the BPM for the control of construction noise. This includes measures such as barriers, set working hours, quieter equipment, and acoustic enclosures for continuously operating plant such as generators; and/or construction noise monitoring, where necessary.
November 2023	Kirkham Town Council, statutory consultation response	The following comment was received: • *'I object to the transformer being built for the following reasons.* – *Noise - constant humming.* – *Close proximity to schools and nurseries.* – *Building on green belt land and the destruction of the landscape.*	The assessment of operational noise impacts is presented in Volume 3, Annex 8.3: Operational noise of the ES and includes an assessment of noise impacts due to the plant equipment forming the electrical strategy for the onshore substations. Particular consideration is given to the tonal components at low

Date	Consultee and type of response	Comment raised	Response to comment raised and/or where considered in this chapter
		– *Increase in traffic especially industrial traffic such as lorries and wagons.* – *Lack of clear information informing the population about the development.* – *Lack of time to properly consult the community.* – *Putting profits before people.'*	frequency which are present in the noise emission spectra of high voltage electricity transmission equipment such as transformers and shunt reactors. Acoustic character corrections have been applied to the predicted levels at receptors where the tonal components are deemed to be perceptible in accordance with the definition in BS 4142:2014+A1:2019. Mitigation measures have been specified where required.
November 2023	Newton with Clifton Parish Council, statutory consultation response	The following comment was received: • *'Researching for examples of large substations, none appear to be so close to such population density, including schools. Strike Lane Primary school setting will be adversely affected by the proposed location of the substations. Carr Hill High School in Kirkham, which is attended by children from Newton-with-Clifton is very close to the proposed substation sites and the children and staff will be subjected to noise and disruption during the school day. If approved will this set an unwelcome poor national precedent?'*	A baseline sound survey has been undertaken to quantify the baseline sound environment at locations representative of the nearest and most exposed noise sensitive receptors. The survey data has been used to derive representative daytime and night-time background sound levels at these receptors against which the assessment of operational noise impacts has been undertaken. Details are provided in Volume 3, Annex 8.1: Baseline sound survey of the ES and **section 8.6.2** of this chapter. The assessment of operational noise impacts is presented in Volume 3, Annex 8.3: Operational noise of the ES. Due to the continuous, 24-hour operation of the onshore substations, the assessment of noise impacts has been undertaken relative to the night-time background sound levels at the nearest and most exposed residential receptors.

Date	Consultee and type of response	Comment raised	Response to comment raised and/or where considered in this chapter
			Operational Noise Management Plan(s) will be developed and will identify the noise limits for the operation of the onshore substations and the measures for how these limits would be monitored. This will result in significant adverse effects being avoided and adverse impacts minimised at all times.
November 2023	Kirkham Town Council, statutory consultation response	The following comment was received: *'The proposed substations are being built on green belt, in an area of separation and very near Carr Hill and Strike Lane school. It is also adjacent to a large holiday park Ribby Hall which is of significant economic importance to the area and the disruption due to construction and the subsequent noise pollution could have a catastrophic impact on this business costing jobs and money into the local economy.'*	The assessment of operational noise impacts is presented in Volume 3, Annex 8.3: Operational noise of the ES. Due to the continuous, 24-hour operation of the onshore substations, the assessment of noise impacts has been undertaken relative to the night-time background sound levels at the nearest and most exposed residential receptors. Operational Noise Management Plan(s) will be developed and will identify the noise limits for the operation of the onshore substations and the measures for how these limits would be monitored. This will result in significant adverse effects being avoided and adverse impacts minimised at all times An assessment of predicted effects due to noise and vibration is presented in **section 8.11** of this chapter. An Outline Construction Noise and Vibration Management Plan (document reference J1.3) has been submitted as part of the application. This will be developed further and will form the basis of final Construction Noise and Vibration

Date	Consultee and type of response	Comment raised	Response to comment raised and/or where considered in this chapter
			Management Plan(s). This document outlines general construction principles and commitments to implement the BPM for the control of construction noise. This includes measures such as barriers, set working hours, quieter equipment, and acoustic enclosures for continuously operating plant such as generators; and/or construction noise monitoring, where necessary.
November 2023	Fylde Council, statutory consultation response	The following comment was received: • *'I am also concerned for the noise that may be emitted from these sites causing a disturbance to local residents.* • *I am in principle happy to see the wind farms established offshore and brought onshore by the underground cables across Fylde to join the Penwortham substation. It will provide the energy we need in the future and help to make us more self-sufficient and less dependent on overseas suppliers. At the moment there is less certainty about the exact route which will be taken and the exact location of the booster stations required. The size of the latter are a real matter of concern, plus the noise levels which they will certainly generate. Newton, an unspoiled area of Fylde, will suffer the impact.* *The cable corridor defies the whole concept of green energy, the environmental impacts are too severe on small community that already have to live with excessive noise, bae systems, Grange 1,2 and 3 landfill sites, Clifton Marsh sewage and water treatment works, Nuclear Fuels Springfields Works, Kirkham Prison. One would wonder how much this community has to live with.'*	The assessment of operational noise impacts is presented in Volume 3, Annex 8.3: Operational noise of the ES. Due to the continuous, 24-hour operation of the onshore substations, the assessment of noise impacts has been undertaken relative to the night-time background sound levels at the nearest and most exposed residential receptors. Operational Noise Management Plan(s) will be developed and will identify the noise limits for the operation of the onshore substations and the measures for how these limits would be monitored. This will result in significant adverse effects being avoided and adverse impacts minimised at all times. An assessment of potential significant effects due to noise and vibration is presented in **section 8.11** of this chapter. Consideration has also been given to the potential for cumulative noise and vibration impacts due to the Transmission Assets and other proposed developments. An

Date	Consultee and type of response	Comment raised	Response to comment raised and/or where considered in this chapter
			assessment can be found in **sections 8.12 and 8.13** this chapter.
April 2023	Noise and Vibration EWG1	Study areas. • It was proposed that the construction noise study area be increased to 300 m from the 250 m. – This change was proposed to better align the study area with the nationally accepted guidance for construction noise presented in DMRB LA 111. • A reduced study area of 20 km for the assessment of offshore piling noise was proposed in place of the 50 km study area presented in the EIA scoping report. – Since the submission of the EIA scoping report, RPS have undertaken noise impact assessments for offshore piling activities. – The assessment results predict negligible impacts beyond approximately 14 km for high impact hammer energies. As such, a conservative study area of 20 km was proposed. • A 2 km study area was proposed in the EIA scoping report for the offshore export cable corridor. It was proposed that this study area be omitted since it is now encompassed by the study area for offshore piling activities. – Following the EIA scoping report, more detailed project and design information was provided. – This information showed that the only sources of noise associated with the offshore cable export corridor will be due to construction, with the only source requiring consideration being offshore piling activities. As such, this study area now falls within the 20 km study area above for offshore piling noise. • A refined definition of the study area of 100 m for vibration due to construction activities was proposed following receipt of more detailed project information. It was proposed that this study area be refined to only	The approach to surveys and the current study areas were agreed as part of the EWG and are set out in **section 8.4.** An agreement log was produced following the EWG to formally document and agree actions moving forward. The offshore substation platforms and interconnector cables have been removed from the scope of the Transmission Assets application and have been assessed within the relevant Generation Assets applications. In addition, the Morgan offshore booster station his no longer required. As such, this study area has been removed from the assessment of noise and vibration impacts.

Date	Consultee and type of response	Comment raised	Response to comment raised and/or where considered in this chapter
		include receptors within 100 m of any piling activities proposed as part of the construction phase. – Refined project information shows the only likely sources of vibration associated with the construction phase will be vibratory piling required to install a cofferdam in the intertidal region. As such, the semantic definition has been refined. Baseline sound survey. • The baseline sound survey methodology was presented along with the proposed measurement locations near landfall, around the onshore substations, and along both the onshore export cable and 400 kV grid connection cable corridors. • This survey plan was formed based upon the most current project information available at the time. It was stated that as some refinement may be required to this survey plan to align with proposed design. • A mixture of up to 24 long-term and four short-term survey positions were presented. It was further proposed that the survey methodology be aligned with that outlined in nationally accepted guidance such as BS 7445-2:1991 'Description and measurement of environmental noise - Part 2: Guide to the acquisition of data pertinent to land use' and other relevant guidance.	
January 2024	Noise and Vibration EWG2	• Additional baseline sound monitoring positions were proposed following receipt of updated design information and to capture data at positions which were not accessible during the survey undertaken as part of the PEIR for the Transmission Assets. • It was agreed that an updated survey plan would be issued to the relevant Local Planning Authorities for review prior to undertaking the survey.	Details of the baseline sound surveys undertaken are provided in Volume 3, Annex 8.1: Baseline sound survey of the ES, a summary of which is provided in **section 8.6.2**.
February 2024	Noise and Vibration EWG3	• The proposed methodology for the assessment of operational noise impacts was presented to Fylde Council. • At the time, it was postulated that additional survey locations at receptors near the onshore substations would not be required. However, upon	An assessment of the noise impacts during the operational phase of the Transmission Assets is presented in Volume 3, Annex 8.3: Operational noise of the ES.

Date	Consultee and type of response	Comment raised	Response to comment raised and/or where considered in this chapter
		review following the meeting, additional baseline sound monitoring positions were deemed necessary and agreed via email as detailed below.	Additional survey measurements were undertaken and presented to the local planning authorities via email, the details for which are provided in Volume 3, Annex 8.1: Baseline sound survey of the ES and summarised in **section 8.6.2**. Also refer to the Technical Engagement Plan (document reference E6).
August 2024	Noise and Vibration EWG5	• The methodology for assessment of operational noise impacts on recreational receptors using the PRoW with reference to *Tranquil Spaces: Measuring the tranquillity of public spaces* (Bentley, 2019) was proposed. • An assessment update on the operational noise assessment was provided, with proposed noise limits at nearby receptors • An update on works at landfall, including additional compounds and direct pipe installation was shared.	N/A An assessment of the noise impacts during the construction phase of the Transmission Assets is presented in Volume 3, Annex 8.3: Construction noise and vibration of the ES. A summary of the assessment of noise impacts at landfall is provided in sections **8.11.2 and 8.11.3**. An assessment of the noise impacts during the operational phase of the Transmission Assets is presented in Volume 3, Annex 8.3: Operational noise of the ES. A summary of the assessment of operational noise impacts is provided in section **8.11.9**.

8.4 Study area

8.4.1.1 The study area for noise and vibration assessment of the Transmission Assets focuses on receptors landward of MLWS where potential noise impacts are most likely to occur. The study area has been refined from that presented in the PEIR following project design refinements and to better align with guidance. Details are provided in **Table 8.7** above.

8.4.1.2 The study area relevant to this ES chapter is defined as:

- the area of land to be temporarily or permanently occupied during the construction, operation and maintenance, and decommissioning of the Transmission Assets (landward of MLWS);
- noise sensitive receptors located within 1 km of the landfall and onshore substations;
- noise sensitive receptors located within 300 m of the onshore export cable corridor and the 400 kV grid connection cable corridor; and
- vibration sensitive receptors located within 100 m of onshore and intertidal construction activities.

8.4.1.3 The above study areas are presented in Figure 8.1 to Figure 8.4 of Volume 3, Figures of the ES.

8.5 Baseline methodology

8.5.1 Methodology for baseline studies

Desk studies

8.5.1.1 A comprehensive desk-based review was undertaken to inform the baseline for noise and vibration. The existing studies and datasets referred to as part of the desk-based review are summarised in **Table 8.8** below.

Table 8.8: Summary of desk study sources used

Title	Source	Year	Author
OS AddressBase Plus	Ordnance Survey	2023	Ordnance Survey.
OS_MasterMap_Topography_Layer_780637_1046228.dwg	Ordnance Survey.	2022	Ordnance Survey.
OS Terrain 5	Ordnance Survey.	2022	Ordnance Survey.
Google Earth Imagery	Data SIO, NOAA, U.S Navy, NGA, GEBCO.	2023	Google.

Site-specific surveys

8.5.1.2 Site-specific surveys were undertaken in June 2023 and March 2024 to inform the EIA. The methodology and survey locations for the site-specific surveys were agreed with the relevant local authorities, regulators and interested stakeholders as part of an EWG in April 2023, EWG2 in January 2024, and via email in March 2024 (see **Table 8.7**).

8.5.1.3 Full details of the survey methodology are presented in Volume 3, Annex 8.1: Baseline sound survey of the ES. In summary, a mixture of long-term and short-term sound measurements were undertaken at locations representative of the nearest noise sensitive receptors to construction, operation and maintenance, and decommissioning noise sources proposed as part of the Transmission Assets.

8.5.1.4 The survey comprised long-term sound monitoring at 22 locations and short-term monitoring at five locations within the Transmission Assets Order Limits (landward of MLWS). These are presented in Figure 1.1 to Figure 1.4 of Volume 3, Annex 8.1: Baseline sound survey of the ES. Long-term monitoring was undertaken over a period of one week with short-term monitoring undertaken over a period of three to six hours.

8.6 Baseline environment

8.6.1 Desk Study

8.6.1.1 Information on noise and vibration within the study area was collected through a detailed review of existing studies and datasets. These are summarised in **Table 8.8.**

8.6.2 Site-specific surveys

8.6.2.1 The baseline sound surveys detailed above were undertaken in June 2023 and March 2024 at positions deemed suitably representative of the nearest noise-sensitive receptors for the Transmission Assets landward of MHWS.

8.6.2.2 The survey data has been processed into the following noise indices.

- $L_{Aeq,16h}$ – 16-hour daytime ambient sound level used to characterise the average level over the period between 07:00 and 23:00.
- $L_{Aeq,12h}$ – 12-hour daytime ambient sound level used to characterise the average level over the period between 07:00 and 19:00.
- $L_{Aeq,8h}$ – 8-hour night-time ambient sound level used to characterise the average level over the period between 23:00 and 07:00.
- $L_{A90,1h}$ – 1-hour daytime background sound level used to characterise the level exceeded for 90% of a 1-hour period between 07:00 and 23:00.
- $L_{A90,15min}$ – 15-minute night-time background sound level used to characterise the level exceeded for 90% of a 15-minute period between 23:00 – 07:00.

Baseline sound survey results (operational noise)

8.6.2.3 Representative ambient sound levels have been derived in accordance with the guidance presented in BS 4142:2014+A1:2019 (British Standards Institution, 2019). The residual sound levels, $L_{Aeq,T}$, have been calculated by logarithmically averaging the measured data over 16-hour and 8-hour periods for the day and night-time, respectively.

8.6.2.4 The representative background sound levels, $L_{A90,T}$, have been derived through statistical analysis of the measured background sound level data with reference to the guidance in BS 4142:2014+A1:2019 (British Standards Institution, 2019) which states the following:

'A representative level should account for the range of background sound levels and should not automatically be assumed to be either the minimum or modal value.'

8.6.2.5 Detailed analysis of the baseline sound levels at each measurement position has been undertaken to determine the representative levels. The background sound level has been derived via the production of histograms and statistical analysis of the measured data during the day and night-time periods. At positions where the modal value occurs more frequently than the next most frequently occurring level, this value has been taken as representative.

8.6.2.6 At positions where the frequency of occurrence is more evenly spread, the analysis has been undertaken on the lower quartile of values since the normally distributed values are skewed towards lower levels. In such instances, the representative background sound level has been derived by analysing the highest levels that are not exceeded for around 25% of the time during the relevant day or night-time period. These levels have been reviewed against the time-history graphs in Appendix A of Volume 3, Annex 8.1: Baseline sound survey of the ES, and are considered acceptable. The results are presented in **Table 8.9** below.

Table 8.9: Baseline sound survey results

Location	Measured Sound Level (dB)			
	Day (7am-11pm)		Night (11pm-7am)	
	Residual Sound Level, $L_{Aeq,16h}$	Background Sound Level, $L_{A90,1h}$	Residual Sound Level, $L_{Aeq,8h}$	Background Sound Level, $L_{A90,15min}$
LT13	58	39	51	32
LT14	53	38	48	35
LT15	64	50	56	37
LT16	50	42	46	31

8.6.2.7 The existing sound climate is dominated primarily by distant traffic on local roads. Further details of the surveys and survey findings are presented in Volume 3, Annex 8.1: Baseline sound survey of the ES.

8.6.3 Future baseline conditions

8.6.3.1 The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 require that '*an outline of the likely evolution thereof without implementation of the development as far as natural changes from the baseline scenario can be assessed with reasonable effort on the basis of the availability of environmental information and scientific knowledge*' is included

within the ES. This section provides an outline of the likely future baseline conditions in the absence of the Transmission Assets.

8.6.3.2 As the proportion of road traffic vehicles which are electrically powered increases, it is possible that traffic noise levels may reduce slightly due to the lower engine-noise levels, although on open roads and motorways, there will still be influence from noise due to tyre-road interaction and aerodynamic deflections over the vehicle surface.

8.6.3.3 The study area comprises a mixture of fields and farmland with residential settlement areas and open roads. As such, it is not anticipated that the future baseline scenario will change significantly in the absence of the Transmission Assets.

8.6.4 Key receptors

8.6.4.1 **Table 8.10** identifies the key receptors taken forward into the assessment and agreed with stakeholders through the consultation process, as presented in **section 8.3.** These receptors are shown on Volume 3, Figure 8.1, Figure 8.2 and Figure 8.4.

Table 8.10: Key receptors taken forward to assessment

Receptor	Description
2 The Crescent	Residential receptor situated approximately 884 m from the Morecambe onshore substation.
21 Manor Drive	Residential receptor situated approximately 529 m from the Morgan onshore substation.
2-8 Eland Way	Residential receptor situated approximately 605 m from the Morgan onshore substation and 909 m from the Morecambe onshore substation.
4 Carter Croft	Residential receptor situated approximately 776 m from the Morecambe onshore substation.
8 Greenfield Lane	Residential receptor situated approximately 842 m from the Morgan onshore substation.
Bibby's Barn	Residential receptor situated approximately 864 m from the Morgan onshore substation and 876 m from the Morecambe onshore substation.
Century Healthcare Care Home	Assisted living facility within the Transmission Assets Order Limits.
Chestnut Tree Barn	Residential receptor situated approximately 624 m from the Morgan onshore substation.
Church Farm	Residential receptor situated approximately 576 m from the Morgan onshore substation.
Dowbridge Farm	Residential receptor situated approximately 596 m from the Morgan onshore substation.
Freshfield Farm	Residential receptor situated approximately 233 m from the Morgan onshore substation .
Greenbank View	Residential receptor situated approximately 650 m from the Morgan onshore substation.

Receptor	Description
Marsh View Farm	Residential receptor situated approximately 901 m from the Morgan onshore substation and 244 m from the Morecambe onshore substation.
Marybank Farm	Residential receptor situated approximately 894 m from the Morgan onshore substation and 241 m from the Morecambe onshore substation.
Mayfield	Residential receptor situated approximately 639 m from the Morgan onshore substation.
Pathways	Residential receptor situated approximately 583 m from the Morgan onshore substation.
Quaker Wood Stables	Equestrian centre situated approximately 170 m from the Morecambe onshore substation.
Sunfield	Residential receptor situated approximately 687 m from the Morgan onshore substation.
Swinza Butts	Residential receptor situated approximately 469 m from the Morgan onshore substation and 588 m from the Morecambe Onshore substation.
Wyfold	Residential receptor situated approximately 460 m from the Morgan onshore substation and 626 m from the Morecambe Onshore substation.

8.6.4.2 Onshore ecological receptors are identified in Volume 3, Chapter 3: Onshore ecology and nature conservation of the ES and Volume 3, Chapter 4: Onshore and intertidal ornithology of the ES.

8.7 Scope of the assessment

8.7.1.1 The scope of the assessment has been developed in consultation with relevant statutory and non-statutory consultees as detailed in **Table 8.7**.

8.7.1.2 Taking into account the scoping and consultation process, **Table 8.11** summarises the matters considered as part of this assessment.

Table 8.11: Matters considered within this assessment

Activity	Potential effects scoped into the assessment
Construction phase	
Construction landward of MLWS	• Noise and vibration effects due to construction activities landward of MLWS, including: – noise and vibration effects due to open cut trenching; – noise and vibration effects due to trenchless techniques at crossings (e.g., sand dunes, roads, railway lines, rivers etc.); and – noise effects due to construction of the onshore substations.
	• Noise effects due to construction traffic.
Operation and maintenance phase	
Operation and maintenance of the onshore substations	• Noise effects due to plant and equipment forming the design of the onshore substations.
Decommissioning phase	
Decommissioning activities landward of MLWS	• Noise and vibration effects due to decommissioning activities landward of MLWS, including noise effects due to traffic.

8.7.1.3 Impacts that are not likely to result in significant effects have been scoped out of the assessment. A summary of the impacts scoped out, together with justification for scoping them out and whether the approach has been agreed with key stakeholders through either scoping or consultation, is presented in **Table 8.12.**

Table 8.12: Matters scoped out of the assessment

Issue	Justification
Construction phase	
Vibration effects from construction and decommissioning traffic.	It was agreed with the Planning Inspectorate that significant effects are unlikely to occur from construction and decommissioning traffic and that vibration from construction and decommissioning traffic can be scoped out (Scoping Opinion 3.17.1).
Operation and maintenance	
Noise and vibration effects due to operation and maintenance of the Transmission Assets including the onshore export cable and associated infrastructure (excluding onshore substations and associated infrastructure).	It was agreed with the Planning Inspectorate that the operation and maintenance of the Transmission Assets will not generate significant levels of noise and vibration, with the exception of the onshore substations, which have been scoped into the assessment. (Scoping Opinion 3.17.3)

8.8 Measures adopted as part of the Transmission Assets (Commitments)

8.8.1.1 For the purposes of the EIA process, the term 'Measures adopted as part of the Transmission Assets' is used to include the following types of mitigation measures (adapted from IEMA, 2016). These measures are set out in Volume 1, Annex 5.3: Commitments Register of the ES.

- Embedded mitigation. This includes the following.
  - Primary (inherent) mitigation - measures included as part of the project design. IEMA describes these as 'modifications to the location or design of the development made during the pre-application phase that are an inherent part of the project and do not require additional action to be taken'. This includes modifications arising through the iterative design process. These measures will be secured through the consent itself through the description of the project and the parameters secured in the DCO and/or marine licences. For example, a reduction in footprint or height.
  - Tertiary (inexorable) mitigation. IEMA describes these as '*actions that would occur with or without input from the EIA feeding into the design process. These include actions that will be undertaken to meet other existing legislative requirements, or actions that are considered to be standard practices used to manage commonly occurring environmental effects*'. It may be helpful to secure such measures through a Code of Construction Practice or similar.

- Secondary (foreseeable) mitigation. IEMA describes these as '*actions that will require further activity in order to achieve the anticipated outcome'*. These include measures required to reduce the significance of environmental effects (such as lighting limits) and may be secured through environmental management plan.

8.8.1.2 Such measures are clearly identified within Volume 1, Annex 5.3: Commitments Register of the ES. The measures relevant to this chapter are summarised in **Table 8.13.**

8.8.1.3 Embedded measures that will form part of the final design (and/or are established legislative requirements/good practice) have been taken into account as part of the initial assessment presented in **section 8.9** below (i.e., the initial determination of impact magnitude and significance of effects assumes implementation of these measures). This ensures that the measures to which the Applicants are committed are taken into account in the assessment of effects.

8.8.1.4 Where an assessment identifies likely significant adverse effects, further or secondary mitigation measures may be applied. These are measures that could further prevent, reduce and, where possible, offset these effects. They are defined by IEMA as actions that will require further activity in order to achieve the anticipated outcome and may be imposed as part of the planning consent, or through inclusion in the ES (referred to as secondary mitigation measures in IEMA, 2016). For further or secondary measures both pre-mitigation and residual effects are presented.

Table 8.13: Measures (commitments) adopted as part of the Transmission Assets

Commitment number	Measure adopted	How the measure will be secured
Embedded mitigation		
CoT18	Core working hours for the construction of the intertidal and onshore works will be as follows: • Monday to Saturday: 07:00 - 19:00 hours; and • up to one hour before and after core working hours for mobilisation ("mobilisation period") i.e. 06:00 to 20:00. Activities carried out during the mobilisation period will not generate significant noise levels (such as piling, or other such noisy activities). In circumstances outside of core working practices, specific works may have to be undertaken outside the core working hours. This will include, but is not limited to, works being undertaken within and/or adjacent to Blackpool Airport and cable installation at landfall and at the River Ribble. Advance notice of such works will be given to the relevant planning authority.	DCO Schedules 2A & 2B, Requirement 14 (Construction hours)
CoT35	An Outline Code of Construction Practice (CoCP) has been prepared and submitted with the application for development consent. Detailed CoCP(s) will be developed in accordance with the Outline CoCP. The Outline CoCP includes measures to maintain and address: • flood protection and control measures; • water environment and drainage; • pollution prevention; • geology and ground conditions; • ecology and nature conservation (including protected species and invasive species); • historic environment; • soil management; • traffic and transport; • noise management measures;	DCO Schedules 2A & 2B, Requirement 8 (Code of Construction Practice)

Commitment number	Measure adopted	How the measure will be secured
	• air quality and dust management; • landscape and visual; • recreation; and • bentonite breakout.	
CoT36	Onshore Decommissioning Plan(s) will be developed prior to decommissioning. The Onshore Decommissioning Plan(s) will include provisions for the removal of all onshore above ground infrastructure and the decommissioning of below ground infrastructure (if and where relevant and practicable), and details relevant to flood risk, pollution prevention and avoidance of ground disturbance. The Onshore Decommissioning Plan(s) will be in line with the latest relevant available guidance.	DCO Schedules 2A & 2B, Requirement 22 (Onshore decommissioning)
CoT38	An Outline Construction Traffic Management Plan (CTMP) has been prepared and submitted with the application for development consent. CTMP(s) will be developed in accordance with the outline CTMP prior to construction. The detailed CTMP(s) will set out measures to include: 1. managing the numbers and routing of HGVs during the construction phase; 2. managing the movement of construction worker traffic during the construction phase; 3. details of measures to manage the safe passage of HGV traffic via the local highway network; and 4. details of localised road improvements if and where these may be necessary to facilitate safe use of the existing road network.	DCO Schedules 2A & 2B, Requirement 9 (Traffic and Transport)
CoT79	An Outline Construction Noise and Vibration Management Plan has been prepared as part of the Outline CoCP submitted as part of the application for development consent. It includes measures to mitigate noise from construction activities associated with the Transmission Assets. Detailed Construction Noise and Vibration Management Plan(s) will be developed in accordance with Detailed CoCPs. Bespoke method statement(s) will be developed to ensure suitable noise limits can be met at specific sensitive noise receptors.	DCO Schedules 2A & 2B, Requirement 8 (Code of Construction Practice)
CoT80	Operational Noise Management Plan(s) for the onshore substations will be prepared and submitted for approval prior to the commencement of operations. The Plan(s) will	DCO Schedules 2A & 2B, Requirement 18 (Control of noise during operational stage)

Commitment number	Measure adopted	How the measure will be secured
	identify the noise limits for the operation of the onshore substations and the measures for how these limits would be monitored.	
CoT88	Best Practicable Means (as defined in Section 72 of the Control of Pollution Act 1974 and Section 79 of the Environmental Protection Act 1990) will be implemented during the construction, operation, maintenance aspects of the Transmission Assets, where appropriate, to ensure that noise levels are minimised within all reasonably foreseeable circumstances. For the construction phase these will be detailed within the Outline CoCP, for the operational and maintenance phase these will be detailed within the Operational Noise Management Plan(s).	DCO Schedules 2A & 2B, Requirement 8 (Code of Construction Practice); DCO Schedules 2A & 2B, Requirement 18 (Control of noise during operational stage)
Secondary mitigation		
CoT19	All trenchless crossings will be undertaken by non-impact methods such as HDD (or other trenchless techniques including micro tunnelling and direct pipe), excluding preparatory works, in order to minimise construction noise and vibration beyond the immediate location of works.	DCO Schedules 2A & 2B, Requirement 8 (Code of Construction Practice)
CoT34	Based on noise modelling results, where construction noise has the potential to cause significant adverse effects, mufflers and acoustic barriers will be used, where practicable, where HDD (or other trenchless techniques) is being undertaken.	DCO Schedules 2A & 2B, Requirement 8 (Code of Construction Practice)

8.9 Key parameters for assessment

8.9.1 Maximum design scenario

8.9.1.1 The maximum design scenarios identified in **Table 8.14** have been selected as those having the potential to result in the greatest effect on an identified receptor or receptor group. These scenarios have been selected from the Project Design Envelope provided in Volume 1, Chapter 3: Project description of the ES. Effects of greater adverse significance are not predicted to arise should any other development scenario, based on details within the Project Design Envelope (e.g., different infrastructure layout), to that assessed here be taken forward in the final design.

Table 8.14: Maximum design scenario considered for the assessment of impacts

Impact	Phase			Maximum Design Scenario	Justification
	C	O	D		
The impact of noise and vibration generated by construction and decommissioning activities for the Transmission Assets on human receptors.	✓	×	✓	**Construction phase: Landfall** • The offshore export cables between the transition joint bay working area within Blackpool Airport and the beach will be installed using the direct pipe trenchless technique for a maximum length of 1,500 m. There is the potential for direct pipe installation to be undertaken during day, evening and night-time periods. • Entry pits for the direct pipe will be situated within the transition joint bay area within Blackpool Airport: The maximum number of entry pits will be six, with a maximum direct drill entry pit area of 450 m^2 per circuit with a depth of 6 m. The total duration of entry pit works which is included within the overall transition joint bay construction works is 18 months assuming a concurrent construction scenario. • Exit pits on the beach: The maximum number of exit pits will be six, with a maximum area of drill exit pit of 875 m^2 per circuit, with a depth of 3 m. The maximum cofferdam area dimensions per pit is 75 m^2 (15 m x5 m). The total duration of exit pit works on the beach is two weeks per circuit. A cofferdam may be required to construct the direct pipe exit pits, which will require vibration piling techniques to install sheet piles. • For the offshore export cable installation between exit pits and MLWS, the burial at the of the offshore export cables seaward of the direct pipe exit pits will via open trenching. The maximum number of trenches will be six. The maximum width of the stepped trench is 10 m at the top and 3 m at the bottom and are each 3 m deep. The maximum length per trench is 300 m with a maximum working area each side of the trench of 25 m. • The open trench will transition to a beach trencher, this will be 3 m wide and up to 1,250 m long, the trench will be contained within a working corridor with a 50 m width. • Cable pull in and burial will take up to six weeks per circuit and the maximum total duration of cable pull in and burial is 36 weeks assuming a concurrent construction scenario.	**Construction phase: landfall** Direct pipe methods will be adopted as the trenchless technique at landfall. The MDS is represented by night-time works where ambient noise levels in the area are likely to be lower. Vibratory piling may be required to construct the direct pipe exit pit. If required, this will make use of equipment with high noise emission levels. The level of vibration generated by this technique can also generate ground-borne waves which transfer energy into nearby buildings causing disturbance to building occupiers and, in extreme cases, building damage. Concurrent construction represents the maximum design scenario. It is likely to cause greater disturbance since receptors would be exposed to high noise levels which are likley to result in significant effects. **Construction phase: onshore substations** The assessment includes consideration of the following: • site clearance using CAT 320 tracked excavators and rock breakers;

Impact	Phase			Maximum Design Scenario	Justification
	C	O	D		
				• There will be up to four compounds required west of the transition joint bays to MLWS: – Compound 1 (welfare): 300 m^2 to be active for 36 weeks; – Compound 2: 2,500 m^2 to be active for 48 weeks; – Compound 3: 510 m^2 to be active for 48 weeks; and – Compound 4: 600 m^2 to be active for 24 months (in a concurrent construction scenario). • There will be two transition joint bay compounds (10,000 m2 for Morgan and 10,000 m2 for Morecambe) within Blackpool Airport to facilitate construction works, to be active for up to 29 months over a 45 month period. – Maximum working area of the transition joint bay: 4,900 m^2 for Morgan and 2,800 m^2 for Morecambe • Dynamic compaction using vibratory rollers will be required for the installation of haul roads, access routes, and the construction of the compounds at landfall. **Construction phase: onshore export cables** • The majority of the onshore export cable corridor will be installed using open cut trenching techniques. • The maximum number of trenches will be six, with a target trench depth of 1.8 m. Trenches will be excavated using a mechanical excavator or trenchers. • Onshore export cable construction corridors width 100 m, with a length of up to 17 km. Width will include two haul roads. There will be up to 110 joint bays and 110 link boxes, with 1,000 m^3 and 8 m^3 of material excavated for each joint bay and link box respectively. The minimum distance between cable joints will be around 500 m. • Trenches will be excavated using a mechanical excavator or trenchers and the ducts will be installed form a cable drum trailer into the open trench. Surplus subsoil and topsoil material excavated from the cable trenches, joint bays, and link boxes will be spread on site.	• piling using a four-tonne hydraulic hammer rig. This is not the most likely piling method but has been adopted as the MDS; • diesel generators and welfare storage areas, as well as security lighting will be in operation 24-hours a day; • equipment installation using articulated trucks and cranes; and • an indicative construction plant list has been used and typical noise levels obtained from the guidance in BS 5228-1:2009+A1:2014. Concurrent construction represents the maximum design scenario. It is likely to cause greater disturbance since receptors would be exposed to high noise levels which are likely to result in significant effects. **Construction phase: landfall, onshore export cables and 400 kV grid connection cables** Trenchless techniques make use of equipment with higher noise emission levels than open cut trenching techniques and may require night-time works. This represents the MDS in terms of construction noise and vibration. A total of two haul roads represents the MDS since this will result in higher

Impact	Phase			Maximum Design Scenario	Justification
	C	O	D		
				• There will be up to ten construction compounds along the onshore export cable corridor. During a concurrent construction compounds will be present for 36 months with the following attributes: – 2 type A compounds, a maximum total area of 26,500 m^2; – 6 type B compounds a maximum total area of 79,500 m^2; and – 2 type C compounds a maximum total area of 17,500 m2. • The maximum number of HDD crossings is 120. Each major HDD location will have a compound, measuring up to 100 m x 150 m. HDD has the potential to require night-time works. **Construction phase: onshore substations** • The combined permanent footprint of the Morecambe onshore substation and Morgan onshore substation 223,500 m^2, including eight main buildings, with two access roads at 15 m width (each) and temporary substation compound. • There would be up to a maximum of eight main buildings with a height of up to 15 m. There will also be 20 secondary buildings with a height of up to 10 m. • The area of temporary compounds (combined) includes working and laydown areas (excludes permanent substation footprint) is 122,500 m2 (additional to permanent footprint). Duration: 30 months (concurrent construction scenario). • Significant noise-generating items include rock breakers/concrete munchers, piling rigs, HDD drilling rigs, and plant such as diesel-powered generators, diesel compressors, and pumps. There is the potential for concreting works to be undertaken during day, evening and night-time periods. Abnormal indivisible load trailers will be required to transport elements of the substation plant to site. **Construction phase: 400 kV grid connection cables** • The majority of the 400 kV grid connection cable corridor will be installed using open cut trenching techniques.	traffic flows at any given time. Similarly, larger HDD compounds will require more works and a greater amount of construction plant to construct. Concurrent construction represents the maximum design scenario. It is likely to cause greater disturbance since receptors would be exposed to high noise levels which are likely to result in significant effects. An assessment has been undertaken using typical spectra for the relevant noise-emitting plant items as presented in BS 5228-2:2009+A1:2014. **Decommissioning phase** Decommissioning is likely to operate within the parameters identified for construction.

Impact	Phase			Maximum Design Scenario	Justification
	C	O	D		
				• The maximum number of trenches for both projects together will be four, with a target trench depth of 1.8 m. The width of the permanent cable corridor is 50 m. There will be a total of 60 joint bays and 60 link boxes. • The working area will include a construction corridor width of 76 m (which includes two haul roads), with a length of up to 13 km. Duration of installation of up to 36 months (concurrent construction scenario). • Trenches will be excavated using a mechanical excavator or trenchers and the ducts will be installed from a cable drum trailer into the open trench. The depth of stabilised backfill in each of the four onshore cable trenches is up to 650 mm. Surplus subsoil and topsoil material excavated from the cable trenches, joint bays, and link boxes will be spread on site. • There will be a maximum of 46 HDD crossings (excluding the Ribble Estuary crossing) and the HDD compound locations will be 100 m x 50 m. HDD has the potential to require night-time works. • Trenchless technologies will be used to cross the River Ribble. Micro-tunnelling is considered to represent the MDS due to the depth of the entry/exit pits. The temporary compound at the launch/exit (two compounds) area would be a maximum of 75 m x 400 m. There will be a maximum of four tunnels/bores over a distance of up to 650 m. The depth of the launch and receiver pits would be a maximum of 45 m. **Decommissioning phase** • Decommissioning is likely to operate within the parameters identified for construction (i.e., any activities are likely to occur within construction working areas and to require no greater amount or duration of activity than assessed for construction).	
The impact of noise generated by additional vehicle movements on the local highway network during the construction and decommissioning	✓	×	✓	**Construction phase** • Construction traffic (HGVs, construction plant, etc.) will contribute to increased vehicular flows on local highway networks thus leading to a potential increase in local traffic noise levels. • Traffic data assumptions as set out in Volume 3, Chapter 7: Traffic and transport of this ES.	**Construction phase** Concurrent construction represents the MDS for this impact as it results in higher traffic flows on local highway networks for a longer period and thus represents the MDS.

Impact	Phase			Maximum Design Scenario	Justification
	C	O	D		
phase for the Transmission Assets on human receptors.				• Concurrent construction will result in increased construction traffic flows for 36 months. **Decommissioning phase** • Decommissioning is likely to operate within the parameters identified for construction (i.e., any activities are likely to occur within construction working areas and to require no greater amount or duration of activity than assessed for construction).	**Decommissioning phase** Decommissioning is likely to operate within the parameters identified for construction.
The impact of noise and vibration generated during operation and maintenance of the onshore substations on human receptors.	×	✓	×	**Operation and maintenance phase: onshore substation** • The combined permanent footprint of the Morecambe onshore substation and Morgan onshore substation 223,500 m^2, including eight main buildings, with two access roads at 15 m width (each) and temporary substation compound. • There would be up to a maximum of eight main buildings with a height of up to 15 m. There will also be 20 secondary buildings with a height of up to 10 m. • A Gas Insulated Switchgear (GIS) substation is proposed for the Morgan onshore substation. Both GIS and Air Insulated Switchgear (AIS) substation options remain under consideration for the Morecambe onshore substation. AIS represents the MDS. • The items to be installed externally include: – super grid transformers (inc. coolers); – shunt reactors (inc. coolers); – Dynamic Reactive Power Compensator (DRPC) phase reactors (inc. Coolers); mechanically switched reactors; – harmonic filters; – auxiliary transformers; and – DRPC and control building heating, ventilation, and air-conditioning (HVAC) units.	**Operation and maintenance phase** Both AIS and GIS designs are being considered for the of the Morecambe onshore substation. The maximum design scenario is represented by the AIS option since this design incorporates fewer buildings and thus less acoustic screening of noise levels due to external plant at receptors. An assessment of the operation of the onshore substations has been undertaken by applying representative spectral shapes for similar plant items to the indicative, broadband (single figure) levels provided by the Applicants in units of dB(A). The acoustic characteristics may not be as influential if the plant is enclosed within buildings however this represents the maximum design scenario.

Impact	Phase			Maximum Design Scenario	Justification
	C	O	D		
				• The proposed substation plant will have distinct acoustic characteristics and will require corrections in line with the guidance in BS 4142:2014+A1:2019, including the following. – The Super Grid Transformers and Shunt Reactors have tonal components at the lower frequencies of their noise emission spectra. A +4 dB acoustic character correction has been applied in the baseline scenario to the level predicted at all receptors where noise from these plant items have the highest contribution. This corresponds to a 'clearly perceptible' tonal component in terms of BS 4142:2014+A1:2019.	

[a] C=construction, O=operation and maintenance, D=decommissioning

8.10 Assessment methodology

8.10.1 Overview

8.10.1.1 The approach to determining the significance of effects is a two-stage process that involves defining the magnitude of the impact and the sensitivity of the receptor. This section describes the criteria applied in this chapter to assign values to the magnitude of impacts and the sensitivity of the receptors. The terms used to define magnitude and sensitivity are based on relevant guidance, including the DMRB methodology (Highways England *et al.,* 2020) where appropriate as described in further detail in Volume 1, Chapter 5: EIA methodology of the ES.

8.10.2 Receptor sensitivity/value

8.10.2.1 The criteria for defining noise and vibration sensitivity in this chapter are outlined in **Table 8.15** below.

Table 8.15: Sensitivity criteria

Sensitivity	Definition	Examples
Very High	Very high importance and rarity, international scale and very limited potential for substitution	Receptors which are very highly sensitive to noise and vibration and/or require low internal noise levels such as: • hospital wards containing high-dependency units, operating theatres, sensitive equipment (e.g., MRI scanners); • recording studios; and • care homes at night.
High	High importance and rarity, national scale and limited potential for substitution	Receptors which are highly susceptible to noise and vibration disturbance such as: • care homes (daytime); • residential (night time) • theatres; and • hospital wards.
Medium	High or medium importance and rarity, regional scale, limited potential for substitution	Receptors where noise and vibration may cause disturbance but a level of tolerance is expected such as: • residential accommodation; • holiday accommodation; • research facilities; and • schools/universities.
Low	Low or medium importance and rarity, local scale	Receptors where noise and vibration may cause short duration effects in a recreational setting although particularly high noise levels may cause a moderate effect such as: • offices; • shops; • GP surgeries; and • sports facilities.

Sensitivity	Definition	Examples
Negligible	Very low importance and rarity, local scale	Receptors where noise and vibration is not expected to be detrimental such as: • industrial facilities; • warehouses; and • car parks.

8.10.3 Magnitude of impact

8.10.3.1 The criteria for defining magnitude in this chapter are outlined in **Table 8.16** to **Table 8.20** below.

Construction and decommissioning noise

8.10.3.2 Impact criteria for construction and decommissioning noise have been determined in accordance with the guidance in DMRB LA 111 and Annex E of BS 5228-1:2009+A1:2014. Full details are provided in Volume 3, Annex 8.2: Construction noise and vibration of the ES. The LOAEL and SOAEL are defined in **Table 8.16** below, and the impact criteria are presented in **Table 8.17**.

8.10.3.3 Section 3 of DMRB LA 111 states the following with regard to durations to be considered in the assessment of significant effects:

'Construction noise and construction traffic noise shall constitute a significant effect where it is determined that a major or moderate magnitude of impact will occur for a duration exceeding:

1) 10 or more days or nights in any 15 consecutive days or nights;

2) a total number of days exceeding 40 in any 6 consecutive months.'

Table 8.16: Construction time period – LOAEL and SOAEL

Time Period	LOAEL	SOAEL
Weekdays (07:00-19:00 hours) Saturdays (07:00-13:00 hours)	Baseline sound levels, $L_{Aeq,T}$	Relevant threshold values as presented Table E.1 BS 5228-1:2009+A1:2014(1).
Evenings (19:00-23:00 hours) Saturdays (13:00-23:00 hours) Sundays (07:00-23:00 hours)		
Night (23:00-07:00 hours)		

(1) This assumption may result in an overestimation of the effects due to construction noise at a limited number of locations and thus forms basis of a robust assessment.

Table 8.17: Construction and decommissioning noise impact magnitude criteria

Magnitude of impact	Construction noise level
High	$L_{Aeq,T}$ ≥ SOAEL + 5 dB
Medium	SOAEL ≤ $L_{Aeq,T}$ < SOAEL +5 dB
Low	LOAEL ≤ $L_{Aeq,T}$ < SOAEL
Negligible	$L_{Aeq,T}$ < LOAEL

Construction and decommissioning traffic noise

8.10.3.4 There may be a change in local noise levels due to contributions from construction traffic on local road networks and temporary diversion networks during the construction of the Transmission Assets.

8.10.3.5 The impact assessment has taken account of the level of the road traffic noise both with and without the construction traffic proposed for the Transmission Assets, as well as the and the existing sound levels at the nearest receptors. Impact criteria for these changes have been obtained from the guidance in DMRB LA 111 and are presented in **Table 8.18** below.

Table 8.18: Construction and decommissioning traffic noise impact magnitude criteria

Magnitude of impact	Increase in BNL of closest public road used for construction traffic (dB)
High	BNL ≥ 5
Medium	3 ≤ BNL < 5
Low	1 ≤ BNL < 3
Negligible	BNL < 1

Construction and decommissioning vibration

8.10.3.6 Impact criteria for vibration from construction have been identified based on guidance provided in BS 5228-2:2009+A1:2014. The following outline criteria in **Table 8.19** in terms of peak particle velocity (PPV) can be used to identify potential significant impacts on nearby receptors.

Table 8.19: Construction and decommissioning vibration impact magnitude criteria

Magnitude of impact	Vibration level, PPV, mm/s
High	PPV ≥ 10(1)
Medium	1 ≤ PPV < 10
Low	0.3 ≤ PPV < 1
Negligible	PPV < 0.3

(1) Vibration at these levels is unlikely to be tolerable for more than a very brief period and major effects could occur below these levels, particularly where impacts occur for longer periods.

8.10.3.7 Further comment is provided in Note C of Table B.1 in Annex B of BS 5228- 2:2009+A1:2014 which states the following:

'Single or infrequent occurrences of these levels do not necessarily correspond to the stated effect in every case. The values are provided to give an initial indication of potential effects, and where these values are routinely measured or expected then an assessment in accordance with BS 6475-1 or -2, and/or other available guidance, might be appropriate to determine whether the time varying exposure is likely to give rise to any degree of adverse comment.'

8.10.3.8 The durations outlined in DMRB (see **paragraph 8.10.3.3** above) have been considered in the assessment of significant effects.

Operational noise

8.10.3.9 The significance of noise effects associated with the operation and maintenance of the onshore substations has been determined based upon the methodology outlined in BS 4142:2014+A1:2019. This methodology includes calculating the operational rating sound level $L_{Ar,Tr}$ predicted at nearby receptors due to the operation of the onshore substations, defined as the operational specific sound level plus any acoustic character corrections due to tonality, impulsivity, intermittency, or any other distinct acoustic characteristics.

8.10.3.10 The rating sound level is then compared to the representative background sound level $L_{A90,T}$ at the nearest receptors which is obtained via measurements of the baseline acoustic environment. The difference between the rating sound level and the representative background sound level is used to determine the impacts which can be assessed in accordance with section 11 of BS 4142:2014+A1:2019, with consideration also required for the context in which the sound has been assessed.

'Where the initial estimate of the impact needs to be modified due to the context, take all pertinent factors into consideration including the following:

[…]

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 sensitivity of the receptor and whether the dwellings or other premises for residential purposes will already incorporate design measures that secure good internal and/or outdoor acoustic conditions, such as:

i) façade insulation treatment;

ii) ventilation and/or cooling that will reduce the need to have windows open so as to provide rapid or purge ventilation; and

iii) acoustic screening.'

8.10.3.11 Based on the above, the following impact criteria in **Table 8.20** have been defined for operational noise.

Table 8.20: Operational noise impact magnitude criteria

Magnitude of impact	BS 4142:2014+A1:2019 semantic description	Difference Δ between rating sound Level $L_{Ar,Tr}$ and background sound level $L_{A90,T}$ (dB)
High	A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context.	Δ ≥ 10
Medium	A difference of around +5 dB is likely to be an indication of an adverse impact, depending on the context.	5 ≤ Δ < 10
Low	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.	0 ≤ Δ < 5
Negligible		-10 ≤ Δ < 0
No change	-	Δ < -10

Natural tranquillity

8.10.3.12 The noise impact magnitude criteria for natural tranquillity have been derived using the NTM (see **section 8.2.3** above). However, whilst this method is useful for characterising the tranquillity of the area, it is necessary to define a level at which significant adverse effects would occur for the purposes of assessing the impacts on tranquillity due to operational noise sources.

8.10.3.13 Natural England produced Guidelines for Creation of Suitable Alternative Natural Greenspace (SANG) (Natural England, 2021) to provide alternative green space to divert visitors from visiting the Thames Basin Heaths Special Protection Area. SANG is intended to provide avoidance measures for the potential impact of residential development on the Thames Basin designated site by preventing an increase in visitor pressure. The following guidance is provided in relationship to noise limits on footpaths:

'Avoid paths running through areas adjacent to major infrastructure with prolonged loud noise. For example, adjacent dual carriageways or motorways. Natural England look at a maximum decibel limit of 60 before discounting of SANG area'.

8.10.3.14 Whilst the guidance does not explicitly outline the applicability of this limit to operational noise sources, the operational noise associated with the onshore substations will be continuous and thus the above limit of 60 dB(A) provides a useful upper guideline level to be considered within the assessment.

8.10.3.15 However, it is important that consideration is given to the tranquillity score in the absence of the development. As such, impact magnitude criteria have been derived based on the tranquillity scores. The impact magnitude criteria are presented in **Table 8.21** below.

8.10.3.16 The upper impact magnitude level for tranquillity scores of 4 to 6 has been obtained from "Minerals: Guidance on planning for mineral extraction in plan making and the application process" (Department for Levelling Up, Housing and Communities, 2023). This guidance states that:

'In any event, the total noise from the operations should not exceed 55dB(A) $L_{Aeq,1h}$ (free field).'

8.10.3.17 This level of 55 dB(A) is equivalent to the upper guideline level outlined in Guidelines for community noise (WHO, 1999) at which 'serious annoyance' can be expected during the daytime and evening periods in outdoor living areas.

8.10.3.18 Consequently, the upper impact magnitude level for tranquillity scores of 7 to 9 have been defined as the lower guideline level in the WHO guidance of 50 dB(A) corresponding to the level at which moderate annoyance may occur during the daytime and evening periods in outdoor living areas.

Table 8.21: Natural tranquillity impact magnitude criteria

Magnitude of Impact	Noise Level (dB) for Natural Tranquillity Score		
	1 – 3	4 – 6	7 – 9
High	$L_{Aeq,T} \geq 60$	$L_{Aeq,T} \geq 55$	$L_{Aeq,T} \geq 50$
Medium	$55 \leq L_{Aeq,T} < 60$	$50 \leq L_{Aeq,T} < 55$	$45 \leq L_{Aeq,T} < 50$
Low	$50 \leq L_{Aeq,T} < 55$	$45 \leq L_{Aeq,T} < 50$	$40 \leq L_{Aeq,T} < 45$
Negligible	$L_{Aeq,T} \leq 50$	$L_{Aeq,T} \leq 45$	$L_{Aeq,T} \leq 40$

8.10.3.19 The noise impact magnitude criteria defined in **Table 8.21** allow for more onerous criteria in more tranquil areas than in those considered less tranquil.

8.10.4 Significance of effect

8.10.4.1 The significance of the effect upon noise and vibration has been determined by taking into account the sensitivity of the receptor and the magnitude of the impact. The method employed for this assessment is presented in **Table** 8.22. Where a range of significance levels is presented, the final assessment for each effect is based upon expert judgement.

8.10.4.2 In all cases, the evaluation of receptor sensitivity, impact magnitude and significance of effect has been informed by professional judgement and is underpinned by narrative to explain the conclusions reached.

8.10.4.3 For the purpose of this assessment, any effects with a significance level of minor or less are not considered to be significant in terms of the EIA Regulations.

Table 8.22: Assessment matrix

Sensitivity of Receptor	Magnitude of Impact			
	Negligible	Low	Medium	High
Negligible	Negligible	Negligible or Minor	Negligible or Minor	Minor
Low	Negligible or Minor	Negligible or Minor	Minor	Minor or Moderate
Medium	Negligible or Minor	Minor	Moderate	Moderate or Major
High	Minor	Minor or Moderate	Moderate or Major	Major
Very High	Minor	Moderate or Major	Major	Major

8.10.4.4 Where the magnitude of impact is 'no change', no effect would arise.

8.10.4.5 The definitions for significance of effect levels are described as follows.

- Major: These beneficial or adverse effects are considered to be very important considerations and are likely to be material in the decision-making process. These effects are generally, but not exclusively, associated with sites or features of international, national or regional importance that are likely to suffer a most damaging impact and loss of resource integrity. However, a major change in a site or feature of local importance may also enter this category. Effects upon human receptors may also be attributed this level of significance.
- Moderate: These beneficial or adverse effects have the potential to be important and may influence the key decision-making process. The cumulative effects of such factors may influence decision-making if they lead to an increase in the overall adverse or beneficial effect on a particular resource or receptor.
- Minor: These beneficial or adverse effects are generally, but not exclusively, raised as local factors. They are unlikely to be critical in the decision-making process but are important in enhancing the subsequent design of the project.
- Negligible: No effects or those that are beneath levels of perception, within normal bounds of variation or within the margin of forecasting error.

8.10.4.6 The duration of the effect is important when considering the significance. The following definitions have been adopted for this assessment.

- Short-term: a period of months, up to one year.
- Medium-term: a period of more than one year, up to five years.
- Long term: a period of greater than five years.

8.10.5 Assumptions and limitations of the assessment

Baseline sound survey

8.10.5.1 All sound surveys are limited by the instrumentation used to undertake the measurements. Uncertainty may arise as a result of the internal processes within the sound level meter to measure and process the measured data into the relevant noise indices. However, modern sound level meters are precision instruments.

8.10.5.2 The equipment used for the baseline sound survey are Class 1 instruments. According to BS EN 61672-1:2003, this has a sampling cycle of 100 milliseconds (ms) and a measurement range of A-weighted levels between 25 dB and 138 dB. The uncertainty due to fluctuations in temperature and humidity is ≤0.5 dB. The accuracy of the equipment used has been monitored via calibration both prior to and upon completion of the survey at each position.

8.10.5.3 There may be temporal and seasonal variations to the local sound climate. The temporal variation has been accounted for by undertaking long-term measurements over a period of one week at a time of year when baseline noise levels are considered likely to be typical of the annual average. The survey period adopted allows for statistical analysis of any temporal variations in the noise climate to reduce uncertainty in the derivation of representative sound levels at nearby receptors.

8.10.5.4 Any influence due to human error has been minimised by ensuring that all sound monitoring equipment was installed discreetly and securely. Installing the equipment securely minimises any movement of the microphone diaphragm with the wind, and ensuring the equipment is discreet minimises interference with the equipment by the general public. All measurements were undertaken at a minimum height of 1.5 m above local ground level and 3.5 m from other reflective surfaces to minimise interference from reflected sound waves.

Construction noise and vibration assessment

8.10.5.5 An indicative construction plant and equipment list was provided by the Applicants (see Volume 3, Annex 8.2: Construction noise and vibration of the ES) which includes details of the indicative quantities, estimated percentage of operation during construction activities, and typical noise spectra for each item obtained from BS 5228:2009+A1:2014.

8.10.5.6 The exact locations of each construction activity have not yet been confirmed. As such, construction noise and vibration levels have been calculated at varying distances from the boundary of the temporary construction compounds or relevant indicative works area, representing the maximum design scenario as defined in **Table 8.14**.

8.10.5.7 This is a standard approach and is considered both robust and acceptable at this stage.

Source data

8.10.5.8 The following source data in **Table 8.23** has been obtained and used to inform the assessment of noise and vibration impacts at nearby receptors.

Table 8.23: Source data information

Project phase	Source data
Construction and decommissioning	• An indicative construction plant and equipment list has been provided by the relevant project engineers along with typical noise spectra obtained from BS 5228:2009+A1:2019. • Predictions of construction traffic flows have been provided by the project traffic consultants and have been used to inform the potential noise impacts due to the increased vehicular flows on local highway networks during construction.
Operation and maintenance	• The indicative layouts and plant strategies for the onshore substations have been provided by the Applicants. • A list of typical plant items for the onshore substations have been provided along with indicative quantities and broadband sound power levels. Frequency content obtained from similar projects have then been applied to the single-figure levels to obtain typical spectral noise levels thus allowing for a more robust assessment. This is a standard approach and is considered acceptable.
Digital mapping and location data	• The following OS digital mapping and location data have been used as part of this assessment: – OS Master map; – OS AddressBase Plus; and – OS Terrain 5.

Prediction methods

8.10.5.9 Uncertainty and limitations may arise during the modelling process due to the sound propagation models used to inform the calculations. The sound levels at the nearest receptors have been calculated using the internationally accepted guidance within ISO 9613-2:1996 which is implemented by the 3D acoustic modelling software (SoundPLAN) used to predict noise levels from the Transmission Assets. This standard claims an accuracy of ±3 dB for source heights up to 30 m and propagation distances between 100 m and 1 km.

8.10.5.10 The assessment of onshore construction noise impacts has been undertaken using typical source noise levels obtained from BS 5228-1:2009+A1:2019. The actual noise levels of the plant items may vary to those used in the assessment. In cases where there are multiple noise spectra for the same equipment, the highest reasonable level has been selected for the assessment of impacts.

8.10.5.11 Vibration levels have been predicted at varying distances from the piling activities in the intertidal region using the methods outlined in Annex B of BS 5228-2:2009+A1:2014. This method is conservative and has been known to overestimate the levels of vibration close to the source. This approach is considered acceptable.

8.11 Assessment of effects

8.11.1 Introduction

8.11.1.1 The impacts arising from the construction, operation and maintenance, and decommissioning phases of the Transmission Assets have been assessed. The impacts arising from the construction, operation and maintenance and decommissioning phases of the Transmission Assets are listed in **Table** 8.14, along with the maximum design scenario against which each impact has been assessed.

8.11.1.2 The assessment of construction noise and vibration impacts for the Transmission Assets is presented in **sections 8.11.2 to 8.11.9**. The assessment has been separated into the key construction activities. This assessment has been broken down as follows:

- noise impacts due to works at the landfall (excluding trenchless techniques);
- noise impacts due to the works at the landfall (trenchless techniques);
- noise impacts due to the construction and decommissioning activities landward of the transition joint bays (open cut trenching);
- noise impacts due to the construction and decommissioning activities landward of transition joint bays (trenchless techniques);
- noise impacts due to the construction and decommissioning of the onshore substations;
- noise impacts due to the operation of the onshore substations;
- noise impacts due to additional traffic movements during construction and decommissioning; and
- vibration impacts due to the construction of the Transmission Assets.

8.11.1.3 The periods assessed, which align with the criteria in **Table 8.16**, include:

- Day:
  - 7am to 7pm on weekdays.
  - 7am to 1pm on Saturdays.
- Evenings and weekends:
  - 7pm to 11pm on weekdays.
  - 1pm to 11pm on Saturdays
  - 7am to 11pm on Sundays
- Night:
  - 11pm to 7am everyday.

8.11.1.4 Construction activities more likely to require evening/weekend working include those associated with HDD (or other trenchless techniques) works. Construction activities associated with potential night-time working are those associated with direct pipe trenchless installation at the landfall,

microtunneling at the River Ribble and concreting works at the onshore substations. As such, the evening/weekend and night-time periods have also been considered as part of the noise impact assessment.

8.11.1.5 The potential for significant effects from the construction noise and vibration impacts for the Transmission Assets identified from the above assessments has been identified using the methodology set out in **section 8.10.4**.

8.11.2 Noise impacts and effects due to works at the landfall (excluding trenchless techniques)

8.11.2.1 The construction works at the landfall (excluding cable installation by trenchless techniques) will comprise the following:

- establish access and the temporary construction compounds;
- transition joint bay excavation;
- transition joint bay wall and base construction;
- connection of the onshore and offshore export cables; and
- backfill over the transition joint bays.

8.11.2.2 Full details of the construction noise and vibration impact assessment are provided in Volume 3, Annex 8.2: Construction noise and vibration of the ES.

8.11.2.3 Measures to manage construction noise and vibration are set out in the Outline Construction Noise and Vibration Management Plan (document reference J1.3) which forms part of the Outline CoCP (document reference J1). Example measures and the typical noise reduction losses achievable by these measures have been included in the assessment based on the guidance presented in Annex B of BS 5228-1:2009+A1:2014. The losses assumed are those typically associated with BPM as detailed in the Outline CoCP (document reference J1). Full details of the mitigation measures assumed can be found in the Outline Construction Noise and Vibration Management Plan (document reference J1.3).

8.11.2.4 Operational noise impacts due to the presence of the offshore cables to/at landfall export cable corridor have been scoped out of the assessment (**see section 8.7**) and thus only impacts during the construction phase are considered.

Construction phase

Magnitude of impact

8.11.2.5 The noise impacts due to construction activities concentrated to within one area at landfall have been predicted at receptors within the noise and vibration study area. The predicted impacts for each activity are reported in Appendix B, Volume 3, Annex 8.2: Construction noise and vibration of the ES. The results for the worst-case all activities are presented in **Table 8.24** below for all activities except trenchless techniques. The values in bold identify the worst-case activity at each individual receptor.

Table 8.24: Construction noise impacts at receptors near landfall

Name	LOAEL (dB)	SOAEL (dB)	Establish access and temporary construction compounds		Joint bay excavation		Joint bay base construction		Cable jointing		Joint bay backfill	
			Level (dB)	Impact	Level (dB)	Impact	Level (dB)	Impact	Level (dB)	Impact	Level (dB)	Impact
Almond Close	49	65	**59**	Low	56	Low	55	Low	49	Low	56	Low
Century Care Home	69	70	**43**	Negligible	39	Negligible	39	Negligible	33	Negligible	39	Negligible
Co-Op Travel Management	66	70	**38**	Negligible	34	Negligible	34	Negligible	28	Negligible	34	Negligible
Dunepoint	60	65	**40**	Negligible	36	Negligible	36	Negligible	30	Negligible	36	Negligible
Kilgrimol Gardens	58	65	**39**	Negligible	34	Negligible	34	Negligible	29	Negligible	35	Negligible
Redfern Way	53	65	**53**	Low	50	Negligible	49	Negligible	43	Negligible	49	Negligible
Westgate Road	53	65	**52**	Negligible	48	Negligible	47	Negligible	41	Negligible	48	Negligible

Sensitivity of the receptor

8.11.2.6 The majority of receptors are residential dwellings and thus are considered **medium** sensitivity during the daytime.

8.11.2.7 Century Care Home is an assisted living facility and is thus considered to be **high** sensitivity during the daytime.

8.11.2.8 Co-Op Travel Management is a commercial receptor and is thus considered to be of **low** sensitivity.

Significance of effect

8.11.2.9 The works in this area which are predicted to give rise to the maximum impacts are those required to establish access to the temporary construction compounds. **Table 8.24** show the impacts from this construction activity.

8.11.2.10 **Low** and **negligible** magnitude of impacts are predicted to occur at all residential receptors. Overall, the sensitivity of these residential receptors is **medium** and the magnitude of the impact is up to **low.** The effects on these will therefore be of **minor adverse** significance which is not significant.

8.11.2.11 Overall, the sensitivity of Century Care Home is **high** and the magnitude of the impact is **negligible.** The effects will therefore be of **minor adverse** significance which is not significant.

8.11.2.12 Overall, the sensitivity of Co-op Travel Management commercial receptor is **low** and the magnitude of the impact is **negligible.** The effect will therefore be of negligible or minor adverse significance. The assessment has been undertaken assuming the construction activities are located close to the boundary nearest the receptor. The plant items and activities are likely to be more spread across the compound and, as such, the overall effect is likely to be of **negligible adverse** significance which is not significant.

Decommissioning phase

Magnitude of impact

8.11.2.13 The offshore export cables at landfall will either remain *in situ* or be removed from transition joint bays. No new trenching or drilling is anticipated. The overall magnitude of impact is thus considered to be up to **low**.

Sensitivity of the receptor

8.11.2.14 The majority of receptors are residential dwellings and thus are considered **medium** sensitivity during the daytime.

8.11.2.15 Century Care Home is an assisted living facility and is thus considered to be **high** sensitivity during the day.

8.11.2.16 Co-Op Travel Management is a commercial receptor and is thus considered to be of **low** sensitivity.

Significance of the effect

8.11.2.17 Overall, the sensitivity of residential receptors is **medium** and the magnitude of the impact is **low.** The effects will therefore be of **minor adverse** significance which is not significant.

8.11.2.18 Overall, the sensitivity of Century Care Home is **high** and the magnitude of the impact is **negligible.** The effects will therefore be of **minor adverse** significance which is not significant.

8.11.2.19 Overall, the sensitivity of commercial receptors is **low** and he magnitude of the impact is **negligible.** The effects will therefore be of **negligible adverse** significance.

8.11.3 Noise impacts due to the works at the landfall (trenchless techniques)

8.11.3.1 The maximum design scenario is represented by direct pipe as the trenchless technique to be adopted at landfall.

8.11.3.2 The predictions have been undertaken based on the proposed location for the transition joint bay compounds within Blackpool Airport and a 3D acoustic model of the compound constructed based on an indicative layout for the proposed compound.

8.11.3.3 Measures to manage construction noise and vibration are set out in the Outline Construction Noise and Vibration Management Plan (document reference J1.3) which forms part of the Outline CoCP (document reference, J1). Example measures and the typical noise reduction losses achievable by these measures have been included in the assessment based on the guidance presented in Annex B of BS 5228-1:2009+A1:2014. The losses assumed are those typically associated with BPM as detailed in the Outline CoCP (document reference J1). Full details of the mitigation measures assumed can be found in the Outline Construction Noise and Vibration Management Plan (document reference J1.3).

Construction phase

Magnitude of impact

8.11.3.4 Direct pipe works have the potential to require night-time works and thus have been assessed against the night-time noise thresholds as well as the daytime and evening periods. The results are presented in **Table 8.25** below which include receptors within 1 km of the direct pipe works for the Morgan and Morecambe Transmission Assets respectively.

Table 8.25: Construction noise impacts due to Direct Pipe at receptors near landfall

Name	Direct pipe (day)				Direct pipe (weekend)				Direct pipe (night-time)			
	LOAEL (dB)	SOAEL (dB)	Level (dB)	Impact	LOAEL (dB)	SOAEL (dB)	Level (dB)	Impact	LOAEL (dB)	SOAEL (dB)	Level (dB)	Impact
Almond Close	49	65	28	Negligible	47	55	28	Negligible	46	50	28	Negligible
Broster Grove	73	75	24	Negligible	73	75	24	Negligible	73	75	25	Negligible
Christal Avenue	73	75	10	Negligible	73	75	10	Negligible	73	75	17	Negligible
Clifton Drive North	73	75	9	Negligible	73	75	9	Negligible	73	75	16	Negligible
Drake Close	54	65	37	Negligible	54	65	37	Negligible	54	65	40	Low
Fieldway	54	65	24	Negligible	54	65	24	Negligible	54	65	27	Negligible
Jellicloe Close	54	65	39	Negligible	54	65	39	Negligible	54	65	41	Low
Leach Lane (N)	54	65	38	Negligible	54	65	38	Negligible	54	65	40	Low
Leach Lane (S)	54	65	35	Negligible	54	65	35	Negligible	54	65	36	Negligible
Redfern Way	53	65	26	Negligible	53	65	26	Negligible	53	65	26	Negligible
Rodney Avenue	54	65	34	Negligible	54	65	34	Negligible	54	65	36	Negligible
Summerfields	73	75	24	Negligible	73	75	24	Negligible	73	75	25	Negligible

Sensitivity of the receptor

8.11.3.5 All receptors within 1 km of the direct pipe works residential dwellings and thus are considered **medium** sensitivity during the daytime and **high** sensitivity at night.

Significance of effect

8.11.3.6 The results in **Table 8.25** above show that works due to the direct pipe works are likely to result in **negligible** to **low** impacts overall. This is due to the residential dwellings being remote from the siting of the direct pipe plant, with Jellicloe Close being the nearest to the works at approximately 300 m away.

8.11.3.7 Overall, the sensitivity of residential receptors is **high** during the night-time and the magnitude of the impact is **negligible to low.** The overall effect will therefore be of **negligible or minor adverse** significance which is not significant.

Decommissioning phase

Magnitude of impact

8.11.3.8 The offshore export cables at landfall will either remain *in situ* or be removed from transition joint bays. No new trenching or drilling is anticipated. The overall magnitude of impact is thus considered to be **low**.

Sensitivity of the receptor

8.11.3.9 All receptors within 1 km of decommissioning are residential dwellings and thus are considered **medium** sensitivity during the daytime (no night-time works are anticipated).

Significance of the effect

8.11.3.10 Overall, the sensitivity of residential receptors is **medium** and the magnitude of the impact is **low.** The effects will therefore be of **minor adverse** significance which is not significant.

8.11.4 Noise impacts due to the onshore cable installation and decommissioning landward of the transition joint bays (open cut trenching)

8.11.4.1 The majority of the onshore export cable corridor and 400 kV grid connection cable corridor will be installed via open cut trenching techniques.

8.11.4.2 Two methodologies have been adopted to determine the noise impacts depending on whether the activity is likely to be concentrated within a single area or spread along sections of the cable corridor. Full details are outlined in Volume 3, Annex 8.2: Construction noise and vibration of the ES.

8.11.4.3 Some construction activities will require works to be concentrated in one area along the onshore export cable corridor. The construction noise impacts have

been predicted via 3D acoustic modelling using SoundPLAN v8.2. The construction activities assessed using this method include:

- establishing access and temporary construction compounds;
- joint bays and link boxes excavation;
- joint bays and link boxes wall and base construction;
- jointing of cables in the joint bays and link boxes; and
- backfill over the joint bays and link boxes.

8.11.4.4 Since the open cut trenching works are transient in nature and will be spread along the full length of the onshore export cable corridor and 400 kV grid connection cable corridor, an alternative assessment methodology has been adopted for these. A calculation of the noise impacts has been undertaken at various distances from the boundary of the onshore export cable corridor and 400 kV grid connection cable corridor. Subsequently, analysis of the number of noise sensitive receptors where a high or medium impact is predicted has been undertaken using Ordnance Survey (OS) AddressBase Plus data and Geographic Information System software. The works assessed using this method include the following:

- site preparation;
  - fencing;
  - topsoil strip;
- haul road construction;
- trench excavation and duct installation;
- trench backfill;
- trench route and topsoil reinstatement; and
- haul road removal.

8.11.4.5 The assessment includes the typical losses associated with BPM such as acoustic barriers, acoustic sheds around bore drills, and more efficient exhausts on moving plant. Full details are provided in Volume 3, Annex 8.2: Construction noise and vibration of the ES and the Outline Construction Noise and Vibration Plan (document J1.3).

8.11.4.6 Finally, the introduction of additional construction vehicles on local highways may increase noise levels at receptors close to the road. A construction traffic noise assessment has been undertaken and is detailed in Volume 3, Annex 8.2: Construction noise and vibration of the ES and summarised in **section 8.11.8** of this chapter.

Construction phase

Magnitude of Impact

8.11.4.7 The noise impacts due to construction activities concentrated in within one area along the onshore export cable and the 400 kV grid connection corridor have been predicted at receptors within the noise and vibration study area.

The predicted impacts for each activity are reported in Appendix B, Volume 3, Annex 8.2: Construction noise and vibration of the ES. The results for the all activities are presented in **Table 8.26** below for all activities except trenchless techniques, which have been assessed separately due to the potential need for weekend working. The values in bold identify the worst-case activity at each individual receptor.

Table 8.26: Construction noise impacts at receptors along the onshore cable corridor for activities concentrated within construction compounds

Name	LOAEL (dB)	SOAEL (dB)	Establish access and temporary construction compounds		Joint bay excavation		Joint bay base construction		Cable jointing		Joint bay backfill	
			Level (dB)	Impact	Level (dB)	Impact	Level (dB)	Impact	Level (dB)	Impact	Level (dB)	Impact
Almond Close	49	65	**36**	Negligible	35	Negligible	35	Negligible	30	Negligible	36	Negligible
Anson Close	54	65	48	Negligible	**52**	Negligible	51	Negligible	45	Negligible	**52**	Negligible
Beechfield	49	65	**51**	Low	47	Negligible	46	Negligible	40	Negligible	47	Negligible
Blackhurst Cottage	47	65	**54**	Low	51	Low	50	Low	43	Negligible	50	Low
Bridge Farm	68	70	**58**	Negligible	55	Negligible	54	Negligible	48	Negligible	54	Negligible
Broster Grove	73	75	**34**	Negligible	31	Negligible	31	Negligible	26	Negligible	32	Negligible
Brythorpe Lodge	49	65	**51**	Low	48	Negligible	47	Negligible	41	Negligible	48	Negligible
Century Care Home	69	70	**36**	Negligible	35	Negligible	35	Negligible	29	Negligible	35	Negligible
Christal Avenue	73	75	**23**	Negligible	17	Negligible	18	Negligible	13	Negligible	19	Negligible
Clifton Drive North	73	75	**21**	Negligible	16	Negligible	17	Negligible	12	Negligible	17	Negligible
Clifton House	56	65	**57**	Low	54	Negligible	53	Negligible	47	Negligible	54	Negligible
Clifton Marsh Farm	49	65	**52**	Low	49	Low	48	Negligible	42	Negligible	48	Negligible
Co-Op Travel Management	66	70	**39**	Negligible	36	Negligible	36	Negligible	31	Negligible	37	Negligible

Name	LOAEL (dB)	SOAEL (dB)	Establish access and temporary construction compounds		Joint bay excavation		Joint bay base construction		Cable jointing		Joint bay backfill	
			Level (dB)	Impact	Level (dB)	Impact	Level (dB)	Impact	Level (dB)	Impact	Level (dB)	Impact
Division Lane (E)	52	65	**64**	Low	61	Low	60	Low	54	Low	60	Low
Division Lane (W)	52	65	**62**	Low	59	Low	58	Low	52	Low	59	Low
Dowbridge Farm	63	65	**52**	Negligible	48	Negligible	47	Negligible	41	Negligible	48	Negligible
Drake Close	54	65	**61**	Low	58	Low	57	Low	51	Negligible	57	Low
Dunepoint	60	65	**34**	Negligible	33	Negligible	33	Negligible	27	Negligible	33	Negligible
Fieldway	54	65	**55**	Low	52	Negligible	51	Negligible	45	Negligible	51	Negligible
Freshfield Farm (NE Facade)	47	65	**43**	Negligible	39	Negligible	39	Negligible	33	Negligible	39	Negligible
Freshfield Farm (SE Facade)	47	65	**45**	Negligible	40	Negligible	40	Negligible	34	Negligible	40	Negligible
Greenfield Caravan Park	59	65	**51**	Negligible	48	Negligible	47	Negligible	41	Negligible	48	Negligible
Greenlands Farmhouse	49	65	**57**	Low	54	Low	53	Low	47	Negligible	53	Low
Grey Cottage	42	65	**37**	Negligible	32	Negligible	32	Negligible	27	Negligible	33	Negligible
Hall Cross Barn	48	65	**58**	Low	54	Low	53	Low	47	Negligible	54	Low
Highfield Close	56	65	**58**	Low	54	Negligible	53	Negligible	48	Negligible	54	Negligible
Hillock Cross Farm	48	65	**60**	Low	56	Low	55	Low	49	Low	56	Low

Name	LOAEL (dB)	SOAEL (dB)	Establish access and temporary construction compounds		Joint bay excavation		Joint bay base construction		Cable jointing		Joint bay backfill	
			Level (dB)	Impact	Level (dB)	Impact	Level (dB)	Impact	Level (dB)	Impact	Level (dB)	Impact
Howick Cross Lane	47	65	**57**	Low	54	Low	53	Low	47	Low	53	Low
Howick Hall Farm	47	65	**46**	Negligible	43	Negligible	42	Negligible	36	Negligible	43	Negligible
Howick Row	42	65	**55**	Low	52	Low	51	Low	45	Low	51	Low
Howick School House	48	65	**60**	Low	57	Low	56	Low	49	Low	56	Low
Jellicloe Close	54	65	**60**	Low	57	Low	56	Low	50	Negligible	56	Low
Kilgrimol Gardens	58	65	**40**	Negligible	40	Negligible	39	Negligible	33	Negligible	40	Negligible
Laneside	56	65	**55**	Negligible	52	Negligible	51	Negligible	45	Negligible	51	Negligible
Lawns Farm	68	70	**53**	Negligible	50	Negligible	49	Negligible	43	Negligible	49	Negligible
Leach Lane (N)	54	65	**65**	Medium	62	Low	61	Low	55	Low	61	Low
Leach Lane (S)	54	65	**59**	Low	56	Low	55	Low	49	Negligible	56	Low
Manor Drive	63	65	**54**	Negligible	51	Negligible	50	Negligible	44	Negligible	50	Negligible
Marsh Farm	42	65	**56**	Low	53	Low	52	Low	46	Low	53	Low
Marybank Farm	59	65	**56**	Negligible	53	Negligible	52	Negligible	46	Negligible	53	Negligible
Meadow View	48	65	**55**	Low	51	Low	50	Low	45	Negligible	51	Low
Mulberry Close	56	65	**56**	Low	53	Negligible	52	Negligible	46	Negligible	52	Negligible
Nook Cottages	56	65	**54**	Negligible	51	Negligible	50	Negligible	44	Negligible	51	Negligible

Name	LOAEL (dB)	SOAEL (dB)	Establish access and temporary construction compounds		Joint bay excavation		Joint bay base construction		Cable jointing		Joint bay backfill	
			Level (dB)	Impact	Level (dB)	Impact	Level (dB)	Impact	Level (dB)	Impact	Level (dB)	Impact
Old Toll House	59	65	**53**	Negligible	50	Negligible	49	Negligible	43	Negligible	49	Negligible
Olroy House	49	65	**48**	Negligible	43	Negligible	43	Negligible	37	Negligible	43	Negligible
Quaker Wood Stables	50	65	**68**	Medium	65	Medium	64	Low	57	Low	64	Low
Redfern Way	53	65	**34**	Negligible	33	Negligible	33	Negligible	27	Negligible	33	Negligible
Rodney Avenue	54	65	**58**	Low	56	Low	54	Low	48	Negligible	55	Low
Rowan Veterinary Centre	48	65	**65**	Medium	62	Low	61	Low	55	Low	61	Low
School House	68	70	**57**	Negligible	54	Negligible	53	Negligible	47	Negligible	54	Negligible
Semper House	49	65	**58**	Low	55	Low	54	Low	47	Negligible	54	Low
SJ Landscapes	42	65	**34**	Negligible	28	Negligible	28	Negligible	23	Negligible	29	Negligible
Summerfields	73	75	**35**	Negligible	31	Negligible	32	Negligible	26	Negligible	32	Negligible
Sundown	49	65	**68**	Medium	65	Medium	63	Low	57	Low	64	Low
Sunnyfield	49	65	**65**	Medium	62	Low	61	Low	55	Low	61	Low
The Chaltons	48	65	**57**	Low	54	Low	53	Low	47	Negligible	53	Low
The Old Dairy	42	65	**31**	Negligible	24	Negligible	25	Negligible	19	Negligible	25	Negligible
Tithe Barn Farm	47	65	**59**	Low	55	Low	54	Low	48	Low	55	Low
Townley Lane	42	65	**47**	Low	43	Low	43	Low	37	Negligible	43	Low

Name	LOAEL (dB)	SOAEL (dB)	Establish access and temporary construction compounds		Joint bay excavation		Joint bay base construction		Cable jointing		Joint bay backfill	
			Level (dB)	Impact	Level (dB)	Impact	Level (dB)	Impact	Level (dB)	Impact	Level (dB)	Impact
Walton Farm	47	65	**55**	Low	52	Low	51	Low	45	Negligible	52	Low
West Moss Lane	68	70	**55**	Negligible	53	Negligible	51	Negligible	45	Negligible	52	Negligible
West Winds	49	65	**59**	Low	56	Low	55	Low	49	Low	55	Low
Westgate Road	53	65	**35**	Negligible	33	Negligible	33	Negligible	28	Negligible	34	Negligible
White Gates	68	70	**61**	Negligible	58	Negligible	57	Negligible	51	Negligible	58	Negligible
White Lodge	68	70	**65**	Negligible	62	Negligible	61	Negligible	55	Negligible	61	Negligible
Wrea Brook Barn	42	65	**35**	Negligible	29	Negligible	29	Negligible	24	Negligible	30	Negligible

8.11.4.8 The results of the assessment of works spread along sections of the route are presented in **Table 8.27** below. The table presents the varying distances from the cable corridor, which are associated with low, medium and high impacts likely to result from individual construction activities and the number of receptors within each of these bands.

Table 8.27: Construction noise impact magnitude and number of receptors per impact magnitude band

Location	Impact magnitude band distance (m)			Approximate number of receptors		
	High	Medium	Low	High	Medium	Low
Site preparation						
Onshore export cable corridor near Blackpool Airport	60	106	425	63	22	555
Onshore export cable corridor east of Blackpool Airport	60	106	1,500	19	13	7500
Cabling in proximity to onshore substations	60	106	750	0	1	320
400 kV grid connection cable corridor	60	106	900	0	12	3900
Trench excavation and duct installation						
Onshore export cable corridor near Blackpool Airport	43	75	300	31	44	240
Onshore export cable corridor east of Blackpool Airport	43	75	1,060	16	10	3750
Cabling in proximity to onshore substations	43	75	530	0	1	320
400 kV grid connection cable corridor	43	75	1,050	0	7	4300
Trench backfill						
Onshore export cable corridor near Blackpool Airport	43	75	300	31	44	240
Onshore export cable corridor east of Blackpool Airport	43	75	1,060	16	10	3750
Cabling in proximity to onshore substations	43	75	530	0	1	320
400 kV grid connection cable corridor	43	75	1,050	0	7	4300
Trench route reinstatement						
Onshore export cable corridor near Blackpool Airport	48	85	335	36	44	140
Onshore export cable corridor east of Blackpool Airport	48	85	1,190	19	7	5400

Location	Impact magnitude band distance (m)			Approximate number of receptors		
	High	Medium	Low	High	Medium	Low
Cabling in proximity to onshore substations	48	85	595	0	1	320
400 kV Grid Connection Cable Corridor	48	85	1,190	0	11	5900
Haul road removal						
Onshore export cable corridor near Blackpool Airport	54	95	375	36	47	150
Onshore export cable corridor east of Blackpool Airport	54	95	1,240	19	12	5800
Cabling in proximity to onshore substations	54	95	670	0	1	320
400 kV grid connection cable corridor	54	95	1,240	0	10	6400

Sensitivity of the receptor

8.11.4.9 The nearest receptors are predominantly residential in nature and thus are deemed to be of **medium** sensitivity during the daytime. Rowan Veterinary Centre is a medical facility and is considered to be of **medium** sensitivity.

8.11.4.10 The Wrea Green Equestrian Centre and Quaker Wood Stables are likely to be in use during the daytime with horses situated outside in the riding area. The British Horse Society published 'Advice on Noise affecting routes used with horses' (British Horse Society, 2022) outlining how horses can respond to noise. In summary, horses are prey animals and their typical response to danger is flight. As such, any noises may be considered as a potential threat from which to flee. As such, the sensitivity of those using these locations for horse riding as a recreational activity receptor is considered to be **medium**.

Significance of effect

Works concentrated in one area

8.11.4.11 The works in this area which are predicted to give rise to the maximum impacts are those required to establish access and the temporary construction compounds. **Table 8.26** shows the noise levels due to these construction works. The calculations have included losses associated with BPM as detailed in the Outline Construction Noise and Vibration Management Plan (document reference J1.3). Examples of such measures include enhanced sound reduction equipment on engines and ventilated enclosures and sheds. Further details of these measures are set out in Table 1.6 of ES Volume 3 Annex 8.2: Construction noise and vibration. The inclusion of these mitigation measures results in noise levels being suitably controlled at residential receptors such that the overall magnitude of impact is **negligible to medium**.

8.11.4.12 As such, the overall sensitivity of the residential receptors is **medium** and the magnitude of impact is predicted to be up to **medium**. The overall effect is considered to be of **moderate adverse** significance which is significant.

8.11.4.13 A **medium** magnitude of impact is predicted at Rowan Veterinary Centre which is located approximately 50 m from the boundary of a temporary construction compound. This sensitivity of this receptor is **medium** and therefore there is the potential for a **moderate adverse** significant effect which is significant.

8.11.4.14 **Low** magnitude impacts are predicted at Wrea Green Equestrian Centre. However, there are **medium** magnitude impacts predicted from works required to establish access and temporary construction compounds at Quaker Wood Stables due to the close proximity of the external riding area to the construction of the cable route close to the Morecambe onshore substation. The sensitivity of the receptor is **medium** and, as a consequence, the overall effect on users of these facilities is likely to be of **moderate adverse** significance which is significant.

Transient works spread along the onshore cable corridor and 400 kV grid connection corridor

8.11.4.15 The results in **Table 8.26** show the number of receptors have the potential to be impacted by construction noise due to transient activities along the onshore cable corridor and 400 kV grid connection cable corridor, which are planned to be undertaken during daytime hours only. Both **high** and **medium** magnitude of impacts are predicted to occur at receptors along the length of the onshore export cable corridor. **Medium** magnitude of impacts are also predicted at receptors in the vicinity of the cabling associated with the onshore substations and the 400 kV routes. The sensitivity of the receptor is **medium** and, as a consequence, the overall effect on users of these facilities is likely to be of **moderate adverse** significance which is significant.

8.11.4.16 The calculation of noise impacts due to these transient works has been undertaken assuming that all equipment will be in operation at the boundary of the onshore export cable corridor. This is unlikely to be the case in reality since the works will be spread at intervals along the width and length of the cable corridor.

8.11.4.17 Furthermore, since trenching works are likely to be transient in nature, consistent activity would not take place at each/ all location(s) for the full construction period. As such, the overall impact is likely to be reduced to **low** at these affected receptors and the effects will be of **minor adverse** significance for standard construction methods (excluding trenchless techniques, which are considered below) which is not significant.

Further (secondary) mitigation and residual effects

8.11.4.18 A potentially significant effect has been identified at Rowan Veterinary Centre and a limited number of residential receptors. However, the model predictions have assumed that construction plant is to be located close to the boundaries of the compounds nearest to the receptors. This is assumed to

be a worst case, as construction plant is unlikely to be concentrated along the compound boundaries for a significant length of time.

8.11.4.19 Similarly, it is noted that the assessment at Quaker Wood Stables has been undertaken assuming noise levels to be spread across the entirety of the compound area, which is a worst case (conservative) approach and therefore construction noise levels at Quaker Wood Stables are likely to be lower in reality.

8.11.4.20 The Applicants have committed to the implementation of Construction Noise and Vibration Management Plan(s) in accordance with the Outline Construction Noise and Vibration Management Plan (document reference J1.3) (CoT79 as secured by Requirement 8 of the DCO). The Outline Construction Noise and Vibration Management Plan states that a range of measures will be considered, including the erection of temporary noise barriers to minimise the effects of construction noise to the nearest receptors at necessary locations. This includes provision of a bund in the temporary construction compound at the Morecambe onshore substation. As the details of the compound layout and working areas are not yet determined this has not been included in the model. However, with such measures in place (such as site hoarding and localised screening to the compound in close proximity to Quaker Wood Stables), noise impacts at these residential properties would be reduced to a level at which they are unlikely to result in a significant adverse effect.

Decommissioning phase

8.11.4.21 The onshore export cables and 400 kV grid connection cables will either remain *in situ* or be removed from link boxes and joint bays. No new trenching or drilling is anticipated. Link boxes will remain *in situ*. The overall magnitude of impact is thus considered to be **low**.

8.11.4.22 Overall, the sensitivity of the residential and recreational receptors is **medium** during the daytime. The magnitude of the impact is **low**. The effects will, therefore, be of **minor adverse** significance, which is not significant.

8.11.5 Noise impacts due to the onshore cable installation and decommissioning landward of the transition joint bays (trenchless techniques)

8.11.5.1 Noise impacts due to works associated with trenchless techniques have been modelled using SoundPLAN v8.2 based on indicative layouts plant associated with this construction activity.

8.11.5.2 HDD (or other trenchless techniques) are likely to be required to cross the railway lines near Moss Side, as well as numerous roads, underground utilities, hedgerows and drains along the onshore export cable and 400 kV grid connection cable route. These works have the potential to require weekend working (Saturday afternoons) and therefore have been assessed against the evening/weekend thresholds, in addition to the daytime period. The MDS is represented by the HDD works associated with Morecambe and Morgan being undertaken concurrently.

8.11.5.3 Micro-tunnelling represents the MDS at the River Ribble. No receptors have been identified within the noise and vibration study area around the River Ribble construction compounds on both sides of the river (entry and exit pits) and, as such, no assessment of impacts associated with these micro-tunnelling works is required.

Construction phase

Magnitude of impact

8.11.5.4 The results of the assessment of HDD (or other trenchless techniques) works are presented in **Table 8.28** below. Impacts are presented for daytime and Saturday afternoon (pm) period, and for night-time for HDD activities close to Blackpool Airport.

Table 8.28: Construction noise impacts at receptors due to trenchless techniques

Name	Trenchless techniques (day)				Trenchless techniques (weekend)				Trenchless techniques (night-time)[1]			
	LOAEL (dB)	SOAEL (dB)	Level (dB)	Impact	LOAEL (dB)	SOAEL (dB)	Level (dB)	Impact	LOAEL (dB)	SOAEL (dB)	Level (dB)	Impact
Almond Close	49	65	24	Negligible	47	55	24	Negligible	-	-	-	-
Anson Close	54	65	32	Negligible	50	55	32	Negligible	-	-	-	-
Beechfield	49	65	35	Negligible	48	55	35	Negligible	-	-	-	-
Blackhurst Cottage	47	65	31	Negligible	44	55	31	Negligible	-	-	-	-
Blackpool Road North	54	65	57	Low	50	55	57	Medium	39	45	57	High
Bridge Farm	68	70	45	Negligible	64	65	45	Negligible	-	-	-	-
Broster Grove	73	75	22	Negligible	69	69	22	Negligible	-	-	-	-
Brythorpe Lodge	49	65	43	Negligible	47	55	43	Negligible	-	-	-	-
Century Care Home	69	70	23	Negligible	65	65	23	Negligible	-	-	-	-
Christal Avenue	73	75	11	Negligible	69	69	11	Negligible	-	-	-	-
Clifton Drive North	73	75	9	Negligible	69	69	9	Negligible	-	-	-	-
Clifton House	56	65	40	Negligible	53	55	40	Negligible	-	-	-	-
Clifton Marsh Farm	49	65	36	Negligible	48	55	36	Negligible	-	-	-	-

[1] Night-time levels only reported for receptors in vicinity of Blackpool Airport, where trenchless techniques are likely to be undertaken during night time hours

Name	Trenchless techniques (day)				Trenchless techniques (weekend)				Trenchless techniques (night-time)[1]			
	LOAEL (dB)	SOAEL (dB)	Level (dB)	Impact	LOAEL (dB)	SOAEL (dB)	Level (dB)	Impact	LOAEL (dB)	SOAEL (dB)	Level (dB)	Impact
Coniston Avenue	54	65	47	Negligible	50	55	47	Negligible	39	45	47	Medium
Co-Op Travel Management	66	70	17	Negligible	44	55	17	Negligible	-	-	-	-
Cottam Close	54	65	46	Negligible	50	55	46	Negligible	39	45	47	Medium
Division Lane (E)	52	65	42	Negligible	44	55	42	Negligible	-	-	-	-
Division Lane (W)	52	65	42	Negligible	44	55	42	Negligible	-	-	-	-
Dowbridge Farm	63	65	33	Negligible	59	60	33	Negligible	-	-	-	-
Drake Close	54	65	38	Negligible	50	55	38	Negligible	-	-	-	-
Dunepoint	60	65	20	Negligible	56	60	20	Negligible	-	-	-	-
Fieldway	54	65	54	Low	50	55	54	Low	39	45	55	High
Freshfield Farm (NE Facade)	47	65	37	Negligible	45	55	37	Negligible	-	-	-	-
Freshfield Farm (SE Facade)	47	65	40	Negligible	45	55	40	Negligible	-	-	-	-
Greenfield Caravan Park	59	65	37	Negligible	57	60	37	Negligible	-	-	-	-
Greenlands Farmhouse	49	65	39	Negligible	47	55	39	Negligible	-	-	-	-
Grey Cottage	42	65	46	Low	41	55	46	Low	-	-	-	-
Hall Cross Barn	48	65	53	Low	46	55	53	Low	-	-	-	-

Name	Trenchless techniques (day)				Trenchless techniques (weekend)				Trenchless techniques (night-time)[1]			
	LOAEL (dB)	SOAEL (dB)	Level (dB)	Impact	LOAEL (dB)	SOAEL (dB)	Level (dB)	Impact	LOAEL (dB)	SOAEL (dB)	Level (dB)	Impact
Highfield Close	56	65	40	Negligible	53	55	40	Negligible	-	-	-	-
Hillock Cross Farm	48	65	40	Negligible	46	55	40	Negligible	44	45	55	High
Holly Mews	54	65	55	Low	50	55	55	Medium	39	45	47	Medium
Honister Square	54	65	47	Negligible	50	55	47	Negligible	-	-	-	-
Howick Cross Lane	47	65	40	Negligible	44	55	40	Negligible	-	-	-	-
Howick Hall Farm	47	65	47	Low	44	55	47	Low	-	-	-	-
Howick Row	42	65	47	Low	41	55	47	Low	-	-	-	-
Howick School House	48	65	36	Negligible	46	55	36	Negligible	-	-	-	-
Jellicloe Close	54	65	36	Negligible	50	55	36	Negligible	-	-	-	-
Kilgrimol Gardens	58	65	26	Negligible	54	55	26	Negligible	-	-	-	-
Laneside	56	65	37	Negligible	53	55	37	Negligible	-	-	-	-
Lawns Farm	68	70	46	Negligible	64	65	46	Negligible	-	-	-	-
Leach Lane (N)	54	65	29	Negligible	50	55	29	Negligible	39	45	40	Low
Leach Lane (S)	54	65	37	Negligible	50	55	37	Negligible	39	45	50	High
Linden Mews	54	65	50	Negligible	50	55	50	Low	-	-	-	-
Manor Drive	63	65	33	Negligible	59	60	33	Negligible	-	-	-	-
Marsh Farm	42	65	46	Low	41	55	46	Low	-	-	-	-

Name	Trenchless techniques (day)				Trenchless techniques (weekend)				Trenchless techniques (night-time)[1]			
	LOAEL (dB)	SOAEL (dB)	Level (dB)	Impact	LOAEL (dB)	SOAEL (dB)	Level (dB)	Impact	LOAEL (dB)	SOAEL (dB)	Level (dB)	Impact
Marybank Farm	59	65	42	Negligible	57	60	42	Negligible	-	-	-	-
Meadow View	48	65	42	Negligible	46	55	42	Negligible	-	-	-	-
Mulberry Close	56	65	41	Negligible	53	55	41	Negligible	-	-	-	-
Nook Cottages	56	65	41	Negligible	53	55	41	Negligible	-	-	-	-
Old Toll House	59	65	36	Negligible	57	60	36	Negligible	-	-	-	-
Olroy House	49	65	39	Negligible	47	55	39	Negligible	-	-	-	-
Quaker Wood Stables	50	65	43	Negligible	47	55	43	Negligible	-	-	-	-
Redfern Way	53	65	23	Negligible	47	55	23	Negligible	-	-	-	-
Rodney Avenue	54	65	36	Negligible	50	55	36	Negligible	-	-	-	-
Rowan Veterinary Centre	48	65	40	Negligible	46	55	40	Negligible	-	-	-	-
School House	68	70	45	Negligible	64	65	45	Negligible	-	-	-	-
Semper House	49	65	40	Negligible	47	55	40	Negligible	-	-	-	-
SJ Landscapes	42	65	52	Low	41	55	52	Low	-	-	-	-
Summerfields	73	75	23	Negligible	69	69	23	Negligible	-	-	-	-
Sundown	49	65	51	Low	47	55	51	Low	-	-	-	-
Sunnyfield	49	65	50	Low	47	55	50	Low	-	-	-	-
The Chaltons	48	65	56	Low	46	55	56	Medium	-	-	-	-
The Hamlet	54	65	52	Negligible	50	55	52	Low	39	45	49	Medium

Name	Trenchless techniques (day)				Trenchless techniques (weekend)				Trenchless techniques (night-time)[1]			
	LOAEL (dB)	SOAEL (dB)	Level (dB)	Impact	LOAEL (dB)	SOAEL (dB)	Level (dB)	Impact	LOAEL (dB)	SOAEL (dB)	Level (dB)	Impact
The Old Dairy	42	65	49	Low	41	55	49	Low	-	-	-	-
Tithe Barn Farm	47	65	32	Negligible	44	55	32	Negligible	-	-	-	-
Townley Lane	42	65	47	Low	41	55	47	Low	-	-	-	-
Walton Farm	47	65	34	Negligible	44	55	34	Negligible	-	-	-	-
West Moss Lane	68	70	42	Negligible	64	65	42	Negligible	-	-	-	-
West Winds	49	65	40	Negligible	47	55	40	Negligible	-	-	-	-
Westgate Road	53	65	24	Negligible	47	55	24	Negligible	-	-	-	-
White Gates	68	70	47	Negligible	64	65	47	Negligible	-	-	-	-
White Lodge	68	70	49	Negligible	64	65	49	Negligible	-	-	-	-
Wrea Brook Barn	42	65	51	Low	41	55	51	Low	-	-	-	-
Wrea Green Equestrian Centre	42	65	41	Negligible	41	55	41	Low	-	-	-	-

Sensitivity of the receptor

8.11.5.5 The nearest receptors are predominantly residential in nature and thus are deemed to be of **medium** sensitivity during the daytime and evening. Rowan Veterinary Centre is a medical facility and is considered to be of **medium** sensitivity.

8.11.5.6 The Wrea Green Equestrian Centre and Quaker Wood Stables are locations used for horse riding as a recreational activity receptor and are considered to be **medium** sensitivity during the daytime.

Significance of effect

8.11.5.7 The noise impacts due to HDD (or other trenchless techniques) are shown in **Table 8.28** above. As with the assessment of standard construction techniques, typical losses associated with BPM have been incorporated into the assessment. The magnitude of the impacts during the daytime due to these works are predicted to be **negligible** to **low** overall for residential receptors. As a consequence, the overall effect will be of **negligible or minor adverse** significance which is not significant.

8.11.5.8 A **negligible** magnitude of impact is predicted at Rowan Veterinary Centre due to the HDD works. The sensitivity of this receptor is **medium** and therefore the overall effect will be of **negligible** or **minor adverse** significance which is not significant.

8.11.5.9 A **negligible** magnitude of impact is predicted for both Wrea Green Equestrian Centre and Quaker Wood Stables. The sensitivity of these recreational receptors is **medium** and therefore the overall effect will be of **negligible** or **minor adverse** significance which is not significant.

8.11.5.10 The assessment has been undertaken with reference to weekend thresholds due to works during Saturday afternoons. The magnitude of the impacts during this period due to these works are predicted to be **negligible** to **low** overall for most residential receptors, with those close to Blackpool Airport predicted to experience **medium** impacts. These particular receptors, which are **medium** in sensitivity, would experience an effect of **moderate adverse** significance. However, the evening/weekend thresholds are only predicted exceeded only for a limited duration at weekends and are therefore would not meet the temporal duration set out in **section 8.10.3.3**. Therefore, a significant adverse effect on receptors close to Blackpool Airport is unlikely to occur. Based on professional judgement, the impact is likely to be of **low** magnitude, resulting in an effect of **minor adverse** significance.

8.11.5.11 The assessment has also been undertaken with reference to night-time thresholds at residential receptors which are in close proximity to Blackpool Airport, where trenchless techniques are likely to be undertaken during the night. These receptors are considered to be of medium sensitivity and the magnitude of impact is predicted to be **medium to high** at all but one receptor. However, the night-time threshold is only predicted exceeded only for a limited duration and would not meet the temporal duration set out in **section 8.10.3.3**. As a consequence, a significant adverse effect on these receptors is unlikely to occur as a result of these night time works. Based on

professional judgement, the impact is likely to be of **low** magnitude, resulting in an effect of **minor adverse** significance.

Decommissioning phase

Magnitude of impact

8.11.5.12 The onshore export cables and 400 kV grid connection cables will either remain *in situ* or be removed from link boxes and joint bays. No new trenching or drilling is anticipated. Link boxes will remain *in situ*. The overall magnitude of impact is thus considered to be **low**.

Sensitivity of the receptor

8.11.5.13 The nearest receptors are predominantly residential in nature and thus are deemed to be of **medium** sensitivity during the daytime and high sensitivity during the night-time.

8.11.5.14 Rowan Veterinary Centre is a medical facility and is considered to be of **medium** sensitivity during the daytime.

8.11.5.15 The Wrea Green Equestrian Centre and Quaker Wood Stables are locations used for horse riding as a recreational activity receptor and are considered to be **medium** sensitivity during the daytime.

Significance of the effect

8.11.5.16 Overall, the sensitivity of the residential receptors is **medium** during the daytime. The magnitude of the impact is **low**. The effect will, therefore, be of **minor adverse** significance, which is not significant.

8.11.5.17 The sensitivity of medical facility and recreational activity receptors are **medium** and the magnitude of impact is **negligible**. As such, the overall effect will be of **minor adverse** significance which is not significant.

8.11.6 Noise impacts due to the construction of the onshore substations

8.11.6.1 The construction of the onshore substations has been assessed across four phases:

- groundworks;
- building foundation works (including night-time concrete pours);
- access road and car park works; and
- building fabrication and high-voltage plant installation.

8.11.6.2 The exact locations where works will be carried out is not yet known. Therefore, predictions have been undertaken assuming that the construction activities within the temporary and permanent substation compounds occur close to their boundaries. Full details of the construction noise and vibration assessment are provided in Volume 3, Annex 8.2: Construction noise and vibration of the ES.

8.11.6.3 Measures to manage construction noise and vibration are set out in the Outline Construction Noise and Vibration Management Plan (document reference J1.3) which forms part of the Outline CoCP (document reference J1). Example measures and the typical noise reduction losses achievable by these measures have been included in the assessment based on the guidance presented in Annex B of BS 5228-1:2009+A1:2014. The losses assumed are those typically associated with BPM as detailed in the Outline CoCP (document reference J1). Full details of the mitigation measures assumed can be found in the Outline Construction Noise and Vibration Management Plan (document reference J1.3).

Construction phase

Sensitivity of the receptor

8.11.6.4 The nearest receptors are residential in nature. As such, the sensitivity of these receptors is considered to be **medium** during the day and **high** during the night.

8.11.6.5 The Quaker Wood Stables is a location used for horse riding as a recreational activity receptor and is considered to be **medium** sensitivity during the daytime.

Magnitude of impact

8.11.6.6 The results of the construction noise assessment for the worst-case activities at each receptor are presented in **Table 8.29** below.

Table 8.29: Construction noise impacts near the onshore substations

Name	LOAEL – day (dB)	SOAEL – day (dB)	Car Park and Access		Groundworks		Building Foundations		Building Fabrication and HV Plant		LOAEL – night (dB)	SOAEL– night (dB)	Concrete Pour	
			Level (dB)	Impact	Level (dB)	Impact	Level (dB)	Impact	Level (dB)	Impact			Level	Impact
Dowbridge Farm	63	65	51	Negligible	49	Negligible	41	Negligible	41	Negligible	56	60	35	Negligible
Freshfield Farm (SE Facade)	47	65	44	Negligible	52	Low	46	Negligible	46	Negligible	42	45	40	Negligible
Manor Drive	63	65	53	Negligible	49	Negligible	41	Negligible	42	Negligible	56	60	35	Negligible
Marybank Farm	59	65	55	Negligible	54	Negligible	47	Negligible	47	Negligible	51	55	37	Negligible

Significance of the effect

8.11.6.7 The results of the onshore substation construction noise impact assessment in **Table 8.29** show that the activities most likely to impact receptors during the daytime will be substation groundworks and access road and car parking works.

8.11.6.8 The assessment has been undertaken based on the assumption that construction plant within the substation permanent and temporary compound area will operate close to their boundaries. This is unlikely to be the case and thus the results are likely an overestimation of the construction noise levels in reality.

8.11.6.9 Overall, the sensitivity of the residential receptors in the daytime is considered to be **medium** and the magnitude of the impact due to the daytime works is deemed to be **low**. The effect will, therefore be of **minor adverse** significance, which is not significant.

8.11.6.10 The sensitivity of the Quaker Wood Stables is **medium** and the magnitude of impact is **medium**. The effect is therefore considered to be of **moderate adverse** significance which is considered significant.

8.11.6.11 However, as outlined in **paragraph 1.2.2.4**, the application of noise mitigation measures as set out in the Outline Construction Noise and Vibration Management Plan (document reference J1.3) beyond those already assumed in model results, such as site hoarding and localised screening to the compound in close proximity to Quaker Wood Stables, have the potential to reduce construction noise impacts at this receptor to a level at which they are unlikely to result in a significant adverse effect.

8.11.6.12 Night-time concrete pouring activities are also anticipated at both onshore substations. **Table 8.29** shows that the magnitude of impact associated with these night-time construction activities is **negligible** at all receptors. As with the daytime works, the assessment has been undertaken based on the assumption that construction plant associated with the concrete pouring activities will operate close to the substation boundary, which is unlikely to be the case in reality. Even with this assumption, the levels from this activity are predicted to be low.

8.11.6.13 Overall, the sensitivity of the residential receptors during the night-time is considered to be **high** and the magnitude of the impact due to the night-time works is deemed to be **negligible**. The effect will, therefore be of **minor adverse** significance, which is not significant.

Further (secondary) mitigation and residual effects

8.11.6.14 A potentially significant effect has been identified at Quaker Wood Stables. The Applicants have committed to the implementation of Construction Noise and Vibration Management Plan(s) in accordance with the Outline Construction Noise and Vibration Management Plan (document reference J1.3) (CoT79 as secured by Requirement 8 of the DCO). The Outline Construction Noise and Vibration Management Plan states that a range of measures will be considered including the erection of temporary noise

barriers to minimise the effects of construction noise to the nearest receptors at necessary locations. The Applicants will ensure that close liaison is maintained with those affected during construction (see Outline Communications Plan, document reference J1.1) and enhanced acoustic mitigation measures, such as acoustic barriers, will be adopted where necessary to reduce noise levels due to decommissioning works.

8.11.6.15 Adopting these measures will result in a residual effect which is of **minor adverse** significance which is not significant.

Decommissioning phase

Magnitude of impact

8.11.6.16 Decommissioning is likely to operate within the parameters identified for construction. As such, decommissioning activities will be limited to within the construction working areas and require a duration no greater than the activities assessed as part of the construction phase.

8.11.6.17 The magnitude of impact is therefore deemed to be **low** at residential receptors and **medium** at the Quaker Wood Stables.

Sensitivity of the receptor

8.11.6.18 The nearest receptors are residential and recreational in nature. As such, the sensitivity of these receptors are both considered to be **medium.**

Significance of effect

8.11.6.19 Overall, the sensitivity of residential receptors is considered to be **medium** and the magnitude of the impact is deemed to be **low**. The effect will, therefore, be of **minor adverse** significance, which is not significant.

8.11.6.20 The sensitivity of Quaker Wood Stables is considered to be up to **medium** and the magnitude of the impact is deemed to be **medium**. As for the construction phase, the effect will therefore be of **moderate adverse** significance which is significant.

Further (secondary) mitigation and residual effects

8.11.6.21 As during construction, implementation of measures through the Onshore Decommissioning Plan (CoT36 as secured by Requirement 22 of the DCO) will ensure any such impacts are managed effectively. Adopting suitable measures will result in a residual effect which is of **minor adverse** significance which is not significant.

8.11.7 Vibration impacts due to the construction of the Transmission Assets

8.11.7.1 The construction of the onshore export cable corridor, 400 kV grid connection cable corridor, and the Morgan and Morecambe onshore substations will require the use of vibration-generating equipment. There are two primary sources of consideration which include the following:

- the use of vibratory piling techniques for the installation of entry and exit pits for HDD (or other trenchless techniques); and
- the use of vibratory rollers for the dynamic compaction of the haul road, temporary construction compounds, and the Onshore Substation platforms during the groundworks phase of construction.

8.11.7.2 The impacts have been assessed for both scenarios based upon the methodology detailed in BS 5228-2:2009+A1:2014 (British Standards Institution, 2014). Full details of the vibration impact assessment methodology are presented in Volume 3, Annex 8.2: Construction noise and vibration of the ES.

8.11.7.3 Vibratory piling techniques may also be required to install a cofferdam within the inter-tidal region, to facilitate the construction of the direct pipe exit pits. However, as these works are at least 300 m from the nearest vibration sensitive receptors located on Clifton Drive North, significant adverse effects from this construction operation are unlikely to occur and no further quantitative assessment of construction vibration from the cofferdam installation has been undertaken.

Construction phase

Magnitude of impact

8.11.7.4 The impact magnitudes for both vibratory piling and dynamic compaction techniques are presented in **Table 8.30**. The calculations have been undertaken based upon the threshold scaling factors outlined in Annex E of BS 5228-2:2009+A1:2014 which correspond to a 33% probability of exceedance as a conservative approach. A maximum extent of 100 m has been applied to align with the maximum extent of the construction vibration study area applied in this assessment. These have been presented for both Morgan and Morecambe onshore substations combined.

8.11.7.5 The vibration impacts due to dynamic compaction have been predicted from the boundary of the onshore substation platforms and vibratory piling techniques from the boundaries of the temporary construction compounds.

Table 8.30: Construction vibration impact magnitude and number of receptors per impact magnitude band

Location	Impact Magnitude Band Distance (m)			Number of Receptors		
	High	Medium	Low	High	Medium	Low
Dynamic compaction						
Haul Road	7	38	88	0	51	96
Temporary construction compounds (onshore export cable corridor)				0	33	189
Temporary Construction Compounds (onshore substations)				0	0	1
Onshore substation platforms				0	0	0

Location	Impact Magnitude Band Distance (m)			Number of Receptors		
	High	Medium	Low	High	Medium	Low
Vibratory piling						
Trenchless technique entry/exit pits	8	41	100	0	72	173
Onshore substation platforms				0	0	1

Sensitivity of receptor

8.11.7.6 The nearest receptors are residential in nature and works are assumed to be undertaken during the daytime only. As such, the receptors are considered to be of **medium** sensitivity.

Significance of effect

8.11.7.7 The results of the assessment of impacts due to dynamic compaction in **Table 8.30** above show that medium impacts are predicted at approximately 51 residential receptors during the construction of the haul road.

8.11.7.8 Medium impacts are predicted at 84 receptors during the dynamic compaction works for the temporary construction compounds.

8.11.7.9 It should be noted that in the assessment of impacts due to construction vibration has been undertaken from the boundary of the cable corridor for the haul road and from the boundary of all temporary construction compounds. It is unlikely that the dynamic compaction works will be undertaken for any extended period along the boundary but would rather be spread within the compounds and cable corridors. Furthermore, the receptors affected during the construction of the haul road are situated along the access routes and thus are likely to be situated a lot further from the construction works then assessed. Any compaction works required along these access routes will be short-term in duration and thus receptors are unlikely to be affected for an extended period.

8.11.7.10 Similarly, vibratory piling is unlikely to be required as close to the boundary of the trenchless technique compounds as has been assessed. Any works required will also be short-term in duration.

8.11.7.11 The Construction Noise and Vibration Plan (document reference J1.3) outlines measures proposed to control vibration such as the use of low-vibration equipment, alternative methods (where appropriate), and cut-off trenches to interrupt the direct transmission path of vibrations between source and receiver. These measures have not been included in the assessment since there is a high degree of uncertainty in quantifying the potential reduction in vibration levels.

8.11.7.12 Based on the above, the overall impact due to construction vibration will be **low** and the effect is considered to be of **minor adverse** significance which is not significant.

8.11.8 The impact of noise generated by additional vehicle movements on the local highway network

8.11.8.1 The introduction of additional construction vehicles on local highways may increase noise levels at receptors close to the road. An indicative construction traffic noise assessment has been undertaken and is detailed in Volume 3, Annex 8.2: Construction noise and vibration of the ES.

Construction phase

Sensitivity of receptor

8.11.8.2 The majority of the nearest noise-sensitive sensitive receptors to the roads are residential dwellings. There are a small number of residential institutions situated near landfall. However, they are situated further back from the road. As such, the sensitivity of these receptors is considered to be **medium**.

Magnitude of impact

8.11.8.3 The existing baseline traffic flows on local highway networks are generally high with a minimum BNL of 60 dB(A) and a maximum BNL of 81 dB(A). As such, the introduction of construction vehicles to these networks does not contribute to a great increase to the BNL on the highway links for which baseline data is available.

8.11.8.4 As such, overall, the magnitude of impact is predicted to be **low**.

Significance of effect

8.11.8.5 Construction Traffic Management Plan(s) (CTMP) will be prepared in accordance with the Outline CTMP submitted as part of the application (document reference J5) outlining methods to control construction traffic. The measures to be adopted to control construction traffic are presented in Volume 3, Chapter 7: Traffic and transport of the ES.

8.11.8.6 Moreover, the use of a haul road will result in less construction traffic on local highway networks.

8.11.8.7 As such, the overall impact is predicted to be negligible and the effect will be of **minor adverse** significance which is not significant.

Decommissioning phase

8.11.8.8 Decommissioning traffic is likely to operate within the parameters identified for construction. As such, decommissioning traffic flows will be no greater than those assessed as part of the construction phase.

8.11.8.9 The effects are thus likely to be of **minor adverse** significance as outlined above which is not significant.

8.11.9 The impact of noise generated during operation and maintenance of the onshore substations

8.11.9.1 The operational noise impacts have been assessed in line with the guidance presented in BS 4142:2014+A1:2019 (British Standards Institution, 2019). The assessment has been undertaken based on the noise emission levels in the upper range for the plant items to be installed.

8.11.9.2 As outlined in **section 8.9.1** and **Table 8.14**, the MDS for the operation and maintenance of the onshore substations is represented by a GIS engineering design for the Morgan onshore substation and AIS engineering design for the Morecambe onshore substation.

8.11.9.3 Three scenarios have been modelled comprising one iteration for each substation operating in isolation with an additional iteration of the model run with both substations operating simultaneously to ensure the combined noise impacts are suitably controlled.

8.11.9.4 A 3D acoustic model has been constructed of the onshore substation sites based on indicative engineering layouts and upper range noise emission levels for the proposed plant items. Full details of the operational noise assessment are presented in Volume 3, Annex 8.3: Operational noise of the ES.

8.11.9.5 At this stage, the design of the Morgan and Morecambe onshore substations are not finalised. During the detailed design phase, noise control measures, where practicable or feasible, will be incorporated to ensure compliance with the operational noise limits to be secured as part of the DCO.

8.11.9.6 In the absence of a detailed design, indicative mitigation measures which may be incorporated as a primary mitigation measure (as part of the design) have been included within the assessment and are set out in **Table 8.31**.

Table 8.31: Indicative noise mitigation measures (Morgan and Morecambe onshore substations

Plant item	Acoustic Mitigation Measure	Insertion Loss (dB)
400/220/33 kV Super Grid Transformer incl. Coolers	Enclosure	20
220 kV Shunt Reactor	Enclosure	20
400 kV Shunt Reactor	Enclosure	20
Dynamic Reactive Power Compensator (SVC) Phase Reactors	Quieter plant/barrier/enclosure	5
2x 33 kV Mechanically Switched Reactors (MSR)	Quieter plant/barrier/enclosure	5
275 kV Filter	Quieter plant/barrier/enclosure	10
400 kV Filter	Quieter plant/barrier/enclosure	10

8.11.9.7 An assessment has been undertaken at:

- residential receptors during the day and night time periods; and
- receptors (e.g. walkers, runners) on nearby footpaths during the daytime.

8.11.9.8 The results of the baseline scenario without mitigation and the scenario with mitigation measures included are provided in Volume 3, Annex 8.3: operational noise of the ES. In summary, without the mitigation measures identified in **paragraph 8.11.9.5** in place, there is the potential for significant adverse effects during the night-time to occur at eight noise sensitive receptors. This is due to the concurrent operation of Morgan and Morecambe onshore substations resulting medium and high impacts at these properties. Implementation of the identified measures has the potential to avoid these significant effects, Further discussion of the mitigated impacts and effects are discussed in **paragraphs 8.11.9.9** to **8.11.9.15**.

Operation of the onshore substations

Sensitivity of receptor

8.11.9.9 The nearest receptor to the Morgan onshore substation is Freshfield Farm, situated approximately 230 m from the permanent substation compound. The nearest residential receptor to the Morecambe onshore substation is Marybank Farm, which is situated approximately 240 m from the permanent substation compound.

8.11.9.10 The sensitivity of residential receptors is considered to be **medium** during the daytime and **high** at night.

8.11.9.11 The Quaker Wood Stables is a location used for horse riding as a recreational activity receptor and is considered to be **medium** sensitivity during the daytime. This receptor is located approximately 170 m from Morecambe onshore substation.

8.11.9.12 Recreational receptors on the PRoW, located at approximately 30 m from Morecambe onshore substation at their closest point, are considered to be of **low** sensitivity since receptors are transient and thus are likely to be exposed to noise for a short duration, as outlined above in **Table 8.15**.

Magnitude of impact

8.11.9.13 The results of the operational noise impact assessment during the night-time (where background sound levels are lower) on residential receptors with indicative mitigation measures included are presented in **Table 8.32** and **Table 8.33** below for Morgan and Morecambe onshore substations, respectively. The results associated with the combined operation of the substations is presented in **Table 8.34**. These mitigation measures will be detailed within the Operational Noise Management Plan(s) as outlined in **Table 8.13** above (CoT80 as secured by Requirement 18 of the DCO).

8.11.9.14 The assessment of operational noise impacts at Quaker Wood Stables has been undertaken based upon daytime levels since this is when horses are

likely to be situated externally and most exposed to operational noise from the onshore substations.

8.11.9.15 The noise emission spectra of the super grid transformers and shunt reactors have tonal components at low frequency (100 Hz 1/3-octave band). The unmitigated assessment of operational noise levels includes tonality corrections, as outlined in Volume 3, Annex 8.3: Operational noise of the ES. However, the mitigated rating levels detailed below do not include a correction for acoustic character since the tonal components are reduced via the implementation of mitigation measures.

Table 8.32: Operational noise impacts due to the Morgan onshore substation

Receptor	Distance to Substation Compound (m)	Background Sound Level, $L_{A90,T}$ (dB)	Specific Sound Level, $L_{Aeq,T}$ (dB)	Acoustic Character Correction (dB)	Rating Level, $L_{Ar,T}$ (dB)	Difference Δ Between Rating Level and Background Sound Level (dB)	Magnitude of Impact
2-8 Eland Way, Freckleton (NE Facade)	605	31	28	0	28	-3	**Negligible**
8 Greenfield Lane, Newton With Clifton (NW Facade)	842	31	25	0	25	-6	**Negligible**
8 Greenfield Lane, Newton With Clifton (SW Facade)	842	31	25	0	25	-6	**Negligible**
21 Manor Drive, Kirkham (South Facade)	529	37	28	0	28	-9	**Negligible**
Bibby's Barn, Grange Lane (South Facade)	864	31	17	0	17	-14	**Negligible**
Bibby's Barn, Grange Lane (West Facade)	864	31	24	0	24	-7	**Negligible**
Chestnut Tree Barn, Lower Lane (NE Facade)	624	31	28	0	28	-3	**Negligible**
Chestnut Tree Barn, Lower Lane (SE Facade)	624	31	28	0	28	-3	**Negligible**
Church Farm, Blackpool Road (SW Facade)	576	37	27	0	27	-10	**Negligible**
Dowbridge Farm (SE Facade)	596	37	26	0	26	-11	**Negligible**
Dowbridge Farm (SW Facade)	596	37	26	0	26	-11	**Negligible**
Freshfield Farm (SE Facade)	233	30	34	0	34	4	**Low**
Freshfield Farm (SW Facade)	233	30	31	0	31	1	**Low**
Greenbank View, Lower Lane (NE Facade)	650	31	28	0	28	-3	**Negligible**

Receptor	Distance to Substation Compound (m)	Background Sound Level, $L_{A90,T}$ (dB)	Specific Sound Level, $L_{Aeq,T}$ (dB)	Acoustic Character Correction (dB)	Rating Level, $L_{Ar,T}$ (dB)	Difference Δ Between Rating Level and Background Sound Level (dB)	Magnitude of Impact
Marybank Farm, Lower Lane (East Facade)	241	32	22	0	22	-10	**Negligible**
Marybank Farm, Lower Lane (North Facade)	241	32	23	0	23	-9	**Negligible**
Mayfield, Blackpool Road (SW Facade)	639	37	27	0	27	-10	**Negligible**
Pathways, Blackpool Road (West Facade)	583	37	26	0	26	-11	**Negligible**
Quaker Wood Stables	474	39	25	0	25	-14	**Negligible**
Sunfield, Freckleton Road (East Facade)	687	30	26	0	26	-4	**Negligible**
Sunfield, Freckleton Road (South Facade)	687	30	26	0	26	-4	**Negligible**
Swinza Butts, Lower Lane (NE Facade)	469	31	29	0	29	-2	**Negligible**
Swinza Butts, Lower Lane (NW Facade)	469	31	29	0	29	-2	**Negligible**
Swinza Butts, Lower Lane (SE Facade)	469	31	24	0	24	-7	**Negligible**
Wyfold, Lower Lane (NE Facade)	460	31	30	0	30	-1	**Negligible**
Wyfold, Lower Lane (SE Facade)	460	31	29	0	29	-2	**Negligible**

Table 8.33: Operational noise impacts due to the Morecambe onshore substation

Receptor	Distance to Substation Compound (m)	Background Sound Level, $L_{A90,T}$ (dB)	Specific Sound Level, $L_{Aeq,T}$ (dB)	Acoustic Character Correction (dB)	Rating Level, $L_{Ar,T}$ (dB)	Difference Δ Between Rating Level and Background Sound Level (dB)	Magnitude of Impact
2-8 Eland Way, Freckleton (NE Facade)	909	31	25	0	25	-6	**Negligible**
Greenfield Caravan Park (North Facade)	933	32	26	0	26	-6	**Negligible**
Greenfield Caravan Park (West Facade)	933	32	26	0	26	-6	**Negligible**
4 Carter Croft, Freckleton (NE Facade)	776	32	27	0	27	-5	**Negligible**
Bibby's Barn, Grange Lane (South Facade)	876	31	27	0	27	-4	**Negligible**
Bibby's Barn, Grange Lane (West Facade)	876	31	27	0	27	-4	**Negligible**
Marsh View Farm, Lower Lane (North Facade)	244	32	30	0	30	-2	**Negligible**
Marybank Farm, Lower Lane (East Facade)	241	32	35	0	35	3	**Low**
Marybank Farm, Lower Lane (North Facade)	241	32	35	0	35	3	**Low**
Quaker Wood Stables	140	39	37	0	37	-2	**Negligible**
Swinza Butts, Lower Lane (NE Facade)	588	31	29	0	29	-2	**Negligible**
Swinza Butts, Lower Lane (NW Facade)	588	31	21	0	21	-10	**Negligible**
Swinza Butts, Lower Lane (SE Facade)	588	31	29	0	29	-2	**Negligible**
Wyfold, Lower Lane (NE Facade)	626	31	28	0	28	-3	**Negligible**
Wyfold, Lower Lane (SE Facade)	626	31	28	0	28	-3	**Negligible**

Table 8.34: Operational noise impacts due to Morgan and Morecambe onshore substations operating concurrently

Receptor	Distance to Nearest Substation Compound (m)	Background Sound Level, $L_{A90,T}$ (dB)	Specific Sound Level, $L_{Aeq,T}$ (dB)	Acoustic Character Correction (dB)	Rating Level, $L_{Ar,T}$ (dB)	Difference Δ Between Rating Level and Background Sound Level (dB)	Magnitude of Impact
2-8 Eland Way, Freckleton (North East Facade)	605	31	30	0	30	-1	**Negligible**
2 The Crescent, Greenfield Caravan Park (North Facade)	842	32	27	0	27	-5	**Negligible**
2 The Crescent, Greenfield Caravan Park (West Facade)	842	32	27	0	27	-5	**Negligible**
4 Carter Croft, Freckleton (North East Facade)	776	32	28	0	28	-4	**Negligible**
8 Greenfield Lane, Newton With Clifton (North West Facade)	842	31	28	0	28	-3	**Negligible**
8 Greenfield Lane, Newton With Clifton (South West Facade)	842	31	28	0	28	-3	**Negligible**
21 Manor Drive, Kirkham (South Facade)	529	37	28	0	28	-9	**Negligible**
Bibby's Barn, Grange Lane (South Facade)	864	31	27	0	27	-4	**Negligible**
Bibby's Barn, Grange Lane (West Facade)	864	31	29	0	29	-2	**Negligible**
Chestnut Tree Barn, Lower Lane (North East Facade)	624	31	29	0	29	-2	**Negligible**
Chestnut Tree Barn, Lower Lane (South East Facade)	624	31	30	0	30	-1	**Negligible**

Receptor	Distance to Nearest Substation Compound (m)	Background Sound Level, $L_{A90,T}$ (dB)	Specific Sound Level, $L_{Aeq,T}$ (dB)	Acoustic Character Correction (dB)	Rating Level, $L_{Ar,T}$ (dB)	Difference Δ Between Rating Level and Background Sound Level (dB)	Magnitude of Impact
Church Farm, Blackpool Road (South West Facade)	576	37	29	0	29	-8	**Negligible**
Dowbridge Farm (SE Facade)	596	37	27	0	27	-10	**Negligible**
Dowbridge Farm (SW Facade)	596	37	28	0	28	-9	**Negligible**
Freshfield Farm (SE Facade)	233	30	34	0	34	4	**Low**
Freshfield Farm (SW Facade)	233	30	32	0	32	2	**Low**
Greenbank View, Lower Lane (North East Facade)	650	31	29	0	29	-2	**Negligible**
Marsh View Farm, Lower Lane (North Facade)	244	32	31	0	31	-1	**Negligible**
Marybank Farm, Lower Lane (East Facade)	241	32	35	0	35	3	**Low**
Marybank Farm, Lower Lane (North Facade)	241	32	35	0	35	3	**Low**
Mayfield, Blackpool Road (South West Facade)	639	37	28	0	28	-9	**Negligible**
Pathways, Blackpool Road (West Facade)	583	37	28	0	28	-9	**Negligible**
Quaker Wood Stables	140	39	38	0	29	-1	**Negligible**
Sunfield, Freckleton Road (East Facade)	687	30	28	0	27	-2	**Negligible**
Sunfield, Freckleton Road (South Facade)	687	30	28	0	28	-2	**Negligible**

Receptor	Distance to Nearest Substation Compound (m)	Background Sound Level, $L_{A90,T}$ (dB)	Specific Sound Level, $L_{Aeq,T}$ (dB)	Acoustic Character Correction (dB)	Rating Level, $L_{Ar,T}$ (dB)	Difference Δ Between Rating Level and Background Sound Level (dB)	Magnitude of Impact
Swinza Butts, Lower Lane (North East Facade)	469	31	32	0	32	1	**Low**
Swinza Butts, Lower Lane (North West Facade)	469	31	30	0	30	-1	**Negligible**
Swinza Butts, Lower Lane (South East Facade)	469	31	31	0	31	0	**Low**
Wyfold, Lower Lane (North East)	460	31	32	0	32	1	**Low**
Wyfold, Lower Lane (South East)	460	31	32	0	32	1	**Low**

8.11.9.16 The assessment of noise impacts at receptors on the PRoW situated to the west of the Morgan onshore substation has been informed by the baseline sound survey data from the short-term measurements as outlined in Volume 3, Annex 8.1: Baseline sound survey of the ES.

8.11.9.17 The highest tranquillity score derived using the methodology outlined in **section 8.10.3** was 6 corresponding to 'fairly tranquil'.

8.11.9.18 The rating level has then been predicted at the receptor points on the PRoW using 3D acoustic modelling. The modelling has been undertaken with both substations operating concurrently with mitigation measures in place representing the maximum design scenario.

8.11.9.19 The results of the assessment of natural tranquillity on the footpath adjacent to the Morgan onshore substation are presented in **Table 8.35** below.

Table 8.35: Operational noise assessment at recreational receptors

Location	Tranquillity Score	Rating Level, $L_{Ar,T}$ (dB)	Magnitude of Impact
Footpath to the west of the Morgan onshore substation	6	41	Negligible

Significance of effect

8.11.9.20 The final design will incorporate noise control measures necessary to ensure that the operational noise criteria secured as a requirement of the DCO, as referenced under CoT80 in **Table 8.13**, are achieved at all receptors. Such may include positioning plant items with higher noise emission levels away from receptors and/or within sound insulated buildings, selecting low-noise plant options where available, and mitigation measures such as acoustic enclosures or barriers.

8.11.9.21 The indicative mitigation measures described in **Table 8.31** adopted as part of the assessment have been obtained based on realistic measures adopted from similar schemes. The shunt reactors have been assumed to be enclosed within an acoustic enclosure that can achieve a noise reduction of 20 dB in the 100 Hz 1/3-octave frequency band. The attenuation at higher frequencies will be greater since the low frequency components of the noise are more difficult to attenuate. However, a 20 dB reduction across all frequency bands has been assumed as a conservative approach.

8.11.9.22 The unmitigated source noise levels are based upon the upper range sound power levels associated with the proposed plant strategies for the onshore substations. The reductions required for each plant item (see Volume 3, Annex 8.3: Operational noise of the ES) will be included during the substation design process to ensure compliance with the operational noise limits to be secured as a requirement of the DCO.

8.11.9.23 Based on the above, the overall sensitivity of residential receptors is **high** and the magnitude of the impact is **low**. The effect is therefore predicted to be of **minor adverse** significance which is not significant.

8.11.9.24 The overall sensitivity of Quaker Wood Stables is **medium** and the magnitude of impact is **negligible**. As such, the effect is predicted to be of **minor adverse** significance which is not significant.

8.11.9.25 Recreational receptors are likely to be transient in nature and thus any impacts which may arise along the PRoWs passing both the Morgan and Morecambe onshore substations will be short-term in duration. As such, overall the sensitivity of these receptors is **low** and the magnitude of impact will be **negligible.** The effect is therefore predicted to be of **negligible or minor adverse** significance which is not significant.

Substation maintenance

Magnitude of Impact

8.11.9.26 The onshore substations will typically be unmanned, and the onshore infrastructure monitored remotely.

8.11.9.27 Operations and maintenance staff will attend site to undertake mainly non-intrusive inspections of the equipment during daytime hours and infrequent works to remedy any potential defects noted.

8.11.9.28 The personnel will be trained appropriately on the potential health hazards of excessive noise to ensure that impacts are minimised during any works required. Example measures include the use of quieter equipment and undertaking works away from receptors where possible.

Sensitivity of the receptor

8.11.9.29 Maintenance works will be undertaken during the daytime and thus residential receptors are considered to be of **medium** sensitivity.

8.11.9.30 Quaker Wood Stables is a location used for horse riding as a recreational activity receptor and is considered to be **medium** sensitivity during the daytime.

Significance of effect

8.11.9.31 Based on the above, the sensitivity of the residential receptors is **medium** and the magnitude of impact is predicted to be **low**. The effect will therefore be of **minor adverse** significance which is not significant.

8.11.9.32 The sensitivity of Quaker Wood Stables during the daytime is **medium** and the magnitude of impact is **low**. Since the major noise generating maintenance works will be infrequent and BPM adopted when undertaking them, the overall effect is likely to be of **minor adverse** significance which is not significant.

8.12 Cumulative effect assessment methodology

8.12.1 Introduction

8.12.1.1 The Cumulative Effects Assessment (CEA) takes into account the impact associated with the Transmission Assets together with other projects and plans. The projects and plans selected as relevant to the CEA presented within this chapter are based upon the results of a screening exercise (see Volume 1, Annex 5.5: Cumulative screening matrix and location plan of the ES). Each project has been considered on a case-by-case basis for screening in or out of this chapter's assessment based upon data confidence, effect-receptor pathways and the spatial/temporal scales involved.

8.12.1.2 The noise and vibration CEA methodology has followed the methodology set out in Volume 1, Chapter 5: Environmental assessment methodology of the ES. As part of the assessment, all projects and plans considered alongside the Transmission Assets have been allocated into 'tiers' reflecting their current stage within the planning and development process.

- Tier 1.
  - Under construction.
  - Permitted application.
  - Submitted application.
  - Those currently operational that were not operational when baseline data were collected, and/or those that are operational but have an ongoing impact.
- Tier 2.
  - Scoping report has been submitted.
- Tier 3.
  - Scoping report has not been submitted.
  - Identified in the relevant Development Plan.
  - Identified in other plans and programmes.

8.12.1.3 This assessment is followed by all other relevant projects, identified by tier.

8.12.1.4 The Tier 1 assessment considers the Transmission Assets alongside those projects defined within Tier 1, unless otherwise stated. The Tier 2 assessment includes the Transmission Assets, the Generation Assets, Tier 1 and other Tier 2 projects unless otherwise stated. The Tier 3 assessment is based upon less definitive parameters due to the limited nature of the information available for projects of this Tier and is subject to qualitative assessment cumulatively with the Transmission Assets only.

8.12.1.5 This tiered approach is adopted to provide a clear assessment of the Transmission Assets alongside other projects, plans and activities.

8.12.1.6 Construction noise is variable in nature. As such, the cumulative effects of construction noise are generally no greater than those that arise for individual works since, most commonly, one construction project dominates the noise

climate at a given receptor. The cumulative effect is thus likely to be equivalent to that for the construction activity with higher noise emission levels in isolation. As an example, two identical and concurrent construction projects in close proximity which use the same methods and equipment will result in a maximum increase in noise level at the nearest receptors of 3 dB (corresponding to a doubling in sound pressure level). This is unlikely to be the case and, for most proposed developments, receptors are unlikely to be subjected to significant adverse cumulative effects above those identified for individual construction projects.

8.12.1.7 The specific projects, plans and activities scoped into the CEA, are outlined in **Table 8.36** and their locations are shown on Figure 8.5. A short-list of proposed projects, plans, and activities has been produced from a long list based on a search area of 300 m for construction noise and 1 km for operational noise. Developments included within the CEA have been selected from the short list based upon the size and scale of the development and the relative proximity to the Transmission Assets.

Table 8.36 List of other projects, plans and activities considered within the CE

Project/plan	Status	Distance from the Transmission Assets (nearest point, km)	Description of project/plan	Dates of construction (if applicable)	Dates of operation (if applicable)	Overlap with the Transmission Assets
Tier 1						
06/2022/1177	Permitted	0.28	Reserved matters application (namely appearance, landscaping, layout and scale) for 280no. dwellings, with associated infrastructure and open space, pursuant to outline permission 06/2018/0885	Not provided but assumed to overlap with the Morgan and Morecambe Offshore Wind Farms: Transmission Assets	Not provided but assumed to overlap with the Morgan and Morecambe Offshore Wind Farms: Transmission Assets	Construction – Yes. Operation – Yes.
07/2018/3907/SCE	Pending	0.05	Gas fired electricity generating facility (GFEGF)	Not provided but assumed to overlap with the Morgan and Morecambe Offshore Wind Farms: Transmission Assets	Not provided but assumed to overlap with the Morgan and Morecambe Offshore Wind Farms: Transmission Assets	Construction – Yes. Operation – Yes.
20/0365	Permitted	Within Transmission Assets Order Limits	Erection of 2, two storey buildings for use as light industrial/storage and offices within Use Class B8 and E g) with associated parking, landscaping and access (Outline application for access, landscaping, layout and scale).	Not provided but assumed to overlap with the Morgan and Morecambe Offshore Wind Farms: Transmission Assets	Not provided but assumed to overlap with the Morgan and Morecambe Offshore Wind Farms: Transmission Assets	Construction – Yes. Operation – Yes.
06/2023/0245	Permitted	0.02	Erection of dry ski slope and mountain bike track, creation of leisure lake and siting of up to 13 lodges to be occupied by young people in the services of	Not provided but assumed to overlap with the Morgan and Morecambe Offshore	Not provided but assumed to overlap with the Morgan and Morecambe Offshore Wind	Construction – Yes. Operation – Yes.

Project/plan	Status	Distance from the Transmission Assets (nearest point, km)	Description of project/plan	Dates of construction (if applicable)	Dates of operation (if applicable)	Overlap with the Transmission Assets
			Pioneer Tec together with associated development.	Wind Farms: Transmission Assets	Farms: Transmission Assets	
23/0739	Pending	0.12	Scoping opinion in respect of a 49.9 MW solar farm	Not provided but assumed to overlap with the Morgan and Morecambe Offshore Wind Farms: Transmission Assets	Not provided but assumed to overlap with the Morgan and Morecambe Offshore Wind Farms: Transmission Assets	Construction – Yes. Operation – Yes.
23/0589	Pending	Within Transmission Assets Order Limits	Hybrid planning application relating enterprise zone development consisting of full application for the construction of new access roads, existing highways improvement works and drainage works; and outline planning application for the construction of 5 no. hangars, a commercial unit (class B2/E(G)) and car parking, alongside associated infrastructure works with access applied for all other matters reserved.	Not provided but assumed to overlap with the Morgan and Morecambe Offshore Wind Farms: Transmission Assets	Not provided but assumed to overlap with the Morgan and Morecambe Offshore Wind Farms: Transmission Assets	Construction – Yes. Operation – Yes.
23/0634	Pending	Within Transmission Assets Order Limits	Hybrid planning application comprising: (a) Full application for the construction of new access roads, existing highways improvement works, and drainage works. (b) Outline planning application for the erection of 5 no. hangars, a commercial unit (Use Class B2 or Eg) and car	Not provided but assumed to overlap with the Morgan and Morecambe Offshore Wind Farms: Transmission Assets	Not provided but assumed to overlap with the Morgan and Morecambe Offshore Wind Farms: Transmission Assets	Construction – Yes. Operation – Yes.

Project/plan	Status	Distance from the Transmission Assets (nearest point, km)	Description of project/plan	Dates of construction (if applicable)	Dates of operation (if applicable)	Overlap with the Transmission Assets
			parking, alongside associated infrastructure works.			
22/0204	Scoping Opinion Issued	Within Transmission Assets Order Limits	Request for screening opinion pursuant to the Town and Country Planning (Environmental Impact Assessment) Regulations) 2017 in respect of a 25 MW solar farm, battery energy storage scheme and associated development.	Not provided but assumed to overlap with the Morgan and Morecambe Offshore Wind Farms: Transmission Assets	Not provided but assumed to overlap with the Morgan and Morecambe Offshore Wind Farms: Transmission Assets	Construction – Yes. Operation – Yes.

8.12.2 Scope of cumulative effects assessment

8.12.2.1 The impacts identified in **Table 8.37** have been selected as those having the potential to result in the greatest cumulative effect on an identified receptor or receptor group. The cumulative effects presented and assessed in this section have been based on the Project Design Envelope set out in Volume 1, Chapter 3: Project description of the ES as well as the publicly available information available on other projects and plans.

Table 8.37: Scope of assessment of cumulative effects

Cumulative effect	Phase[a]			Project(s) considered	Justification
	C	O	D		
The impact of noise and vibration generated by construction and decommissioning activities for the Transmission Assets on human receptors.	✓	×	✓	Maximum design scenario as described for the Transmission Assets (**Table 8.14**) assessed cumulatively with the following other projects/plans. **Tier 1** • 06/2022/1177 – Construction will be undertaken concurrently with the Transmission Assets. • 07/2018/3907/SCE: – Construction and decommissioning will be undertaken concurrently with the Transmission Assets. • 22/0365 – Construction will be undertaken concurrently with the Transmission Assets. • 06/2023/0245 – Construction will be undertaken concurrently with the Transmission Assets. • 23/0739 – Construction and decommissioning will be undertaken concurrently with the Transmission Assets.	• Outcome of the CEA will be greatest when the greatest number of other schemes are considered. • The CEA is receptor-led. • The onshore cable corridor associated with each development is the one routed closest to common receptors. • Concurrent construction represents the MDS in this case.

Cumulative effect	Phase[a]			Project(s) considered	Justification
	C	O	D		
				• 23/0589 – Construction will be undertaken concurrently with the Transmission Assets. • 23/0634 – Construction will be undertaken concurrently with the Transmission Assets. • 22/0204 – Construction and decommissioning will be undertaken concurrently with the Transmission Assets.	
The impact of noise generated during operation and maintenance of the onshore substations	×	✓	×	• 22/0204 – The site will operate concurrently with the Morgan and Morecambe onshore substations.	• Outcome of the CEA will be greatest when the greatest number of other schemes are considered. • The CEA is receptor-led.

8.13 Cumulative effects

8.13.1 Introduction

8.13.1.1 A description of the significance of cumulative effects upon noise and vibration receptors arising from each identified impact is given below.

8.13.2 The impact of noise and vibration generated by construction and decommissioning activities

Construction phase

Sensitivity of the receptor

8.13.2.1 Most of the receptors are residential in nature, however, there are a number of residential institutions and assisted living facilities in the area surrounding the Transmission Assets near landfall. As such, sensitivity of these receptors is therefore considered to be **high** during the day and **very high** during the night-time.

8.13.2.2 Receptors along the onshore cable corridor are residential in nature and construction activities are likely to only be undertaken during the daytime. As such, these receptors are deemed to be of **medium** sensitivity.

Magnitude of impact

8.13.2.3 The proposed tier 1 developments identified in **Table 8.36,** do not contain any specific information pertinent to the construction techniques or plant items adopted for construction in their planning applications. Therefore, at this stage it is not possible to quantitatively assess the potential for cumulative impacts.

8.13.2.4 Many of the proposed developments are residential in nature and thus are unlikely to require evening or night-time construction works. As such, the CEA has been undertaken on the basis of daytime construction only.

8.13.2.5 Cumulative construction noise and vibration impacts may occur if the construction programmes for the Transmission Assets and the proposed cumulative developments overlap and noise and vibration generating activities occur concurrently. For significant cumulative effects to occur, any cumulative impacts must occur for a period of either 10 or more days in any 15 consecutive days or a total number of days exceeding 40 in any 6 consecutive months, as discussed in **paragraph 8.10.3.7**.

8.13.2.6 The Transmission Assets and the proposed developments will be constructed in accordance with a CoCP (or similar), and BPM will be used to avoid and minimise significant adverse effects due to noise and vibration. Also, construction noise levels associated with the construction of the Transmission Assets are predominantly negligible to low. As a result, the likelihood of the generating cumulative construction noise levels close to or exceeding SOAEL for any period of time, and resulting any cumulative significant effects is considered unlikely.

8.13.2.7 The cumulative impact is predicted to be of local spatial extent and short-term duration and the magnitude is **low**.

Significance of effect

8.13.2.8 Many of the proposed developments are residential in nature and thus are unlikely to require evening or night-time construction works. As such, the CEA has been undertaken on the basis of daytime construction only.

8.13.2.9 Overall, the sensitivity of the receptor is considered to be **high** and the magnitude of the cumulative impact is considered at this stage to be **low**. The effect will, therefore, be of **minor adverse** significance.

8.13.2.10 Many of the decision notices for the proposed developments contain conditions relating to the need to control construction noise and vibration via the implementation of a CoCP (or similar). As such, the overall cumulative effect is expected to be of **minor adverse** significance which is not significant.

Operation and maintenance phase

Sensitivity of receptor

8.13.2.11 The nearest common receptor to development 22/0204 is Bibby's Barn, Grange Lane. The proposed development is a 25 MW solar farm which will comprise noise emitting plant items such as solar PV inverters, medium voltage transformers, and high voltage transformers for distribution of energy to the grid. The solar PV inverters are likely to operate during daytime hours only. However, it is likely that any high-voltage transformers included in the proposed development will operate 24/7.

8.13.2.12 As such, the receptors are deemed to be of **medium** and **high** sensitivity.

Magnitude of impact

8.13.2.13 The representative background sound level at Bibby's Barn during the night-time is 31 dB $L_{A90,15min}$. Assuming that the solar farm will be designed to an operational noise limit equivalent to that proposed for the Transmission Assets, a rating level of 35 dB $L_{Ar,T}$ has been assumed at Bibby's Barn as the maximum operational noise level due to the solar farm at this receptor. This is equivalent to a difference between the rating level and the representative background sound level of +4 dB.

8.13.2.14 The results of the assessment of cumulative impacts are presented in **Table 8.38** below.

Table 8.38: Operational noise levels at Bibby's Barn.

Receptor	Noise Level, $L_{Aeq,T}$ (dB)		Cumulative Noise Level (dB)
	Transmission Assets	Proposed Development 22/0204	
Bibby's Barn	27	35	36

8.13.2.15 The cumulative operation of both developments is predicted to result in a **medium** impact overall at the nearest receptors.

Significance of effect

8.13.2.16 The medium impact predicted results in a moderate or major adverse significance at Bibby's Barn and, thereby, a potential significant cumulative effect is likely.

8.13.2.17 However, as discussed in **paragraph 8.13.2.11**, the high-voltage transformers are likely to be the only sources operational during the night-time, if included. As such, the total operational noise level from the site is likely to be significantly less than that assumed in **Table 8.38**.

8.13.2.18 Based on the above, the receptors are likely to be of **high** sensitivity, the magnitude of impact is predicted to be **low** and the effect will be of **minor or moderate adverse** significance. However, only a small portion of the site is likely to be operational during the night-time, this being the area where high-voltage transformers, if included, will be located. Therefore, the overall cumulative effect will be of **minor adverse** significance which is not significant.

Decommissioning phase

8.13.2.19 The onshore export cable and 400 kV grid connection cable will either remain *in situ* or be removed from link boxes and joint bays. No new trenching or drilling is anticipated. Link boxes remain *in situ*.

8.13.2.20 Decommissioning is likely to operate within the parameters identified for construction. As such, construction activities will be limited to within the construction working areas and require a duration no greater than the activities assessed as part of the construction phases for the Transmission Assets and any of the proposed developments.

8.13.2.21 Overall, the sensitivity of the receptors is **high** and the magnitude of the impact is **low**. The effect will, therefore, be of **minor adverse** significance, which is not significant in EIA terms.

8.14 Transboundary effects

8.14.1.1 A screening of transboundary impacts has been carried out and has identified that there was no potential for significant transboundary effects with regard to noise and vibration from the Transmission Assets upon the interests of other states. The potential transboundary impacts assessed within Volume 1, Annex 5.4: Transboundary screening of the ES.

8.14.1.2 No significant transboundary effects upon the interests of other European economic area states with regards to noise and vibration have been identified.

8.15 Inter-related effects

8.15.1.1 Inter-relationships are the impacts and associated effects of different aspects of the Transmission Assets on the same receptor. These are as follows.

- Project lifetime effects: Assessment of the scope for effects that occur throughout more than one phase of the Transmission Assets (construction, operation and maintenance, and decommissioning), to interact to potentially create a more significant effect on a receptor group than if just one phase were assessed in isolation.
- Receptor led effects: Assessment of the scope for all relevant effects across multiple topics to interact, spatially and temporally, to create inter-related effects on a receptor.

8.15.1.2 The assessment of inter-related effects between noise and vibration and ecology, human health, and historic environment can be found in the following chapters:

- Volume 3, Chapter 3: Onshore ecology and nature conservation of the ES;
- Volume 3, Chapter 4: Onshore and intertidal ornithology of the ES;
- Volume 1, Annex 5.1: Human health of the ES; and
- Volume 3, Chapter 5: Historic environment of the ES.

8.15.1.3 A description of the likely inter-related effects arising from the Transmission Assets on noise and vibration is provided in Volume 4, Chapter 3: Inter-relationships of the ES.

8.16 Summary of impacts, mitigation measures and monitoring

8.16.1.1 Information on noise and vibration within the study area was collected through desktop reviews of the onshore infrastructure area, consultation with the relevant local authorities and PINS, and baseline sound surveys.

8.16.1.2 **Table 8.39** presents a summary of the impacts, measures adopted as part of the Transmission Assets and residual effects in respect to noise and vibration. The impacts assessed include:

- the impact of noise and vibration generated by construction and decommissioning activities for the Transmission Assets on human receptors;
- the impact of noise generated by additional vehicle movements on the local highway network during the construction and decommissioning phase for the Transmission Assets on human receptors; and
- the impact of noise generated during operation and maintenance of the onshore substations on human receptors.

8.16.1.3 Overall, in the absence of further mitigation, it is concluded that there will likely be no significant effects arising from the Transmission Assets during the construction, operation and maintenance or decommissioning phases

8.16.1.4 There are unlikely to be any significant residual effects once mitigation is applied.

8.16.1.5 **Table 8.40** presents a summary of the potential cumulative impacts, mitigation measures and residual effects. The cumulative impacts assessed include:

- the impact of noise and vibration generated by construction and decommissioning activities for the Transmission Assets on human receptors; and
- the impact of noise generated during operation and maintenance of the onshore substations.

8.16.1.6 Overall, it is concluded that there will be no significant cumulative effects from the Transmission Assets alongside other projects/plans.

8.16.1.7 The inter-related effects of noise and vibration with human health are considered in Volume 1, Annex 5.1: Human health of the ES.

8.16.1.8 The inter-related effects of noise and vibration with historic environment are considered in Volume 3, Chapter 5: Historic environment of the ES.

8.16.1.9 The inter-related effects noise and vibration with ecology are considered in Volume 3, Chapter 3: Onshore ecology and nature conservation of the ES and Volume 3, Chapter 4: Onshore and intertidal ornithology of the ES.

8.16.1.10 No potential transboundary impacts have been identified in regard to effects of the Transmission Assets.

Table 8.39: Summary of environmental effects, mitigation and monitoring

Description of impact	Phase[a]			Commitment number	Magnitude of impact	Sensitivity of the receptor	Significance of effect	Further mitigation	Residual effect	Proposed monitoring
	C	O	D							
Noise impacts due to the onshore export cables at landfall (excluding trenchless techniques)	✓	×	✓	CoT18 CoT34 CoT35 CoT36 CoT79	**Residential (dwellings)** C: Up to Low D: Low **Residential (care home)** C: Negligible D: Negligible **Commercial** C: Negligible D: Negligible	**Residential (dwellings)** C: Medium D: Medium **Residential (care home)** C: High D: High **Commercial** C: Low D: Low	**Residential (dwellings)** C: Up to minor adverse D: Minor adverse **Residential (care home)** C: Minor adverse D: Minor adverse **Commercial** C: Negligible D: Negligible	None proposed beyond existing commitments.	**Residential (dwellings)** C: Minor adverse D: Minor adverse **Residential (care home)** C: Minor adverse D: Minor adverse **Commercial** C: Negligible D: Negligible	A noise and vibration monitoring strategy may be agreed upon with the relevant stakeholders to ensure compliance with the agreed noise and vibration threshold values, if and where required.
Noise impacts due to the onshore export cables at landfall (trenchless techniques)	✓	×	✓	CoT18 CoT34 CoT35 CoT36 CoT79	**Residential (dwellings)** C: Negligible to low D: Low	**Residential (dwellings)** C: High (at night), medium (day time) D: Medium	**Residential (dwellings)** C: Negligible to minor adverse D: Minor adverse	None proposed beyond existing commitments.	**Residential (dwellings)** C: Minor adverse D: Minor adverse	A noise and vibration monitoring strategy may be agreed upon with the relevant stakeholders to ensure compliance with the agreed noise and vibration threshold values,

Description of impact	Phase[a]			Commitment number	Magnitude of impact	Sensitivity of the receptor	Significance of effect	Further mitigation	Residual effect	Proposed monitoring
	C	O	D							
										if and where required.
Noise impacts due to the onshore construction and decommissioning landward of the transition joint bay (open-cut construction techniques)	✓	×	✓	CoT18 CoT35 CoT36	**Residential (dwellings)** C: Medium D: Low **Commercial (equestrian centre)** C: Medium D: Low **Medical (veterinary practice)** C: Medium D: Low	**Residential (dwellings)** C: Medium D: Medium **Commercial (equestrian centre)** C: Medium D: Medium **Medical (veterinary practice)** C: Medium D: Medium	**Residential (dwellings)** C: Moderate adverse D: Minor adverse **Commercial (equestrian centre)** C: Moderate adverse D: Minor adverse **Medical (veterinary practice)** C: Moderate adverse D: Minor adverse	CoT79 to be developed to provide details of location-specific mitigation	**Residential (dwellings)** C: Minor adverse D: Minor adverse **Commercial (equestrian centre)** C: Minor adverse D: Minor adverse **Medical (veterinary practice)** C: Moderate adverse D: Minor adverse	A noise and vibration monitoring strategy may be agreed upon with the relevant stakeholders to ensure compliance with the agreed noise and vibration threshold values, if and where required.
Noise impacts due to the onshore construction and decommissioning landward of the transition joint bay (HDD or other trenchless techniques)	✓	×	✓	CoT18 CoT34 CoT35 CoT36 CoT79	**Residential (dwellings)** C: Negligible to Low D: Low **Commercial (equestrian centre)**	**Residential (dwellings)** C: Medium D: Medium **Commercial (equestrian centre)**	**Residential (dwellings)** C: Negligible to minor adverse D: Minor adverse	None proposed beyond existing commitments.	C: Minor adverse D: Minor adverse	N/A

Description of impact	Phase[a]			Commitment number	Magnitude of impact	Sensitivity of the receptor	Significance of effect	Further mitigation	Residual effect	Proposed monitoring
	C	O	D							
					C: Negligible D: Negligible **Medical (veterinary practice)** C: Negligible D: Negligible	C: Medium D: Medium **Medical (veterinary practice)** C: Medium D: Medium	**Commercial (equestrian centre)** C: Minor adverse D: Minor adverse **Medical (veterinary practice)** C: Minor adverse D: Minor adverse			
Noise impacts due to the construction and decommissioning of the onshore substations	✓	×	✓	CoT18 CoT35 CoT36	**Residential (dwellings)** C: Low (day time) C: Negligible (night time) D: Low **Commercial (equestrian centre)** C: Medium D: Medium	**Residential (dwellings)** C: Medium (daytime) C: Hight (night time) D: Medium **Commercial (equestrian centre)** C: Medium D: Medium	**Residential (dwellings)** C: Minor adverse D: Minor adverse **Commercial (equestrian centre)** C: Moderate adverse D: Moderate adverse	Application of additional Best Practicable Means measures within Construction Noise and Vibration management Plan to minimise construction noise from onshore substation construction	**Residential (dwellings)** C: Minor adverse D: Minor adverse **Commercial (equestrian centre)** C: Minor adverse D: Minor adverse	A noise and vibration monitoring strategy may be agreed upon with the relevant stakeholders to ensure compliance with the agreed noise and vibration threshold values, if and where required.

Description of impact	Phase[a]			Commitment number	Magnitude of impact	Sensitivity of the receptor	Significance of effect	Further mitigation	Residual effect	Proposed monitoring
	C	O	D							
Vibration impacts due to the construction of the Transmission Assets.	✓	×	×	CoT18 CoT35 CoT36	**Residential (dwellings)** C: Low	**Residential (dwellings)** C: Medium	**Residential (dwellings)** C: Minor adverse	None proposed beyond existing commitments.	**Residential (dwellings)** C: Minor adverse	A noise and vibration monitoring strategy may be agreed upon with the relevant stakeholders to ensure compliance with the agreed noise and vibration threshold values, if and where required.
The impact of noise generated by additional vehicle movements on the local highway network during the construction and decommissioning phase for the Transmission Assets on human receptors	✓	×	✓	CoT18 CoT35 CoT38	**Residential (dwellings)** C: Low D: Low	**Residential (dwellings)** C: Medium D: Medium	**Residential (dwellings)** C: Minor adverse D: Minor adverse	None proposed beyond existing commitments.	**Residential (dwellings)** C: Minor adverse D: Minor adverse	A Construction Traffic Management Plan (CTMP) will be developed and outline methods to control construction traffic
The impact of noise generated during operation and maintenance of the onshore substations on human receptors	×	✓	×	CoT80 CoT88	**Residential (dwellings)** O: Low **Commercial (equestrian centre)**	**Residential (dwellings)** O: High **Commercial (equestrian centre)**	**Residential (dwellings)** O: Minor adverse	None proposed beyond existing commitments.	**Residential (dwellings)** O: Minor adverse	None.

Description of impact	Phase[a]			Commitment number	Magnitude of impact	Sensitivity of the receptor	Significance of effect	Further mitigation	Residual effect	Proposed monitoring
	C	O	D							
					O: Negligible **Recreational receptors (PRoW)** O: Negligible	O: Medium **Recreational receptors (PRoW)** O: Low	**Commercial (equestrian centre)** O: Minor adverse **Recreational receptors (PRoW)** O: Negligible or minor adverse		**Commercial (equestrian centre)** O: Minor adverse **Recreational receptors (PRoW)** O: Negligible or minor adverse	

[a] C=construction, O=operation and maintenance, D=decommissioning

Table 8.40: Summary of cumulative environmental effects, mitigation and monitoring

Description of effect	Phase[a]			Commitment number	Magnitude of impact	Sensitivity of the receptor	Significance of effect	Further mitigation	Residual effect	Proposed monitoring
	C	O	D							
Tier 1										
The impact of noise and vibration generated by construction and decommissioning activities	✓	✓	✓	CoT18 CoT34 CoT35 CoT36 CoT38 CoT79	C: Low O: Medium D: Low	C: High O: High D: High	C: Minor adverse O: Minor adverse D: Minor adverse	None proposed beyond existing commitments.	C: Minor adverse D: Minor adverse	A noise and vibration monitoring strategy may be agreed upon with the relevant stakeholders to ensure compliance with the agreed noise and vibration threshold values.

[a] C=construction, O=operation and maintenance, D=decommissioning

8.17 References

8.17.1 Legislation

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