UK Onshore Scheme

Environmental Statement

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Chapter 15

Noise & Vibration (Proposed Underground DC Cable)

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Environmental Statement Volume 2			
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Glossary of Terms	
Term	**Meaning**
A-weighting/ A-weighted	Weighting of the audible frequencies designed to reflect the response of the human ear to sound. The ear is more sensitive to sound at frequencies in the middle of the audible range than it is to either very high or very low frequencies. Sound measurements are often A-weighted (using a dedicated filter) to compensate for the sensitivity of the ear.
Ambient sound level	BS 4142 (Ref 15-11) defines the ambient sound level as the: 'totally encompassing sound in a given situation at a given time, usually from many sources near and far.' It is sometimes used to represent an environmental noise level defined specifically in terms of the L_{Aeq} index.
Anthropogenic noise	Noise from man-made sources or man's activities, i.e. noise from road, rail or farming activities.
Background sound level	BS 4142 (Ref 15-11) defines the background sound level $L_{A90,T}$ as the: '*A-weighted sound pressure level that is exceeded by the residual sound at the assessment location for 90% of a given time interval, T, measured using time weighting F and quoted to the nearest whole number of decibels*' (i.e. a sound level defined specifically in terms of the L_{A90} index). The ambient sound level is a measure of the residual sound and the specific sound when present. The terms 'ambient' and 'background' may be colloquially synonymous when describing environmental noise levels but this is not correct in formal terminology for acoustics terms. Horizontal Guidance H3 Part 2 Noise Assessment and Control (Ref 15-2) describes the L_{A90} background noise level as: 'Whilst it is not the absolute lowest level measured in any of the short samples, it gives a clear indication of the underlying noise level, or the level that is almost always there in between intermittent noisy events'.
Baseline sound or noise levels / Baseline sound or noise environment	The existing sound or noise levels before construction or operation of a development commences.
Broadband	A sound containing a wide range of frequencies (for example, a whooshing sound like a waterfall or an out of tune analogue radio).
Decibel (dB)	Units of sound measurement and noise exposure measurement.
Directivity	The uniform/non-uniform directional characteristics of a sound source (as sound may be emitted from the source in different directions with varying intensities and frequencies).

Glossary of Terms	
Term	**Meaning**
Equivalent continuous sound pressure level ($L_{Aeq,T}$)	Defined in BS 7445-2 (Ref 15-12) as the 'value of the A-weighted sound pressure level of a continuous, steady sound that, within a specified time interval, T, has the same mean square sound pressure as a sound under consideration whose level varies with time' i.e. it is a measure of the noise dose or exposure over a period. It is a unit commonly used to describe construction noise and noise from industrial premises and is the most suitable unit for the description of other forms of environmental noise including noise mapping. It is also the unit that best reflects community response.
Façade/Freefield	This applies to the positions for either measurement or prediction. A façade position is one that effectively represents sound levels at a building but is conventionally taken at a position 1 m from the building; this includes reflections from the building. A freefield position is one that is at least 3.5 m from a building where reflection effects are not significant. The difference between a sound level measured at a façade position and a freefield position, assuming that there is a specific sound source that causes reflections, is that levels are around 3 dB higher at the façade, due to the reflection effects.
Frequency	The pitch of the sound, measured in Hz. The tonal quality of a sound is described and measured in terms of the frequency content and is commonly expressed as octave or third octave bands; the latter being the division of the octave bands into three for finer analysis, across the frequency spectrum. The smaller the octave band or third octave band centre frequency number defined in terms of Hz, the lower the sound. For example, 63 Hz is lower than 500 Hz and is perceived as a deeper sound. The attenuation due to air absorption and natural barriers increases with frequency, i.e. low frequencies are always the most difficult to control/mitigate. Frequency ranges for commonly occurring sounds include: · the low notes on a bass guitar are typically around 40 to 50 Hz; · the lowest string on a guitar is typically about 80 Hz; · middle C is about 250 Hz; · the C above middle C is about 500 Hz; · sound from cars in a residential area is generally around 250 and 500 Hz; · Greenwich Mean-time signal (pips) is around 1 kHz; · bird calls are generally around 2 to 5 kHz; and · a 'Shhh' sound made by the mouth is mostly around 4 kHz and above.
Harmonic	An oscillation (e.g. sound wave) that has a frequency that is an integral multiple of a fundamental frequency.
Hertz (Hz)	The unit of frequency in cycles per second.
Immission	The correlative of emission; emissions are emitted by the sound source and immissions are received at the noise sensitive receptor.
$L_{Aeq,T}$	See 'Equivalent continuous sound pressure level'.
L_{Amax}	Maximum value of the A-weighted sound pressure level, measured using the fast (F) time weighting (in dBA).

Glossary of Terms	
Term	**Meaning**
L_{A90}	See 'Background sound level'.
Landfall	The area where the Onshore and Offshore Schemes meet.
Loudness/Loud	The measure of the subjective impression of the magnitude or strength of a sound as perceived by the human ear.
Noise and Sound	Response to sound can be subjective and is affected by many factors, both acoustic and non-acoustic. The significance of its impact, for example, can depend on such factors as the margin by which a sound exceeds the background sound level, its absolute level, time of day and change in the acoustic environment, as well as local attitudes to the source of the sound and the character of the neighbourhood. Sound can be measured by a sound level meter or other measuring system. Noise is related to a human response and is routinely described as unwanted sound, or sound that is considered undesirable or disruptive.
Octave	The range between two frequencies whose ratio is 2:1.
Octave bands	Groups of frequencies defined by standards where the upper frequency of each band is equal to twice the lower frequency of the next higher band. Octave bands are usually named by their geometric centre frequency. For example, the octave band extending between 44.7 Hz and 89.1 Hz is called the 63 Hz octave band. The octave band extending between 89.1 Hz and 178 Hz is called the 125 Hz octave band. The full complement of octave bands in the audible frequency range is as follows: 31.5, 63, 125, 250, 500, 1,000, 2,000, 4,000, 8,000 and 16,000 Hz.
Point/Line/Area Source	Noise sources can be modelled as point, line or area sources. Noise attenuation due to geometric spreading, which is the effect of acoustic energy being spread over an increasing area with increasing distance from the source, can be different for the different types of source. Generally, when the distance from the source to the receptor is very much greater than the dimensions of the source, the attenuation due to geometric spreading from all source types is the same as for point sources.
Rating level, $L_{Ar,Tr}$	BS 4142:2014 (Ref 15-11) defines the rating level as 'The specific noise level plus any adjustment for the characteristic features of the noise.'
Reflection	Sound can be reflected by hard surfaces including water which is acoustically hard and reflection effects can affect sound levels.
Slow/Fast Time Weighting	The response speed of the detector in a sound level meter. Slow response time is 1 second; fast response time is 1/8 second (0.125 seconds) and will detect changes in sound levels more rapidly than measurements made with Slow time-weighting.
Sound	See 'Noise and Sound'.
Sound Power Level (SWL, L_W)	A sound power level is a measure of the total power radiated as sound by a source in all directions. It is a property of the source and is essentially independent of the measuring environment. The sound power level of a source is expressed in decibels (dB) and is equal to 10 times the logarithm to the base 10 of the ratio of the sound power of the source to a reference sound power. The reference sound power in air is normally taken to be 10^{-12} watt.

Glossary of Terms	
Term	**Meaning**
SoundPLANÒ	A computer software package that uses a ray-tracing numerical modelling approach to predict acoustic propagation from industrial and/or transport sound sources. The prediction methodologies follow national and international standards.
Sound Pressure Level (SPL)	Sound pressure is the dynamic variation of the static pressure of air and is measured in force per unit area. Sound pressure is normally represented on a logarithmic amplitude scale, which gives a better relationship to the human perception of hearing. The sound pressure level is expressed in decibels (dB) and is equal to 20 times the logarithm to the base 10 of the ratio of the sound pressure at the measurement location to a reference sound pressure. The reference sound pressure in air is normally taken to be 20 µPa, which roughly corresponds to the threshold of human hearing.
Sound spectrum	A sound represented by its frequency components.
Soundscape	The acoustic environment as perceived and understood by people in context.
Source term	The acoustic properties of a source defined as a sound power level or as a sound pressure level under specific measurement conditions. Source terms are sometimes provided as a spectrum.
Specific sound level, $L_{Aeq,Tr}$	BS 4142 (Ref 15-11) defines the specific sound level as the 'equivalent continuous A-weighted sound pressure level produced by the specific sound source over a given reference time interval'.
Third-octave bands	Frequency ranges where each octave is divided into one-third octaves.
Tonal	Sound sources sometimes contain audible or measurable components that can be identified as hums, whistles etc. The presence of these tonal components is sometimes considered to add an extra, annoying quality to the sound.
µPa	Symbol for micropascal.

List of Abbreviation	
Abbreviation	**Meaning**
BBC	Boston Borough Council
BS	British Standard
BSi	British Standards Institution
CoCP or CEMP	Code of Construction Practice/Construction Environmental Management Plan
CS	Converter Station
dBA	Decibels A-weighted
DCLG	Department for Communities and Local Government
DCO	Development Consent Order
DMRB	Design Manual for Roads and Bridges

List of Abbreviation	
Abbreviation	**Meaning**
EIA	Environmental Impact Assessment
ELDC	East Lindsey District Council
EPO	Environmental Protection Officer
ES	Environmental Statement
HDD	Horizontal Directional Drilling (a trenchless technology for setting cables or pipelines under obstructions such as water bodies, roads or railways)
HVAC	High Voltage Alternating Current
HVDC	High Voltage Direct Current
Hz	Hertz
IPC	Infrastructure Planning Commission
LOAEL	Lowest Observed Adverse Effect Level
MLWS	Mean Low Water Springs (low tide)
NKDC	North Kesteven District Council
NOEL	No Observed Effect Level
NPPF	National Planning Policy Framework (Ref 15-7)
NPPGN	National Planning Practice Guidance – Noise (Ref 15-8)
NPSE	Noise Policy Statement for England (Ref 15-6)
NVSR	Noise and Vibration Sensitive Receptor
OS	Ordnance Survey
PINS	Planning Inspectorate
PPV	Peak Particle Velocity
PRoW	Public Right of Way
SHDC	South Holland District Council
SOAEL	Significant Observed Adverse Effect Level
SRI	Sound Reduction Index
TJP	Transition Joint Pit
TT	Trenchless Technology (including HDD, thrust boring and auger boring)
WHO	World Health Organization

1 Introduction

1.1 Introduction

1.1.1 This chapter has been prepared by RPS. It reports the results of baseline studies and the assessment of the potential impacts of the proposed Direct Current (DC) cable route on Noise & Vibration Sensitive Receptors (NVSRs). Table 15.1 below sets out the structure of the Environmental Statement (ES) with respect to noise & vibration.

1.1.2 Noise & vibration effects are interrelated with impacts on ecological receptors; this chapter considers only the effects on human NVSRs; effects upon ecological receptors are considered in ES-2-B.06, Volume 2, Chapter 10, Ecology.

1.1.3 Reference should also be made to ES-2-B.10, Volume 2, Chapter 14, Traffic and Transportation, upon which the assessment of transport noise depends.

Table 15.1 Environmental Statement: Noise & Vibration

ES Reference	ES Volume	ES Chapter	Content
ES-2-B.11	**2**	**15**	**Main Report: Proposed Underground DC Cable**
ES-2-C.10	2	26	Main Report: Proposed Converter Station
ES-3-B.01	3	15	Figures: Proposed Underground DC Cable
ES-3-C.01	3	26	Figures: Proposed Converter Station
ES-4-B.11	4	15	Technical Appendices: Proposed Underground DC Cable
ES-4-C.10	4	26	Technical Appendices: Proposed Converter Station

1.2 Chapter Structure

1.2.1 The remainder of this chapter is structured as follows:

- Section 2. Approach to Assessment. Sets out the discipline specific approach to the assessment in accordance with relevant guidance.
- Section 3. Basis of Assessment. Sets out the key assumptions which have been made in undertaking the impact assessment.
- Section 4. Planning Policy and Legislative Considerations. Provides a summary of the key points of planning policy and legislation which have been considered as part of the assessment.
- Section 5. Baseline Conditions. Reports the results of desktop and field studies undertaken to establish existing conditions.
- Section 6. Potential Impacts. Identifies the potential impacts on NVSRs which may occur as result of construction and operation.

- Section 7. Mitigation. Identifies the mitigation which is proposed including measures which are incorporated into the siting, design and construction of the proposed converter station.
- Section 8. Residual Effects. Reports the residual effects which remain taking into account proposed mitigation and identifies whether these are significant or not.
- Section 9. Monitoring. Considers the requirement for noise or vibration monitoring during the installation of the DC cable.
- Section 10. Cumulative Effects. Identifies the inter-project cumulative effects which may occur in combination with other developments.
- Section 11. Summary of Assessment. Provides a summary of the key findings of the impact assessment.
- Section 12. References.

2 Approach to Assessment

2.1 Introduction

2.1.1 This section describes the discipline specific approach in accordance with relevant guidance relating to noise and vibration.

2.2 Summary of Consultation

Scoping Opinion Review

2.2.1 Table 15.2 summarises the issues raised in the scoping opinion in relation to noise and vibration and outlines how and where this has been addressed in the subsequent assessment. A copy of the Scoping Opinion is included in Appendix 4.1.

Table 15.2 Scoping Opinion (Noise & Vibration)

Consultee	Summary of Comment	How and where addressed
Boston Borough Council (BBC)	The Councils consider that all residential receptors should be classed as being of high sensitivity whereas RPS had classed individual properties or small groups of properties as medium sensitivity and conglomerations of six or more properties as high sensitivity.	RPS considers that the classification should remain as stated to allow for more sensitive receptors which would otherwise require a change to the matrix to add a very high sensitivity. Following further consideration, the designation of six or more properties as being of high sensitivity has been revised. These are now considered to be of medium sensitivity as for individual properties.

2.3 Scope of Assessment

Aspects to be assessed

2.3.1 The key aspects with regards to noise and vibration for the Scheme are considered to be:

- Construction Effects: any adverse noise and vibration effects arising from the construction/installation of the underground DC cable on NVSRs between the landfall and proposed converter station.
- Construction Traffic Effects: any adverse noise and vibration effects arising from construction traffic associated with the Scheme both on the public highway and on temporary access roads off the public highway to the construction areas/compounds.

2.3.2 Once the cable installation has been completed, it will emit no perceptible noise or vibration and hence this aspect is scoped out and not mentioned further.

2.3.3 With regard to overlaps with other disciplines, the main area is ecology where noise or vibration levels may interfere with species breeding, communicating etc. This is aspect is considered in ES-2-B.06, Volume 2, Chapter 10, Ecology.

Spatial Scope

2.3.4 The spatial scope of the study area covers the area of land 1 km around the proposed landfall and 500 m either side of the centre of the proposed DC cable route including the proposed landfall. These areas establish the Zone of Influence (ZoI) in which NVSRs are present and baseline surveys have been focused. The Limits of Deviation (LoD) will sit within this ZoI and this consists of a corridor typically 100 m within which the 30 m working width will be finalised.

Temporal Scope

2.3.5 The assessment of noise and vibration effects is limited to those times when the noise or vibration is being generated. Once the source of noise or vibration is removed, any associated impact or effect will cease. For the assessment of noise and vibration effects arising during the construction/installation phase for the proposed DC cable route, the temporal scope is the duration of the construction works.

2.4 Identification of Baseline Conditions

Desk Studies

2.4.1 This assessment is based on the description of the construction/installation and operation of the underground DC cable from the landfall to the converter station. ES-2-B.01, Chapter 05, Proposed Underground DC Cable, provides a full description of the DC cable from the landfall to the converter station.

2.4.2 Ordnance Survey mapping and project information have been used to identify potential NSVRs in the area surrounding the length of proposed DC cable route.

2.4.3 The proposed DC cable makes landfall in the administrative area of East Lindsey District Council (ELDC), passing through Boston Borough Council (BBC), North Kesteven District Council (NKDC), back into BBC, then into South Holland District Council (SHDC) where it connects to the proposed converter station.

2.4.4 The assumption for assessment purposes is that the majority of the cable will be laid directly into the trench or pulled through ducts within trenches which have been constructed/excavated by the open cut / trench method. Where the DC cable route crosses structures or features for which trenching is not possible (including sea defences; roads; railway; and drains / waterways), then a trenchless method will be employed. Trenchless methods considered are: horizontal directional drill (HDD); pipe jacking; and micro bore.

2.4.5 Approximately 264 trenchless crossings have been identified; most are classified as 'Small', with 55 identified as 'Medium', 32 identified as 'Large' and eight as 'Major'. Some of these include one or more existing service or obstruction. Full details are provided in ES-2-B.01, Chapter 05, Underground Cable Route Description, which includes a schedule of crossings.

2.4.6 Cable joint bays will be required along the route, installed at circa 800 m to 1200 m intervals, where sections of the cable will be joined.

2.4.7 No significant or regular maintenance would be required and hence the DC cable operation would not generate any significant road traffic. Exceptional maintenance would be subject to separate assessment or undertaken in emergency situations; both situations falling outside the scope of this assessment.

2.5 Assessment Criteria

Construction Noise

2.5.1 The magnitude of impacts from construction noise has been determined in accordance with one example contained within Annex E of BS 5228-1:2009+A1:2014 (Ref 15-1). The significance criteria for assessing noise impact from construction works have been based on Example Method 2 contained within Annex E.3.3 of the standard, as referred to above; this indicates that:

'Noise levels generated by site activities are deemed to be potentially significant if the total noise (pre-construction ambient plus site noise) exceeds the pre-construction ambient noise by 5 dB or more, subject to lower cut-off values of 65 dB, 55 dB and 45 dB $L_{Aeq,Period}$, from site noise alone, for the daytime, evening and night-time periods, respectively; and a duration of one month or more, unless works of a shorter duration are likely to result in significant effect.'

2.5.2 Table 15.3 summarises the criteria that have been used for the assessment of construction noise effects for residential dwellings and other NVSRs of Medium and High sensitivity as developed for EIA purposes by RPS. The guidance in BS 5228-1:2009+A1:2014 applies to residential dwellings only; therefore, for NVSRs that have Low sensitivity, professional judgement has been applied to determine the overall level of effect.

Table 15.3 Construction Noise Levels Lower Cut-off Values which Might Result in Various Probabilities of Adverse Impact at Residential Building Facades					
Assessment category and threshold value period (L_{Aeq})	Threshold value[1], in decibels (dB)				
	No / Negligible	Minor	Median line for receptors of medium sensitivity	Moderate	Major
Night-time (23.00 to 07.00 hours)	<40	40 - 45		45 – 55	>55
Evenings (19.00 to 23.00 hours weekdays). Weekends (13.00 to 23.00 hours Saturdays and 07.00 to 23.00 hours Sundays)	<50	50 - 55		55 – 65	>65
Daytime (07.00 to 19.00 hours) weekdays and Saturdays (07.00 to 13.00 hours)	<60	60 - 65		65 - 75	>75

[1]Subject to duration criteria and where ambient noise levels are low.

2.5.3 The calculation method of BS 5228-1:2009+A1:2014 takes account of the duration of an activity per hour, the 'on-time'; and the attenuation of sound due to the effects of distance, ground attenuation and barrier effects. The assessment has been based on reasonably expected construction phases, plant items and on-times based on the information provided within BS 5228-1:2009+A1:2014.

2.5.4 Where predicted construction noise levels are up to 5 dB below the level criteria given in paragraph 2.5.1 above or of short duration (less than 1 month), this is considered to be a 'no change' or negligible adverse magnitude of impact. For works of significant duration (of one month or more, unless works of a shorter duration are likely to result in a significant effect: where levels are between -5 dB below and equal to the criteria above (to the left of the median line), this is considered to be a minor adverse impact; where the criteria are exceeded by up to 10 dB (to the right of the median line), this is considered to be a moderate adverse impact. Noise levels greater than 10 dB above the criteria (median line of 45, 55 and 65 dB for night, evening and day) are considered a major adverse impact depending on the context and duration of the works.

2.5.5 For the majority of NVSRs, noise levels are likely to result in the criteria set within the lower cut-off levels given in Table 15.3 above, the most stringent limits.

2.5.6 The noise changes identified in Table 15.4 below have been used in the assessment of noise impacts associated with construction traffic on the local road network and from temporary diversion routes resulting from construction of the Scheme. These are based on the guidance in the Design Manual for Roads and Bridges (DMRB), Volume 11, Section 3, Part 7 'Noise and Vibration' (Ref 15-2) for the classification of magnitude of noise impacts in the long term.

Although construction works have their effects in the short-term, the temporary nature of the works decreases the rating of impacts.

Table 15.4 Classification of Magnitude of Temporary Traffic Noise Impacts	
Noise Change, $L_{A10,18h}$	Magnitude of Impact
0	No change
0 1– 2.9	Negligible
3 – 4.9	Low
5 – 9.9	Medium
10+	High

Construction Vibration

2.5.7 Criteria for assessing the significance of construction vibration are provided in BS 5228-2:2009+A1:2014 (Ref 15-1). Table 15.5 below details potential vibration levels measured in terms of Peak Particle Velocity (PPV) based on the guidance in BS 5228-2:2009+A1:2014 and provides a semantic scale for construction vibration effects on human receptors.

Table 15.5 Guidance on Effects of Vibration Levels		
Peak Particle Velocity	Description	Magnitude of Impact
0.14 mm/s	Vibration might just be perceptible in the most sensitive situations for most vibration frequencies associated with construction. At lower frequencies, people are less sensitive to vibration.	Negligible
0.3 mm/s	Vibration might just be perceptible in residential environments.	Low
1.0 mm/s	It is likely that vibration of this level in residential environments will cause complaint but can be tolerated if prior warning and explanation has been given to residents.	Medium
10 mm/s	Vibration is likely to be intolerable for any more than a brief exposure to this level.	High

2.5.8 Vibration from construction activities may impact on adjacent buildings. The criteria used in this assessment relate to the potential for cosmetic damage, not structural damage. Table 15.6 below provides the vibration limits contained within BS 5228-2:2009+A1:2014 above which cosmetic

damage could occur. Minor damage is possible at vibration magnitudes that are greater than twice those given in Table 15.6 and major damage to a structure may occur at values greater than four times the tabulated values. The limits are the same as those in BS 7385-2:1993 'Evaluation and measurement of vibration in buildings - Part 1: Guide for measurement of vibrations and evaluation of their effects on buildings' (Ref 15-4) which would be applicable for effects beyond the construction phase.

Table 15.6 Threshold Vibration Values for the Evaluation of Cosmetic Building Damage

Building Classification	Frequency of Range of Vibration (Hz)	PPV mm/s [1]	
		Transient Vibration	Continuous Vibration
Unreinforced or light framed structures[2] Residential or light commercial type buildings[2]	4 Hz to 15 Hz	15 mm/s at 4 Hz increasing to 20 mm/s at 15 Hz	7.5 mm/s at 4 Hz increasing to 10 mm/s at 15 Hz
	15 Hz and above	20 mm/s at 15 Hz increasing to 50 mm/s at 40 Hz and above	10 mm/s at 15 Hz increasing to 25 mm/s at 40 Hz and above
Reinforced or framed structures Industrial and heavy commercial buildings	4 Hz and above	50	25

1. Values relate to the base of the building.
2. For lightweight structures, at frequencies below 4 Hz, a maximum displacement of 0.6 mm (zero to peak) is not to be exceeded.

Sensitivity of Receptors

2.5.9 A common set of criteria have been provided to evaluate: Sensitivity or Value / Importance of Receptors; Magnitude of Potential Impacts; and Definition of Significance of Potential Effects. The acoustic criteria have been selected so as to match the shared definitions.

2.5.10 Residential properties as both individuals and groups have been considered as 'Medium' sensitivity.

2.5.11 Users of public rights of way (PRoW),) other permitted recreational trails and users of recreational facilities where the purpose of that recreation is enjoyment of the countryside have been treated as being of low sensitivity.

2.5.12 Other sensitive receptors (such as schools, nursing homes, hospitals etc.) have been treated as being of 'high' sensitivity, unless particular circumstances indicate otherwise. The sensitivity of

impacts and effects upon important ecological sites or areas have been assessed by the ecologists and reported in ES-2-B.06, Volume 2, Chapter 10, Ecology, as appropriate.

2.5.13 Table 15.7 describes the sensitivity and value criteria applied for various classes of receptor.

Table 15.7 Receptor Sensitivity (Noise & Vibration)

Sensitivity	Receptor types	Notes
Very High	None identified	Unless particular circumstances indicate otherwise
High	Other sensitive receptors (such as schools, nursing homes, hospitals etc)	Unless particular circumstances indicate otherwise -
Medium	Individual residential properties	Unless particular circumstances indicate otherwise
Low	PRoW, other permitted recreational trails and users of recreational facilities where the purpose of that recreation is enjoyment of the countryside	Unless particular circumstances indicate otherwise
Negligible	Effects of noise on receptors of negligible sensitivity to noise are scoped out of the assessment	Unless particular circumstances indicate otherwise
Other	Ecological receptors.	As reported within the Ecological sections of the ES. See ES-2-B.06, Volume 2, Chapter 10, Ecology

2.5.14 No receptors of Very High sensitivity have been identified. Effects of noise on receptors of negligible sensitivity to noise are scoped out of the assessment.

Magnitude of Impacts

2.5.15 As a guiding principle, magnitudes of impact have been ranked none, negligible or low for effects within current guidelines; medium for effects marginally exceeding current guidelines; and high for effects significantly exceeding current guidelines.

Table 15.8 Magnitude of Impacts (Noise & Vibration)

Magnitude of Impacts	Description	Notes
High / Very High	Effects significantly exceeding current guidelines	Threshold between marginal and significant exceedance will be specific to the aspect being considered

Table 15.8 Magnitude of Impacts (Noise & Vibration)		
Magnitude of Impacts	**Description**	**Notes**
Medium	Effects marginally exceeding current guidelines	
Low	Effects within current guidelines	-
Negligible		-
None		-

Assessing the Significance of Effects

2.5.16 The following assessment of significance matrix has been used, with moderate or major effects being classed as a significant effect. Consequently, a minor (i.e. below guidelines) effect on a large number of properties, or a moderate effect on a single property, would be classed as a significant effect. Consequently, an effect of minor significance but affecting multiple receptors would be significant.

Table 15.9 Assessment of Significance (Noise & Vibration)					
Magnitude of Impact	**Sensitivity or Value of Receptor**				
	Very High	**High**	**Medium**	**Low**	**Negligible**
High	Major	Major	Moderate	Moderate	Minor
Medium	Major	Moderate	Moderate	Minor	Negligible
Low	Moderate	Moderate	Minor	Negligible	Negligible
Negligible	Minor	Minor	Negligible	Negligible	Negligible

3 Basis of Assessment

3.1 Introduction

3.1.1 The assessment of potential impacts includes mitigation measures in relation to noise and vibration. These have been applied in two ways:

- Mitigation by design – this relates to the development of the proposed DC cable route including the establishment of the LoD. Through the design, NVSRs have been avoided as much as possible maximising standoff distances to reduce the potential impact of construction noise immissions.
- Mitigation during construction - primarily this is applying best practicable means (BPM – Ref 15.4) to reduce noise and vibration emissions during construction of the proposed DC cable route and adherence to an appropriate Construction Environmental Management Plan (CEMP).

3.1.2 These design and embedded construction mitigation measures are discussed in Section 7 of this chapter.

3.2 Temporary Impacts

3.2.1 For the purposes of this EIA, construction effects are typically temporary or short-term occurring during the construction phase only. The noise and vibration effects could result from construction plant and activities and construction traffic either off the public highway on access roads to or within the working width or on the public highway. Other temporary noise effects could result from proposed access arrangements (where temporary junctions are proposed) or from Temporary Construction Compounds (TCCs).

3.2.2 The construction of the proposed DC cable route will necessarily result in construction noise over an extended but temporary period. Cable installation is not required to be undertaken sequentially; as a result installation could occur in multiple sections along the length of the proposed DC cable route in parallel. This will limit the extent and duration of construction activity at any given location.

3.2.3 The majority of the DC cable will be laid into trenches; either directly or pulled through ducts which are pre-laid into trenches. Where the DC cable route crosses obstacles for which open cut or trenching is not possible (including sea defences; roads; railways; and drains / waterways), then trenchless installation methods will be deployed. Trenchless crossings would be achieved by a range of techniques, depending on the site requirements. Typically, a launch pit and reception pit would be constructed at each end of the crossing, with the majority of the more-noisy plant situated around the launch pit. At this stage of assessment, it is not known from which direction each crossing will be constructed, however, in finalising the detailed scheme design

consideration will be given to potential noise impacts to reduce these as much as possible. The duration of construction of crossings will depend on the exact trenchless method utilised, the ground conditions encountered and the length of the crossing required but for the purposes of the assessment has been assumed to be between 7 and 20 days. Typical durations are provided within ES-2-B.01, Chapter 5, The Proposed Underground DC cable.

3.2.4 Construction impacts associated with the trenching the proposed DC cable route would be temporary at any one receptor, occurring for only a small portion of the overall construction period. Construction using open cut trenching would progress at an estimated rate of 10 to 30 days per kilometre. Trenching works would be interspersed with the installation of joint bays and trenchless crossings, where these are necessary, which are considered below.

3.2.5 The majority of works would occur within the proposed DC cable route working width of 30 m within the LoD of the proposed DC cable route. Temporary Works Areas (TWAs) will often require a wider working corridor for trenchless crossings and joint bays. In addition larger TCCs are located along the proposed DC cable route generally at 2 to 3 km intervals. These sit within a 50 m LoD buffer forming the base scheme design. Following the principle of the Rochdale Envelope, works are assumed to occur within the boundary of the base scheme design such as to present a realistic worst-case assessment of the potential impact at neighbouring NVSRs.

3.2.6 Temporary cable joint bay cabin will also be required along the DC cable route, located at circa 800 m to 1500 m intervals. Cable jointing requires to be undertaken in a clean controlled environment. The joint bay provides a clean base over which temporary cabins or enclosures are installed for the duration of the jointing process. These require a power supply, air conditioning and temporary lighting. Due to the precise nature of jointing operations it may require continuous 24-hour working for short periods. The cabins or enclosures are removed once the jointing process is complete.

3.2.7 The construction has been separated into the following different activities:

- construction works at the landfall to facilitate the submarine cable coming onshore;
- trenching for the cable;
- cable joint bays;
- trenchless cable crossings; and
- construction vehicles on the public highway.

3.2.8 Assessment of noise associated with the access and haul roads to the TCCs is included within the assessment of the TCCs.

3.2.9 Construction noise levels have been predicted using spreadsheet assessment implementing British Standard (BS) 5228-1:2009+A1:2014 based on an assumed plant list and source terms contained within the Standard (Ref 15-1). The model input data and results of the assessments are provided in ES-4-B.11 Technical Appendix 15 Annexes 1-4.

3.3 Sensitivity of Receptors

3.3.1 For the majority of the proposed DC cable route, there are mainly isolated residential NVSRs potentially affected by the cable laying. The sensitivity of the NVSRs is considered to be **medium**. The sensitivity of the PRoWs is considered to be **low**, with respect to their users.

3.4 Vibration from Construction of the Proposed DC Cable Route

3.4.1 Vibration arising during construction will be minimised as far as is reasonably practicable. No blasting or impact piling is anticipated. All trenchless crossings and piling will be undertaken by non-impact methods. As such, construction vibration would be unlikely to be significant beyond the immediate construction site. Off-site vibration from HGVs etc. on haul roads or the public highway would have negligible impact at all locations assuming the roads are maintained in good order to prevent holes or ruts developing which would be a source of vibration.

3.4.2 Construction vibration would be of **negligible** significance.

3.5 Longer Term, Operational and Permanent Impacts

3.5.1 Once installed, the operational underground DC cable emits no perceptible noise.

3.5.2 No significant or regular maintenance would be required, nor would its operation generate road-traffic. Exceptional maintenance would be subject to separate assessment (if required) or undertaken in emergencies, both falling outside the scope of this assessment.

3.6 DC Cable Route Decommissioning

3.6.1 The future decommissioning of the DC Cable Route has minimal potential to result in adverse effects. Noise emissions would be controlled by future best practice, and are likely to be much less than those during construction and of a lesser duration; the cable may be left in situ. However, there may be additional receptors, residential or otherwise, which do not currently exist.

3.6.2 With appropriate best practice, it is anticipated that noise or vibration effects associated with decommissioning of the DC cable would be similar to or no worse than those which would occur during installation.

4 Planning Policy and Legislative Considerations

4.1 Introduction

4.1.1 This section summarises the key points of planning policy and legislation which have been considered as part of the assessment. A full description and analysis of planning policy and legislation is considered in detail in a separate Planning Statement.

4.1.2 NGVL and their appointed contractors will comply with legislation.

4.2 Planning Policy and Guidance

4.2.1 Relevant guidance and national planning policy is contained within the Noise Policy Statement for England (NPSE) (Ref 15-6), the National Planning Policy Framework (NPPF) (Ref 15-7) and published Planning Practice Guidance on Noise (PPGN) (Ref 15-8). These documents do not contain guidance in terms of numerical noise levels. Guidance is provided descriptively, which may be transposed to numerical noise levels for site-specific situations, using the methods contained within British Standards (BSs). However, there is no specific guidance on this; the research that Defra promoted has apparently been inconclusive and is likely to vary by source.

Noise Policy Statement for England

4.2.2 The noise element of the assessment is based on the definition of 'noise' and the reference to 'sound' contained within the NPSE, which states:

"For the purposes of the NPSE, 'noise' includes:

- *'environmental noise' which includes noise from transportation sources;*
- *'neighbour noise' which includes noise from inside and outside people's homes; and*
- *'neighbourhood noise' which includes noise arising from within the community such as industrial and entertainment premises, trade and business premises, construction sites and noise in the street.*

Furthermore, sound only becomes noise (often defined as 'unwanted sound') when it exists in the wrong place or at the wrong time such that it causes or contributes to some harmful or otherwise unwanted effect, like annoyance or sleep disturbance. Unlike many other pollutants, noise pollution depends not just on the physical aspects of the sound itself, but also the human reaction to it."

4.2.3 On this basis, the assessment determines the significance of noise effects on the basis of measured and predicted levels of sound taking into account the context of the levels received at the noise sensitive receptors (NVSRs) as described in the NPSE.

4.2.4 The NPSE aims to provide clarity regarding current policies and practices to enable noise management decisions to be made within the wider context, at the most appropriate level, in a cost-effective manner and in a timely fashion.

4.2.5 Paragraph 1.6 of the NPSE sets out the long-term vision and aims of Government noise policy:

"Noise Policy Vision

Promote good health and a good quality of life through the effective management of noise within the context of Government policy on sustainable development."

"Noise Policy Aims

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

- *avoid significant adverse impacts on health and quality of life;*
- *mitigate and minimise adverse impacts on health and quality of life; and*
- *where possible, contribute to the improvement of health and quality of life."*

4.2.6 The aims require that all reasonable steps should be taken to avoid, mitigate and minimise adverse effects on health and quality of life whilst also taking into account the guiding principles of sustainable development, which include social, economic, environmental and health considerations.

4.2.7 With regard to the terms 'significant adverse' and 'adverse' included in the 'Noise Policy Aims', these are explained further in the 'Explanatory Note' as relating to established concepts from toxicology that are currently being applied to noise impacts, for example, by the World Health Organisation which are:

'NOEL – No Observed Effect Level

This is the level below which no effect can be detected. In simple terms, below this level, there is no detectable effect on human health and quality of life due to noise.

LOAEL – Lowest Observed Adverse Effect Level

This is the level above which adverse effects on health and quality of life can be detected.'

4.2.8 Defra has then extended these concepts for the purpose of the NPSE to introduce the concept of:

'SOAEL – Significant Observed Adverse Effect Level

This is the level above which significant adverse effects on health and quality of life occur.'

4.2.9 The accompanying explanation states:

'It is not possible to have a single objective noise-based measure that defines SOAEL that is applicable to all sources of noise in all situations. Consequently, the SOAEL is likely to be different for different noise sources, for different receptors and at different times. It is acknowledged that further research is required to increase our understanding of what may constitute a significant adverse impact on health and quality of life from noise. However, not having specific SOAEL values in the NPSE provides the necessary policy flexibility until further evidence and suitable guidance is available'.

4.2.10 With regard to 'further evidence', Defra has commissioned research to try and identify the levels at which the above effects occur but this is not yet in the public domain. However, early indications are that this research has been largely inconclusive. On this basis, and until further guidance becomes available, and given that there is no specific guidance in the NPPF on noise, there is no justification to vary assessment methods and criteria from those previously adopted from British Standards etc.

National Planning Policy Framework

4.2.11 The NPPF, published in March 2012, sets out the Government's planning policies for England. The document does not contain any specific noise policy, or noise limits but it provides a framework for local people and local authorities to produce their own local and neighbourhood plans, which reflect the needs and priorities of their communities.

4.2.12 In Section 11 of the NPPF, 'Conserving and enhancing the natural environment', paragraph 123 relates to noise and states:

'123. Planning policies and decisions should aim to:

- *avoid noise from giving rise to significant adverse impacts[27] on health and quality of life as a result of new development;*
- *mitigate and reduce to a minimum other adverse impacts[27] on health and quality of life arising from noise from new development, including through the use of conditions;*
- *recognise that development will often create some noise and existing businesses wanting to develop in continuance of their business should not have unreasonable restrictions put on them because of changes in nearby land uses since they were established;[28] and*
- *identify and protect areas of tranquillity which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason*.'

[27] See Explanatory Note to the Noise Policy Statement for England (Department for the Environment, Food and Rural Affairs).

[28] Subject to the provisions of the Environmental Protection Act 1990 and other relevant law.'

4.2.13 The first bullet point refers to 'significant adverse impacts' which relates to the 'significant observed adverse effect level' (SOAEL) in the Noise Policy Statement for England (NPSE), though the term 'effect' is used instead of the term 'impact' although these have been deemed to be interchangeable in this context. Therefore, given the comments above on the NPSE with regard to assessment methods and criteria, the current content of the NPPF does not require any change in previously adopted approaches.

Planning Practice Guidance on Noise

4.2.14 The Government has published Planning Practice Guidance on a range of subjects including noise. The guidance forms part of the NPPF and provides advice on how to deliver its policies. The PPGN reiterates general guidance on noise policy and assessment methods provided in the

NPPF, NPSE and British Standards (BSs) and contains examples of acoustic environments commensurate with various effect levels. Paragraph 006 of the PPGN explains that:

'The subjective nature of noise means that there is not a simple relationship between noise levels and the impact on those affected. This will depend on how various factors combine in any particular situation.'

4.2.15 According to the PPGN, factors that can influence whether noise could be of concern include:

- the source and absolute level of the noise together with the time of day it occurs;
- for non-continuous sources of noise, the number of noise events, and the frequency and pattern of occurrence of the noise;
- the spectral content and the general character of the noise;
- the local topology and topography along with the existing and, where appropriate, the planned character of the area.
- where applicable, the cumulative impacts of more than one source should be taken into account along with the extent to which the source of noise is intermittent and of limited duration;
- whether adverse internal effects can be completely removed by closing windows and, in the case of new residential development, if the proposed mitigation relies on windows being kept closed most of the time;
- in cases where existing noise sensitive locations already experience high noise levels, a development that is expected to cause even a small increase in the overall noise level may result in a significant adverse effect occurring even though little to no change in behaviour would be likely to occur;
- where relevant, Noise Action Plans, and, in particular the Important Areas identified through the process associated with the Environmental Noise Directive and corresponding regulations;
- the effect of noise on wildlife;
- if external amenity spaces are an intrinsic part of the overall design, the acoustic environment of those spaces; and
- the potential effect of a new residential development being located close to an existing business that gives rise to noise should be carefully considered. This is because existing noise levels from the business even if intermittent (for example, a live music venue) may be regarded as unacceptable by the new residents and subject to enforcement action. To help avoid such instances, appropriate mitigation should be considered, including optimising the sound insulation provided by the new development's building envelope. In the case of an established business, the policy set out in the third bullet of paragraph 123 of the NPPF should be followed.

4.2.16 Relevant experience and professional judgment are fundamental to all stages of the assessment that leads to the determination of the significance of a noise effect. The non-numeric guidance contained within the PPGN, based upon the initial advice in the NPSE, is summarised in Table 10 below.

Table 15.10 Summary of Guidance from NPSE and PPGN			
Perception	**Examples of Outcomes**	**Increasing Effect Level**	**Action**
Not noticeable	No Effect	No Observed Effect	No specific measures required
Noticeable and not intrusive	Noise can be heard, but does not cause any change in behaviour or attitude. Can slightly affect the acoustic character of the area but not such that there is a perceived change in the quality of life.	No Observed Adverse Effect	No specific measures required
Lowest Observed Adverse Effect Level (LOAEL)			
Noticeable and intrusive	Noise can be heard and causes small changes in behaviour and/or attitude, 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 perceived change in the quality of life.	Observed Adverse Effect	Mitigate and reduce to a minimum
Significant Observed Adverse Effect Level (SOAEL)			
Noticeable and disruptive	The noise causes a material change in behaviour and/or attitude, e.g. avoiding certain activities during periods of intrusion; where there is no alternative ventilation,	Significant Observed Adverse Effect	Avoid

Table 15.10 Summary of Guidance from NPSE and PPGN			
Perception	**Examples of Outcomes**	**Increasing Effect Level**	**Action**
	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.		
Unacceptable Adverse Effect Level (UAEL)			
Noticeable and very disruptive	Extensive and regular changes in behaviour and/or an inability to mitigate effect of noise leading to psychological stress or physiological effects, e.g. regular sleep deprivation/awakening; loss of appetite, significant, medically definable harm, e.g. auditory and non-auditory	Unacceptable Adverse Effect	Prevent

4.2.17 The PPGN provides further information on the adverse effects of noise and how it can be mitigated. For noise sensitive development, mitigation measures can include: avoiding noisy locations; designing the development to reduce the impact of noise from the local environment, including noise barriers; and optimising the sound insulation provided by the building envelope including through noise insulation.

4.3 Legislation

Control of Pollution Act, 1974

4.3.1 Part III of the Control of Pollution Act 1974 (CoPA) (Ref 15-5) is specifically concerned with pollution. With regards to noise it covers construction sites; noise in the street; noise abatement zones; codes of practice and best practicable means (BPM).

4.3.2 Section 60, Part III of the CoPA refers to the control of noise on construction sites. It provides legislation by which local authorities can control noise from construction sites to prevent noise disturbance occurring. The Control of Noise (Code of Practice for Construction and Open Sites) (England) Order 2015 approved British Standard (BS) 5228-1:2009+A1:2014 (Ref 28-1) and BS 5228-2:2009+A1:2014 (Ref 28-3) for the purpose of giving guidance on appropriate methods for minimising noise 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.

4.3.3 The CoPA enables the local authority, in whose area work is going to be undertaken, or is being undertaken, the power to serve a notice imposing requirements as to the way in which construction works are to be carried out. This notice can specify, the plant or machinery that is or is not to be used, the hours during which the construction work can be carried out, the level of noise and vibration that can be emitted from the premises in question or at any specified point on these premises or that can be emitted during specified hours, or for any change of circumstances.

4.3.4 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. If consent is given, and the stated method and hours of work are complied with, then the local authority cannot take action under Section 60.

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

4.3.6 Section 72, Part III of the CoPA refers to BPM, which is defined as:

'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'.

4.3.7 If BPM is applied, then it can provide a defence against prosecution by the local authority.

Environmental Protection Act 1990, Part lll (EPA)

4.3.8 The Environmental Protection Act 1990 (EPA) (Ref 15-9) deals with statutory nuisance, including noise.

4.3.9 Section 79, Part III of the EPA, 'Statutory nuisances and inspections therefor', places a duty on local authorities to regularly inspect their areas to detect whether a statutory nuisances exists. This section also considers and defines the concept of 'Best Practicable Means' (BPM) which originates from Section 72, Part III of the Control of Pollution Act (CoPA), where BPM is defined as:

'reasonably practicable having regard, among other things, to local conditions and circumstances, to the current state of technical knowledge and to the financial implications'.

4.3.10 Where the local authority is satisfied that a statutory nuisance does exist, or is likely to occur or recur, it must serve an abatement notice. Section 80, Part III of the EPA, 'Summary proceedings for statutory nuisances', provides local authorities with the power to serve an abatement notice requiring the abatement of the nuisance or prohibiting or restricting its occurrence or recurrence; and/or carrying out such works or other action necessary to abate the nuisance.

4.3.11 Section 82, Part III of the EPA, 'Summary proceedings by persons aggrieved by statutory nuisances', allows a Magistrates' court to act on a complaint made by any person on the grounds that he is aggrieved by a statutory nuisance, such as noise.

4.3.12 The procedures for appeals against abatement notices are detailed in the Statutory Nuisance (Appeals) Regulations 1995 (Ref 15-10).

5 Baseline Conditions

5.1 Study Area

5.1.1 This section provides a brief description of the baseline conditions present in the study area including along the proposed DC cable route and within the LoD on either side of the cable, temporary access and compounds.

5.2 Baseline Noise Conditions - Summary

5.2.1 The area along the proposed DC cable route is mostly quiet and rural. Away from the larger roads and conglomerations of houses, representative noise levels are generally below 60 dB L_{Aeq} during the day; 50 dB L_{Aeq} during the evening and 40 dB L_{Aeq} at night. At the more urban fringes and nearer main roads, levels are higher but still relatively low.

5.2.2 Baseline noise levels have been determined by means of survey, both attended and unattended sound level measurement, in the vicinity of the proposed DC cable route.

5.2.3 Baseline sound level monitoring was undertaken in two rounds: over a 15 day period between Wednesday 26 October 2016 and Thursday 10 November 2016 during which six partially attended, 15-day continuous surveys were completed; and over a 17 day period between Tuesday 7 February 2017 and Friday 24 February 2017 during which ten partially attended, 15-day continuous surveys were completed.

5.2.4 Attendance and observations in the general survey area (along the proposed DC cable route) were made during the evening and night-time periods, around 19.00 hours and 02.00 hours respectively, on separate evenings/nights. In addition, nine fully attended short-term surveys, consisting of three 1-hour discontinuous periods, were completed during the daytime period (10.00 to 17.00 hours).

5.2.5 Survey locations were selected to be representative of a range of acoustic environments along the proposed DC cable route and proposed landfall study area and agreed with the LPAs in advance. These locations were representative of residential receptors, nature conservation areas, recreational use areas and otherwise noise sensitive locations.

5.2.6 Survey locations are shown in the Baseline Sound Monitoring Report – DC Cable Route [ES-4-B.11, Volume 4, Appendix 15, Noise & Vibration] which forms Technical Appendix Volume 4 Part B to this chapter together full details of the survey procedure, locations and results.

5.2.7 The area surrounding the proposed DC cable route is predominantly agricultural land, with an intercrossing road network, and to a lesser extent rail and drain network. In addition to road traffic, sound sources such as machinery and tractors in the fields and roads were present; these were audible at the majority of the survey locations including during the evening attended

observations. However, whilst agricultural activity was noted at many locations, it was transient and not continuous in nature.

5.2.8 Other notable sound sources included occasional traffic movements on the local road network close to the survey locations and regular low level aircraft (one to twenty per hour) from RAF Coningsby, which was dominant at some locations.

5.2.9 Other sources of sound included road traffic on A-roads (mainly audible during quiet periods), bird calls and some wind rustle of trees and other foliage etc.

5.2.10 Table 15.11 below provides a summary of representative baseline sound levels used for the assessment.

Table 15.11 Summary of Representative Baseline Sound Levels – Proposed DC Cable Route

Group	Period	Representative Ambient Level $L_{Aeq,T}$ (dB)
Residential receptors, quieter facades	Day	< 60 dB
	Evening	< 50 dB
	Night	< 40 dB

5.3 Baseline Vibration Conditions - Summary

5.3.1 No significant sources of baseline vibration relevant to the UK Onshore Scheme have been identified; any assessment of vibration will not be made in relation to existing vibration levels. It is therefore not necessary for any baseline vibration measurements to have been undertaken and hence none have which is consistent with normal practice.

5.4 Route Section 1 Proposed Landfall to Well High Lane

5.4.1 Route Section 1 is approximately 13.04 km in length and is situated entirely within ELDC.

5.4.2 Full details of the noise survey methodology, locations and results are provided in the Baseline Sound Monitoring Report – DC Cable Route [ES-4-B.11, Volume 4, Appendix 15, Noise & Vibration].

5.4.3 For the majority of survey locations, representative noise levels fall below 60 dB $L_{Aeq,day}$; 50 dB $L_{Aeq,evening}$ and 40 dB $L_{Aeq,night}$. The exceptions to these are where surveys were in close proximity to heavily trafficked roads. It is considered that, using these levels would provide a robust and fair assessment for residential receptors in the area and would reflect the noise levels experienced at quieter facades, even for receptors on busy roads.

5.5 Route Section 2 Well High Lane to A16/Keal Road

5.5.1 Route Section 2 is approximately 16.85 km in length and is situated entirely within ELDC.

5.5.2 Full details of the noise survey methodology, locations and results are provided in the Baseline Sound Monitoring Report – DC Cable Route [ES-4-B.11, Volume 4, Appendix 15, Noise & Vibration].

5.5.3 For the majority of survey locations, representative noise levels fall below 60 dB $L_{Aeq,day}$; 50 dB $L_{Aeq,evening}$ and 40 dB $L_{Aeq,night}$. The exceptions to these are where surveys were in close proximity to heavily trafficked roads. It is considered that, using these levels would provide a robust and fair assessment for residential receptors in the area and would reflect the noise levels experienced at quieter facades, even for receptors on busy roads.

5.6 Route Section 3 A16/Keal Road to River Witham

5.6.1 Route Section 3 is approximately 22.06 km in length and is situated within both ELDC and BBC.

5.6.2 Full details of the noise survey methodology, locations and results are provided in the Baseline Sound Monitoring Report – DC Cable Route [ES-4-B.11, Volume 4, Appendix 15, Noise & Vibration].

5.6.3 For the majority of survey locations, representative noise levels fall below 60 dB $L_{Aeq,day}$; 50 dB $L_{Aeq,evening}$ and 40 dB $L_{Aeq,night}$. The exceptions to these are where surveys were in close proximity to heavily trafficked roads. It is considered that using these levels would provide a robust and fair assessment for residential receptors in the area and would reflect the noise levels experienced at quieter facades, even for receptors on busy roads.

5.7 Route Section 4 River Witham to the Proposed Converter Station

5.7.1 Route Section 4 is approximately 15.21 km in length and is situated within BBC, NKDC and SHDC.

5.7.2 Full details of the noise survey methodology, locations and results are provided in the Baseline Sound Monitoring Report – DC Cable Route [ES-4-B.11, Volume 4, Appendix 15, Noise & Vibration].

5.7.3 For the majority of survey locations, representative noise levels fall below 60 dB $L_{Aeq,day}$; 50 dB $L_{Aeq,evening}$ and 40 dB $L_{Aeq,night}$. The exceptions to these are where surveys were in close proximity to heavily trafficked roads. It is considered that, using these levels would provide a robust and fair assessment for residential receptors in the area and would reflect the noise levels experienced at quieter facades, even for receptors on busy roads.

6 Potential Impacts

6.1 Overview of Potential Impacts

6.1.1 The following sections describe the impacts within each of the proposed four DC cable sections from the proposed landfall to the proposed converter station. Given that the 30 m wide working width will be situated somewhere within the LoD which are typically 100 m wide, there is some uncertainty regarding the precise impacts which may occur. As a result this assessment is high level but is considered to provide an assessment of the reasonable worst case impacts which may occur.

6.1.2 Figures 15.1 to 15.4 indicate the noise and vibration sensitive receptors (based on the OS AddressBase dataset) within 1 km of the indicative DC cable alignment for the four route sections. These are:

- Figure 15.1 Noise and Vibration Sensitive Receptors Route Section 1;
- Figure 15.2 Noise and Vibration Sensitive Receptors Route Section 2;
- Figure 15.3 Noise and Vibration Sensitive Receptors Route Section 3; and
- Figure 15.4 Noise and Vibration Sensitive Receptors Route Section 4.

6.1.3 The four figures also show distance bands from the indicative DC cable alignment, at 25 m; 50 m; 100 m; 250 m; 500 m; and 1000 m. It should be noted that the distances given for impact boundaries within this chapter relate to the distance separation from construction activities, so are measured from the edge of LoD, working width, TCCs or TWAs.

6.1.4 The majority of construction works related to open cut or trenching are short-term and transitory occurring for only a small portion of the overall construction period; progressing at an estimated 10 to 20 days per kilometre. However, longer term works are required at the proposed landfall, and at the locations of trenchless crossings and joint bays. Consequently, works associated with trenched installation are very short-term and daytime only and hence effects are generally limited. Effects associated with the other construction activities may occur for longer periods; for example, works for some of the larger crossings may take up to 3 weeks some will require continuous 24 hour working.

6.2 Route Section 1 Proposed Landfall to Well High Lane

Temporary Impacts

Landfall Construction Works

Magnitude of Impact

6.2.1 Construction impacts associated with the proposed landfall at Boygrift in East Lindsey would be temporary, occurring for only a small portion of the overall construction period; an estimated 1 to 2 months per HDD.

6.2.2 The proposed DC cable would be installed using HDD techniques. A TWA would be established west (inland) of Hutton Bank / Roman Road, from which ducts would be installed under the road, sea defence and beach, emerging either above or below the Mean Low Water Springs (MLWS).

6.2.3 The majority of works would occur within the TWA. Some works would be required at the HDD breakout location, near the MLWS, where a cofferdam may be required to maintain a dry working area.

6.2.4 Whilst it is intended that the majority of the works would be undertaken during the daytime, it may be necessary for evening, night or weekend works to occur; the HDD will be 24 hour. The anticipated impact of such works has been estimated for day, evening and night periods; predicting the distances at which impacts would occur. Calculations are provided in ES-4-B.11, Volume 4, Chapter 15 Technical Appendices: Underground Cable and summarised in Table 15.12 below:

Table 15.12 Summary of Impact Distances – Landfall Construction Works

Impact Boundary	Distance in Relation to Impact Magnitude (NVSRs) / m		
	Daytime	Evening	Night
Negligible / Low	154	388	975
Low / Medium	97	245	615
Medium / High	39	97	245

6.2.5 From this table, it can be seen that NVSRs within approximately 100 m of the landfall TCC (i.e. falling within the Low/Medium boundary) would experience a **medium** (or **high** within 40 m) impact during daytime works. If evening or night-time works take place, then any NVSRs within a greater area would potentially be affected. In particular, if night-time works occur, then the southern fringe of Sandilands would experience a **low** magnitude impact.

Sensitivity of Receptor

6.2.6 There are NVSRs within 1 km of the proposed landfall TCC. The sensitivity of the residential NVSRs is **medium** and the sensitivity of the PRoWs is considered to be **low** with respect to their users.

Significance of Effect

6.2.7 Residential receptors within approximately 100 m of daytime works and 250 m of evening works would experience a **medium or high** impact, which is of **moderate adverse** significance. Beyond this, to 150 m daytime and 400 m evening, a low impact, of **minor adverse** significance might occur.

6.2.8 For any night-time works at the landfall, properties within 615 m of the TWA would experience a **medium/high** impact, of **moderate to minor adverse** significance. The effect on NVSRs will therefore be of **moderate to minor adverse** significance. The effect on users of the PRoWs will be of **negligible to minor adverse** significance.

Trenched DC Cable Route Works

Magnitude of Impact

6.2.9 Construction impacts associated with the trenched DC cable would be temporary at any one receptor, occurring for only a small portion of the overall construction period; progressing at an estimated 10 to 20 days per kilometre. Trenching works would be interspersed with joint bays and trenchless crossings, where these are necessary, which are considered below.

6.2.10 The majority of the works would be undertaken during the daytime. In exceptional circumstances, it may be necessary for evening, night or weekend works to occur. The anticipated extent of any impact of such works has been estimated for day, with distances also provided for evening and night; predicting the distances within which impacts may occur. Calculations are provided in ES-4-B.11, Volume 4, Chapter 15 Technical Appendices: Underground Cable and summarised in Table 15.13 below:

Table 15.13 Summary of Impact Distances – Trenched DC Cable Route Works

Impact Boundary	Distance in Relation to Impact Magnitude (NVSRs) / m		
	Daytime	Evening	Night
Negligible / Low	61	154	387
Low / Medium	39	97	244
Medium / High	15	39	97

6.2.11 From this table, it can be seen that NVSRs within approximately 40 m of the trenched DC cable route would experience a **medium** (or **high** within 15 m) impact during daytime works. If evening or night-time works take place, then any NVSRs within a greater distance would potentially be affected.

6.2.12 Four PRoWs cross the proposed DC cable route working width within Route Section 1. Whilst users might experience elevated noise levels for short periods when traversing the proposed DC cable route, this is likely to be no more than a **low** impact with regards to noise.

Sensitivity of Receptor

6.2.13 There are residential NVSRs within 400 m of the proposed DC cable route working width. The sensitivity of the residential NVSRs is considered to be **medium** and the sensitivity of the PRoWs is considered to be **low** with respect to their users.

Significance of Effect

6.2.14 Residential receptors within approximately 40 m of daytime works would experience an effect of **moderate adverse** significance. Beyond this, to a distance of 60 m from the LoD, a **low** effect of **minor adverse** significance is predicted to occur. These effects would only occur for a very short duration.

6.2.15 The effect on NVSRs will, therefore, generally be of **minor to moderate adverse** significance. The effect on users of the PRoWs will be of **negligible to minor** adverse significance.

Joint Bay Works

Magnitude of Impact

6.2.16 Noise from works at joint bays will be similar in magnitude to that from along the trenched DC cable route. However, the duration and intensity of the activity, and the likelihood of evening / night-time works are increased, with some 24-hour working required. Bays would remain open for approximately 2 weeks for jointing and testing and would require some 24-hour working. Construction impacts associated with the joint bay works would be temporary, occurring for only a fraction of the overall construction period.

6.2.17 The location of the joint bays is yet to be confirmed. However, they will be situated within the LoD and have been assessed on a worst case scenario basis for the purpose of each relevant receptor.

6.2.18 The majority of the works would be undertaken during the daytime, with some evening, night or weekend works occurring. The anticipated extent of any impact of such works has been estimated for the daytime, with distances also provided for evening and night; predicting the distances within which impacts would occur. Calculations are provided in ES-4-B.11, Volume 4, Chapter 15 Technical Appendices: Underground Cable and summarised in Table 15.14 below:

Table 15.14 Summary of Impact Distances – Joint Bay Works

Impact Boundary	Distance in Relation to Impact Magnitude (NVSRs) / m		
	Daytime	Evening	Night
Negligible / Low	79	198	497
Low / Medium	50	125	314
Medium / High	20	50	125

6.2.19 From this table, it can be seen that NVSRs within approximately 50 m of the joint bay worksites would experience a **medium** (or **high** within 20 m) impact during daytime works. Where evening or night-time works take place, then any NVSRs within a greater area; to 315 m during the night would potentially be affected.

6.2.20 Four PRoWs cross the proposed DC cable route within Route Section 1, included two long-distance routes (the Lindsey Loop). Until the location of the joint bays is determined, it is not possible to specifically predict noise levels at the PRoWs. However, as for the proposed DC cable route, whilst users might experience elevated noise levels for short periods when traversing near the works, this is likely to be no more than a **low** impact with regards to noise.

Sensitivity of Receptor

6.2.21 The NVSRs within 500 m of the proposed DC cable route are considered to be of **medium** sensitivity and the sensitivity of the PRoWs is considered to be **low** with respect to their users.

Significance of Effect

6.2.22 Subject to determination of the location of joint bays, residential receptors within approximately 50 m of daytime works would experience a **medium** impact, which is of **moderate adverse** significance. Beyond this, to 80 m in the daytime, a **low** impact of **minor adverse** significance might occur. For night-time works, residential receptors within approximately 315 m of daytime works would experience a **medium or high** impact, which is of **moderate adverse** significance. Beyond this, to 500 m at night, a **low** impact of **minor adverse** significance might occur.

6.2.23 The effect on NVSRs will, therefore, generally be of **minor to moderate adverse** significance. The effect on users of the PRoWs will be of **negligible to minor adverse** significance which is not significant.

Trenchless Construction Works (excluding Landfall)

Magnitude of Impact

6.2.24 There are a number of trenchless crossings within this section, some of which contain more than one service or obstruction, as indicated in the crossings schedule contained in Appendix 5.1 of document ES-2-B.01, Chapter 05 The Proposed Underground DC Cable.

6.2.25 Construction impacts associated with the trenchless crossings would be temporary, occurring for only a small portion of the overall construction period. The exact duration of crossing works will depend on the detailed scheme design but they are expected to last between 7 and 20 days.

6.2.26 Noise emissions will depend on the technique and magnitude of the works. For the purpose of this section, the distances given below relate to larger, noisier works, as a worst-case assessment.

6.2.27 While it is intended that the majority of the works would be undertaken during the daytime, it may be necessary for evening, night or weekend works to occur. The anticipated impact of such works

has been estimated for day, evening and night periods; predicting the distances within which impacts could occur. Calculations are provided in ES-4-B.11, Volume 4, Chapter 15 Technical Appendices: Underground Cable and summarised in Table 15.15 below:

Table 15.15 Summary of Impact Distances – Trenchless Construction Worksite

Impact Boundary	Distance in Relation to Impact Magnitude (NVSRs) / m		
	Daytime	Evening	Night
Negligible / Low	154	388	975
Low / Medium	97	245	615
Medium / High	39	97	245

6.2.28 From this table, it can be seen that NVSRs within approximately 100 m of the trenchless crossing worksites would experience a **medium** (or **high** within 40 m) impact during daytime works. If evening or night-time works take place, then any NVSRs within a greater area would potentially be affected, to a **medium** impact within 615 m and **low** impact within 975 m.

Sensitivity of Receptor

6.2.29 The sensitivity of the NVSRs is considered to be **medium** and the sensitivity of the PRoWs is considered to be **low** with respect to their users.

Significance of Effect

6.2.30 Residential receptors within approximately 100 m of daytime works and 250 m of evening works would experience a **medium** or **high** impact, which is of **moderate adverse** significance. Beyond this, to 150 m daytime and 400 m evening, a **low** impact, of **minor adverse** significance might occur.

6.2.31 For any night-time works associated with trenchless crossings, properties within 615 m would experience a **medium/high** impact, of moderate adverse significance. The effect on NVSRs will, therefore, be of **negligible to moderate adverse** significance. The effect on users of the PRoWs will be of **negligible to minor adverse** significance.

Construction Vehicles on the Public Highway

Magnitude of Impact

6.2.32 Construction traffic data for the proposed DC cable route have been provided by the transport consultant for the project. Flows relate to the 18-hour weekday, for both summer and winter periods and have been provided for 100 links across the scheme. In addition, the traffic consultants indicate that night-time traffic will be minimal, with deliveries being made during the daytime. As construction progresses, slight changes to the predicted traffic flows are expected. However, predicted noise levels are unlikely to change by more than a fraction of 1 dB.

Furthermore, a 20% uplift prediction is also included within the assessment from the traffic data provided, to allow for any variation in prediction.

6.2.33 Full details of the traffic forecasting methodology and assumptions are provided in ES-2-B.10 Chapter 14: Traffic & Transport. The assessment only takes into account data for the road links identified in chapter 14. A figure identifying the road traffic links is provided in ES-2-B.10 Chapter 14, Traffic and Transport.

6.2.34 For most of the road links assessed, changes in traffic flow would result in a corresponding noise change of less than 1 dB at any nearby NVSRs. This would be a negligible effect.

6.2.35 Within Route Section 1, sixteen road links have been identified which will have a non-negligible increase in traffic due to the construction work. For NVSRs where one or more of these links is currently their dominant source of environmental noise, these properties may experience a noise increase of between 1 dB and 3 dB during the Section 1 construction works. This would correspond to a **low** adverse impact.

6.2.36 The sixteen links identified as having a low adverse impact are: A52 (Huttoft); B1449 (Thurlby); A1111 (Markby); A1104 (Saleby); A1104 (Alford); A16 (Ulceby Cross); A16 (Hilldyke); A16 (Northlands); A16 (East Keal); A158 (Hagworthingham); A158 (Stainton by Langworth); A157 (South Reston); B1225 (Ludford); B1225 (Normanby le Wold); Croxton Road (Humberside Airport); and B1372 (Woodthorpe).

6.2.37 No links would have changes in traffic which generate a noise increase of 3 dB or greater.

Sensitivity of Receptor

6.2.38 Traffic generation on the local road network has the potential to affect only a few individual residential receptors at a time. From the assessment criteria adopted, these residential receptors are considered as **medium** sensitivity.

Significance of Effect

6.2.39 The impact at the residential NVSRs on or close to the local road network is predicted to be local, short-term, continuous and temporary. It is predicted that the impact will affect the receptors directly. The results of the assessment indicate that adverse significance criteria are not exceeded at any NVSRs due to construction traffic noise; the magnitude of impact from traffic generation on the local road network is, therefore, considered to be **negligible to low**.

6.2.40 The effect on users of the PRoWs will be no different than that already experienced from existing traffic movements on the local road network. The effect on NVSRs will, therefore, be of **negligible to minor** adverse significance. Due to the minimal traffic generation at night, any night-time noise would be of **negligible** impact and hence of **negligible** significance.

6.3 Route Section 2 Well High Lane to A16/Keal Road

Temporary Impacts

Trenched DC Cable Route Works

Magnitude of Impact

6.3.1 Construction impacts associated with the trenched DC cable route would be temporary at any one receptor, occurring for only a small portion of the overall construction period; progressing at an estimated 10 to 20 days per kilometre. Trenching works would be interspersed with joint bays and trenchless crossings, where these are necessary, which are considered below.

6.3.2 These works would mostly be undertaken during the daytime. In exceptional circumstances, it may be necessary for evening, night or weekend working to occur. The anticipated extent of any impact of such works has been estimated for day, with distances also provided for evening and night; predicting the distances within which impacts may occur. Calculations are provided in Table 15.16 below:

Table 15.16 Summary of Impact Distances – Trenched DC Cable Route Works

Impact Boundary	Distance to Impact Magnitude (NVSRs) / m		
	Daytime	Evening	Night
Negligible / Low	61	154	387
Low / Medium	39	97	244
Medium / High	15	39	97

6.3.3 From this table, it can be seen that NVSRs within approximately 40 m of the DC cable route would experience a **medium** (or **high** within 20 m) impact during daytime works. If evening or night-time works take place, then any NVSRs within a greater distance would potentially be affected.

6.3.4 Five PRoWs cross the proposed DC cable route working width within Route Section 2, including one long-distance route (the Greenwich Meridian Trail). Whilst users might experience elevated noise levels for short periods when traversing the proposed DC cable route, this is likely to be no more than a **low** impact with regards to noise.

Sensitivity of Receptor

6.3.5 The sensitivity of the residential NVSRs is considered to be **medium** and the sensitivity of the PRoWs is considered to be **low** with respect to their users.

Significance of Effect

6.3.6 Residential receptors within approximately 40 m of daytime works would experience an effect of **moderate adverse** significance. Beyond this, to 60 m in the daytime, a **low** impact of **minor adverse significance** might occur.

6.3.7 The effect on NVSRs will, therefore, generally be of **minor to moderate adverse** significance. For the residential properties within 40 m of the works, an effect of **moderate adverse significance** would occur but only for a short period. The effect on users of the PRoWs will be of **negligible to minor adverse** significance.

Joint Bay Works

Magnitude of Impact

6.3.8 Noise from works at joint bays will be similar in magnitude to that along the trenched DC cable route. In comparison, however, the duration of the noise and the likelihood of evening / night-time works are increased, with some 24-hour working likely to be required. Bays would remain open for approximately 2 weeks for jointing and testing and would require some 24-hour working. Construction impacts associated with the joint bay works would be temporary, occurring for only a small portion of the overall construction period.

6.3.9 The location of the joint bays is yet to be confirmed. However, they will be situated within the LoD and have been assessed on a worst case scenario basis for the purpose of each relevant receptor.

6.3.10 The majority of the works would be undertaken during the daytime, with some evening, night or weekend works occurring. The anticipated extent of any impact of such works has been estimated for day, with distances also provided for evening and night; predicting the distances within which impacts would occur. Calculations are provided in Table 15.17 below:

Table 15.17 Summary of Impact Distances – Trenched DC Cable Route Joint Bay Works

Impact Boundary	Distance to Impact Magnitude (NVSRs) / m		
	Daytime	Evening	Night
Negligible / Low	79	198	497
Low / Medium	50	125	314
Medium / High	20	50	125

6.3.11 From this table it can be seen that NVSRs within approximately 50 m of the joint bay worksites would experience a **medium** (or **high** within 20 m) impact during daytime works. Where evening or night-time works take place, then any NVSRs within a greater area; to 315 m during the night would potentially be affected.

6.3.12 One PRoW and the Sustrans National Cycle Route (Water Rail Way) cross the proposed DC cable route alignment within Route Section 2. Until the location of the joint bays is determined it is

not possible to specifically predict noise levels at the PRoW. However, as for the proposed DC cable route, whilst users might experience elevated noise levels for short periods when traversing the proposed DC cable route, this is likely to be no more than a **low** impact with regards to noise.

Sensitivity of Receptor

6.3.13 The sensitivity of these residential NVSRs is considered to be **medium** and the sensitivity of the PRoWs is considered to be **low** with respect to their users.

Significance of Effect

6.3.14 Subject to determination of the location of joint bays, residential receptors within approximately 50 m of daytime works would experience an effect of **moderate adverse** significance for a short period. Beyond this, to 80 m in the daytime, a **low** impact of **minor adverse** significance may occur. For night-time works, residential receptors within approximately 315 m of daytime works would experience an effect of **moderate adverse** significance. Beyond this, to 500 m at night, a **low** impact of **minor adverse** significance may occur.

6.3.15 The effect on NVSRs will, therefore, be generally of **negligible to moderate adverse** significance. For the residential properties within 315 m of the joint bays, an effect of **moderate adverse** significance would occur associated with significant night-time works. The effect on users of the PRoWs will be of **negligible to minor adverse** significance.

Trenchless Construction Works

Magnitude of Impact

6.3.16 There are a number of trenchless crossings within this section, some of which contain more than one service or obstruction, as indicated in the crossings schedule contained in Appendix 5.1 of document ES-2-B.01, Chapter 05 The Proposed Underground DC Cable.

6.3.17 Construction impacts associated with the trenchless crossings would be temporary, occurring for only a small portion of the overall construction period. The exact duration of crossing works will depend on the detailed scheme design but they are expected to last between 7 and 20 days.

6.3.18 While it is intended that the majority of the works would be undertaken during the daytime, it may be necessary for evening, night or weekend works to occur. The anticipated impact of such works has been estimated for day, evening and night; predicting the distances within which impacts would occur. Calculations are provided in Table 15.18 below:

Table 15.18 Summary of Impact Distances – Trenchless Construction Worksite

Impact Boundary	Distance to Impact Magnitude (NVSRs) / m		
	Daytime	Evening	Night
Negligible / Low	154	388	975
Low / Medium	97	245	615

Table 15.18 Summary of Impact Distances – Trenchless Construction Worksite			
Impact Boundary	Distance to Impact Magnitude (NVSRs) / m		
	Daytime	Evening	Night
Medium / High	39	97	245

6.3.19 From this table, it can be seen that NVSRs within approximately 100 m of the trenchless crossing worksites would experience a **medium** (or **high** within 40 m) impact during daytime works. If evening or night-time works take place, then any NVSRs within a greater area would potentially be affected, to a **medium** impact within 615 m and **low** impact within 975 m.

Sensitivity of Receptor

6.3.20 The sensitivity of the residential NVSRs is considered to be **medium** and the sensitivity of the PRoWs is considered to be **low** with respect to their users.

Significance of Effect

6.3.21 Residential receptors within approximately 100 m of daytime works and 250 m of evening works would experience a **medium or high** impact, which is of **moderate adverse** significance. Beyond this, to 150 m daytime and 400 m evening, a **low** impact, of **minor adverse** significance may occur.

6.3.22 For any night-time works associated with trenchless crossings, properties within 615 m would experience a **medium/high** impact, of **moderate adverse** significance. The effect on NVSRs will, therefore, be of **minor to moderate adverse** significance. The effect on users of the PRoWs will be of **negligible to minor adverse** significance.

Construction Vehicles on the Public Highway

Magnitude of Impact

6.3.23 Construction traffic data for the proposed DC cable route have been provided by the transport consultant for the project. Flows relate to the 18-hour weekday, for both summer and winter periods, have been provided for 100 links across the scheme. In addition, the traffic consultants indicate that night traffic will be minimal, with deliveries being made during the daytime.

6.3.24 As construction progresses, slight changes to the predicted traffic flows are expected. However, predicted noise levels are most unlikely to change by more than a fraction of 1 dB. Furthermore, a 20% uplift prediction is also included within the assessment from the traffic data provided, to allow for any variation in prediction.

6.3.25 Full details of the traffic forecasting methodology and assumptions are provided in ES-2-B.10 Chapter 14: Traffic & Transport. The assessment only takes into account data for the road links

identified in chapter 14. A figure identifying the road traffic links is provided in ES-2-B.10 Chapter 14, Traffic and Transport.

6.3.26 For most of the road links assessed, changes in traffic flow would result in a corresponding noise change of less than 1 dB at any nearby NVSRs. This would be a negligible effect.

6.3.27 Within Route Section 2, eleven road links have been identified which will have a non-negligible increase in traffic due to the construction work. For NVSRs where one or more of these links is currently their dominant source of environmental noise, these properties may experience a noise increase of between 1 dB and 3 dB during the Section 2 construction works. This would correspond to a low adverse impact.

6.3.28 The eleven links identified as having a low adverse impact are: A16 (Ulceby Cross); A16 (Hilldyke); A16 (Northlands); A16 (East Keal); A158 (Hagworthingham); A16 (Haugham); B1225 (Ranby); B1225 (Ludford); B1225 (Normanby le Wold); Croxton Road (Humberside Airport); and B1195 (Lusby).

6.3.29 It should be noted that calculations for one of these links, the B1225 (Ranby), does indicate a noise increase greater than 3 dB. However, the base flow on this link is particularly low, being less than 70 vehicles per 18-hour day. Consequently, the impact associated for this link is limited to **low**.

6.3.30 Any night-time noise would be of **negligible** impact.

Sensitivity of Receptor

6.3.31 From the assessment criteria adopted, these residential receptors are considered as **medium** sensitivity.

Significance of Effect

6.3.32 The impact at the residential NVSRs on or close to the local road network is predicted to be local, short-term, continuous and temporary. It is predicted that the impact will affect the receptors directly. The results of the assessment indicate that adverse significance criteria are not exceeded at any NVSRs due to construction traffic noise; the magnitude of impact from traffic generation on the local road network is, therefore, considered to be **negligible to low**.

6.3.33 The effect on users of the PRoWs will be no different than that already experienced from existing traffic movements on the local road network.

6.3.34 The effect on NVSRs will, therefore, be of **negligible to low** significance. Due to the minimal traffic generation at night, any night-time noise would be of **negligible** impact and hence of **negligible** significance.

6.4 Route Section 3 A16/Keal Road to River Witham

Temporary Impacts

Trenched DC Cable Route Works

Magnitude of Impact

6.4.1 Construction impacts associated with the trenched DC cable route works would be temporary at any one receptor, occurring for only a small portion of the overall construction period; progressing at an estimated 10 to 20 days per kilometre. Trenching works would be interspersed with joint bays and trenchless crossings, where these are necessary, which are considered below.

6.4.2 The majority of the works would be undertaken during the daytime. In exceptional circumstances it may be necessary for evening, night or weekend works to occur. The anticipated extent of any impact of such works has been estimated for day, with distances also provided for evening and night; predicting the distances within which impacts would occur. Calculations are provided in Table 15.19 below:

Table 15.19 Summary of Impact Distances – Trenched DC Cable Route Works

Impact Boundary	Distance to Impact Magnitude (NVSRs) / m		
	Daytime	Evening	Night
Negligible / Low	61	154	387
Low / Medium	39	97	244
Medium / High	15	39	97

6.4.3 From this table, it can be seen that NVSRs within approximately 40 m of the trenched DC Cable would experience a **medium** (or **high** within 15 m) impact during daytime works. If evening or night-time works take place, then any NVSRs within a greater area would potentially be affected.

6.4.4 Four PRoWs cross the proposed DC cable route working width within Route Section 3. Whilst users might experience elevated noise levels for short periods when traversing the proposed DC cable route, this is likely to be no more than a **low** impact with regards to noise.

Sensitivity of Receptor

6.4.5 The sensitivity of the residential NVSRs is considered to be **medium** and the sensitivity of the PRoWs is considered to be **low** with respect to their users.

Significance of Effect

6.4.6 Residential receptors within approximately 40 m of daytime works would experience an effect of **moderate adverse** significance. Beyond this, to 60 m in the daytime, a **low** impact of **minor adverse** significance may occur.

6.4.7 The effect on NVSRs will, therefore, generally be of **minor to moderate adverse** significance. For the residential properties within 40 m of the works, an effect of **moderate adverse** significance would occur but only for a short period. The effect on users of the PRoWs will be of **negligible to minor adverse** significance.

Joint Bay Works

Magnitude of Impact

6.4.8 Noise from works at joint bays will be similar in magnitude to that along the trenched DC cable route. In comparison, however, the duration of the noise and the likelihood of evening / night-time works are increased, with some 24-hour working likely to be required. Bays would remain open for approximately 2 weeks for jointing and testing and would require some 24-hour working. Construction impacts associated with the joint bay works would be temporary, occurring for only a small portion of the overall construction period.

6.4.9 The location of the joint bays is yet to be confirmed. However, they will be situated within the LoD and have been assessed on a worst case scenario basis for the purpose of each relevant receptor.

6.4.10 The majority of the works would be undertaken during the daytime, with some evening, night or weekend works occurring. The anticipated extent of any impact of such works has been estimated for day, with distances also provided for evening and night; predicting the distances within which impacts would occur. Calculations are provided in Table 15.20 below:

Table 15.20 Summary of Impact Distances – Trenched DC Cable Route Joint Bay Works

Impact Boundary	Distance to Impact Magnitude (NVSRs) / m		
	Daytime	Evening	Night
Negligible / Low	79	198	497
Low / Medium	50	125	314
Medium / High	20	50	125

6.4.11 From this table, it can be seen that NVSRs within approximately 50 m of the joint bay worksites would experience a **medium** (or **high** within 20 m) impact during daytime works. Where evening or night-time works take place, then any NVSRs within a greater area; to 315 m during the night would potentially be affected.

6.4.12 Four PRoWs cross the proposed DC cable route alignment within Route Section 3. Until the location of the joint bays is determined, it is not possible to specifically predict noise levels at the PRoWs. However, as for the proposed DC cable route, whilst users might experience elevated noise levels for short periods when traversing the proposed DC cable route, this is likely to be no more than a **minor** impact with regards to noise.

Sensitivity of Receptor

6.4.13 The sensitivity of the residential NVSRs is considered to be **moderate** and the sensitivity of the PRoWs is considered to be **low** with respect to their users.

Significance of Effect

6.4.14 Subject to determination of the location of joint bays, residential receptors within approximately 50 m of daytime works, would experience an effect of **moderate adverse** significance. Beyond this, to 80 m in the daytime, a **low** impact of **minor adverse** significance may occur. For night-time works, residential receptors within approximately 315 m of daytime works, which is of **moderate adverse** significance. Beyond this, to 500 m at night, a **low** impact of **minor adverse** significance might occur.

6.4.15 The effect on NVSRs will, therefore, generally be of **negligible to moderate adverse** significance. For the residential properties within 315 m of the joint bays, an effect of **moderate adverse** significance would occur associated with significant night-time works. The effect on users of the PRoWs will be of **negligible to minor adverse** significance.

Trenchless Construction Works

Magnitude of Impact

6.4.16 There are a number of trenchless crossings within this section, some of which contain more than one service or obstruction, as indicated in the crossings schedule contained in Appendix 5.1 of document ES-2-B.01, Chapter 05 The Proposed Underground DC Cable.

6.4.17 Construction impacts associated with the trenchless crossings would be temporary, occurring for only a small portion of the overall construction period. The exact duration of crossing works will depend on the detailed scheme design but they are expected to last between 7 and 20 days. While it is intended that the majority of the works would be undertaken during the daytime, it may be necessary for evening, night or weekend works to occur. The anticipated impact of such works has been estimated for day, evening and night; predicting the distances within which impacts would occur. Calculations are provided in Table 15.21 below:

Table 15.21 Summary of Impact Distances – Trenchless Construction Worksite

Impact Boundary	Distance to Impact Magnitude (NVSRs) / m		
	Daytime	Evening	Night
Negligible / Low	154	388	975
Low / Medium	97	245	615
Medium / High	39	97	245

6.4.18 From this table it can be seen that NVSRs within approximately 100 m of the trenchless crossing worksites would experience a **medium** (or **high** within 40 m) impact during daytime works. If

evening or night-time works take place, then any NVSRs within a greater area would potentially be affected, to a **medium** impact within 615 m and **low** impact within 975 m.

Sensitivity of Receptor

6.4.19 The sensitivity of the few residential NVSRs is considered to be **medium** and the sensitivity of the PRoWs is considered to be **low** with respect to their users.

Significance of Effect

6.4.20 Residential receptors within approximately 100 m of daytime works and 250 m of evening works would experience a **medium** or **high** impact, which is of **moderate adverse** significance. Beyond this, to 150 m daytime and 400 m evening, a **low** impact, of **minor adverse** significance might occur.

6.4.21 For any night-time works associated with trenchless crossings, properties within 615 m would experience a **medium/high** impact, of **moderate adverse** significance. The effect on NVSRs will, therefore, be of **negligible to moderate** adverse significance. The effect on users of the PRoWs will be of **negligible to minor adverse** significance.

Construction Vehicles on the Public Highway

6.4.22 Construction traffic data for the proposed DC cable route and landfall have been provided by the transport consultant for the project. Flows relate to the 18-hour weekday, for both summer and winter periods, have been provided for 100 links across the scheme. In addition, the traffic consultants indicate that night traffic will be minimal, with deliveries being made during the daytime.

6.4.23 As construction progresses, slight changes to the predicted traffic flows are expected. However, predicted noise levels are most unlikely to change by more than a fraction of 1 dB. Furthermore, a 20% uplift prediction is also included within the assessment from the traffic data provided, to allow for any variation in prediction.

6.4.24 Full details of the traffic forecasting methodology and assumptions are provided in ES-2-B.10 Chapter 14: Traffic & Transport. The assessment only takes into account data for the road links identified in chapter 14. A figure identifying the road traffic links is provided in ES-2-B.10 Chapter 14, Traffic and Transport.

6.4.25 For most of the road links assessed, changes in traffic flow would result in a corresponding noise change of less than 1 dB at any nearby NVSRs. This would be a negligible effect.

6.4.26 Within Route Section 3, thirteen road links have been identified which will have a non-negligible increase in traffic due to the construction work. For NVSRs where one or more of these links is currently their dominant source of environmental noise, these properties may experience a noise increase of between 1 dB and 3 dB during the Section 3 construction works. This would correspond to a low adverse impact.

6.4.27 The thirteen links identified as having a low adverse impact are: A16 (Hilldyke); A16 (Northlands); A16 (East Keal); West Fen (Stickney); A155 (East Kirkby); Westville Road; (Bunkers Hill); Moorshide Road (Sandy Bank); B1192 (New York); A153 (West Ashby); B1225 (Ranby); A153 (Anwick); A155 (Mareham le Fen); and Croxton Road (Humberside Airport).

6.4.28 It should be noted that calculations for one of these links, the B1225 (Ranby), does indicate a noise increase greater than 3 dB. However, the base flow on this link is particularly low, being less than 70 vehicles per 18-hour day. Consequently, the impact associated for this link is limited to low.

6.4.29 Any night-time noise would be of negligible impact.

Sensitivity of Receptor

6.4.30 The number of NVSRs on each road link varies; however, traffic generation on the local road network has the potential to affect only a few individual residential receptors at a time. From the assessment criteria adopted, these residential receptors are considered as **medium** sensitivity.

Significance of Effect

6.4.31 The impact at the residential NVSRs on or close to the local road network is predicted to be local, short-term, continuous and temporary. It is predicted that the impact will affect the receptors directly. The results of the assessment indicate that adverse significance criteria are not exceeded at any NVSRs due to construction traffic noise; the magnitude of impact from traffic generation on the local road network is, therefore, considered to be **negligible to low**.

6.4.32 The effect on users of the PRoWs will be no different than those already experienced from existing traffic movements on the local road network. The effect on NVSRs will, therefore, be of **negligible to minor adverse** significance.

6.5 Route Section 4 River Witham to the Proposed Converter Station

Temporary Impacts

Trenched DC Cable Route Works

Magnitude of Impact

6.5.1 Construction impacts associated with the trenched DC cable route works would be temporary at any one receptor, occurring for only a small portion of the overall construction period; progressing at an estimated 10 to 20 days per kilometre. Trenching works would be interspersed with joint bays and trenchless crossings, where these are necessary, which are considered below.

6.5.2 While it is intended that the majority of the works would be undertaken during the daytime, it may be necessary for evening, night or weekend works to occur. The anticipated impact of such works has been estimated for day, evening and night; predicting the distances within which impacts would occur. Calculations are provided in Table 15.21 below:

Table 15.22 Summary of Impact Distances – Trenched DC Cable Route Works			
Impact Boundary	Distance to Impact Magnitude (NVSRs) / m		
	Daytime	Evening	Night
Negligible / Low	61	154	387
Low / Medium	39	97	244
Medium / High	15	39	97

6.5.3 From this table it can be seen that NVSRs within approximately 40 m of the Trenched DC Cable TCC would experience a **medium** (or **high** within 15 m) impact during daytime works. If evening or night-time works take place, then any NVSRs within a greater area would potentially be affected.

6.5.4 Four PRoWs cross the proposed DC cable route working width within Route Section 4. Whilst users might experience elevated noise levels for short periods when traversing the proposed DC cable route, this is likely to be no more than a **minor** impact with regards to noise.

Sensitivity of Receptor

6.5.5 The sensitivity of the residential NVSRs is considered to be **medium** and the sensitivity of the PRoWs is considered to be **low** with respect to their users.

Significance of Effect

6.5.6 Residential receptors within approximately 40 m of daytime works would experience an effect of **moderate adverse** significance. Beyond this, to 60 m in the daytime, a **low** impact of **minor adverse** significance might occur.

6.5.7 The effect on NVSRs will, therefore, be generally of **negligible to minor adverse** significance. For the residential properties within 40 m of the works, an effect of **moderate adverse** significance would occur. The effect on users of the PRoWs will be of **negligible to minor adverse** significance.

Joint Bay Works

Magnitude of Impact

6.5.8 Noise from works at joint bays will be similar in magnitude to that along the trenched DC cable route. In comparison, however, the duration of the noise and the likelihood of evening / night-time works are increased, with some 24-hour working likely to be required. Bays would remain open for approximately 2 weeks for joint and testing and would require some 24-hour working. Construction impacts associated with the joint bay works would be temporary, occurring for only a small portion of the overall construction period.

6.5.9 The location of the joint bays is yet to be confirmed. However, they will be situated within the LoD and have been assessed on a worst case scenario basis for the purpose of each relevant receptor.

6.5.10 The majority of the works would be undertaken during the daytime, with some evening, night or weekend works occurring. The anticipated extent of any impact of such works has been estimated for day, with distances also provided for evening and night; predicting the distances within which impacts would occur. Calculations are provided in Table 15.23 below:

Table 15.23 Summary of Impact Distances – Trenched DC Cable Route Joint Bay Works

Impact Boundary	Distance to Impact Magnitude (NVSRs) / m		
	Daytime	Evening	Night
Negligible / Low	79	198	497
Low / Medium	50	125	314
Medium / High	20	50	125

6.5.11 From this table, it can be seen that NVSRs within approximately 50 m of the joint bay worksites would experience a **medium** (or **high** within 20 m) impact during daytime works. Where evening or night-time works take place, then any NVSRs within a greater area; to 315 m during the night would potentially be affected.

6.5.12 Four PRoWs cross the proposed DC cable route alignment within Route Section 4. Until the location of the joint bays is determined it is not possible to specifically predict noise levels at the PRoWs. However, as for the proposed DC cable route, whilst users might experience elevated noise levels for short periods when traversing the proposed DC cable route, this is likely to be no more than a **minor** impact with regards to noise.

Sensitivity of Receptor

6.5.13 The sensitivity of the residential NVSRs is considered to be **medium** and the sensitivity of the PRoWs is considered to be **low** with respect to their users.

Significance of Effect

6.5.14 Subject to determination of the location of joint bays, residential receptors within approximately 50 m of daytime works would experience an effect of **moderate adverse** significance. Beyond this, to 80 m in the daytime, a **low** impact of **minor adverse** significance might occur. For night-time works, residential receptors within approximately 315 m of daytime works, which is of **moderate adverse** significance. Beyond this, to 500 m at night, a **low** impact of **minor adverse** significance may occur.

6.5.15 The effect on NVSRs will, therefore, be generally of **negligible to minor adverse** significance. For the properties within 185 m of the joint bays, an effect of **moderate adverse** significance

would occur associated with significant night-time works. The effect on users of the PRoWs will be of **negligible to minor adverse** significance.

Trenchless Construction Works

Magnitude of Impact

6.5.16 There are a number of trenchless crossings within this section, some of which contain more than one service or obstruction, as indicated in the crossings schedule contained in Appendix 5.1 of document ES-2-B.01, Chapter 05 The Proposed Underground DC Cable.

6.5.17 Construction impacts associated with the trenchless crossings would be temporary, occurring for only a small portion of the overall construction period. The exact duration of crossing works will depend on the detailed scheme design but they are expected to last between 7 and 20 days.

6.5.18 While it is intended that the majority of the works would be undertaken during the daytime, it may be necessary for evening, night or weekend works to occur. The anticipated impact of such works has been estimated for day, evening and night; predicting the distances within which impacts would occur. Calculations are provided in Table 15.24 below:

Table 15.24 Summary of Impact Distances – Trenchless Construction Worksite

Impact Boundary	Distance to Impact Magnitude (NVSRs) / m		
	Daytime	Evening	Night
Negligible / Low	154	388	975
Low / Medium	97	245	615
Medium / High	39	97	245

6.5.19 From this table, it can be seen that NVSRs within approximately 100 m of the trenchless crossing worksites would experience a **medium** (or **high** within 40 m) impact during daytime works. If evening or night-time works take place, then any NVSRs within a greater area would potentially be affected, to a medium impact within 615 m and low impact within 975 m.

Sensitivity of Receptor

6.5.20 The sensitivity of the residential NVSRs is considered to be **medium** and the sensitivity of the PRoWs is considered to be **low** with respect to their users.

Significance of Effect

6.5.21 Residential receptors within approximately 100 m of daytime works and 250 m of evening works would experience a **medium** or **high** impact, which is of moderate adverse significance. Beyond this, to 150 m daytime and 400 m evening, a **low** impact, of **minor adverse** significance may occur.

6.5.22 For any night-time works associated with trenchless crossings, properties within 615 m would experience a **medium/high** impact, of **moderate adverse** significance. The effect on NVSRs will, therefore, be of **negligible to moderate adverse** significance. The effect on users of the PRoWs will be of **negligible to minor adverse** significance.

Construction Vehicles on the Public Highway

Magnitude of Impact

6.5.23 Construction traffic data for the proposed DC cable route and landfall have been provided by the transport consultant for the project. Flows relate to the 18-hour weekday, for both summer and winter periods, have been provided for 100 links across the scheme. In addition, the traffic consultants indicate that night traffic will be minimal, with deliveries being made during the daytime.

6.5.24 As construction progresses, slight changes to the predicted traffic flows are expected. However, predicted noise levels are most unlikely to change by more than a fraction of 1 dB. Furthermore, a 20% uplift prediction is also included within the assessment from the traffic data provided, to allow for any variation in prediction.

6.5.25 Full details of the traffic forecasting methodology and assumptions are provided in ES-2-B.10 Chapter 14: Traffic & Transport. The assessment only takes into account data for the road links identified in chapter 14. A figure identifying the road traffic links is provided in ES-2-B.10 Chapter 14, Traffic and Transport.

6.5.26 For most of the road links assessed, changes in traffic flow would result in a corresponding noise change of less than 1 dB at any nearby NVSRs. This would be a negligible effect.

6.5.27 Within Route Section 4, one road link, A1121 (Hubbert's Bridge), has been identified which will have a non-negligible increase in traffic due to the construction work. For NVSRs where this link is currently their dominant source of environmental noise, these properties may experience a noise increase of between 1 dB and 3 dB during the Section 4 construction works. This would correspond to a low adverse impact.

6.5.28 No links would have changes in traffic which generate a noise increase of 3 dB or greater.

Sensitivity of Receptor

6.5.29 The number of NVSRs on each road link varies; however, traffic generation on the local road network has the potential to affect only a few individual residential receptors at a time. From the assessment criteria adopted, these residential receptors are considered as **medium** sensitivity.

Significance of Effect

6.5.30 The impact at the residential NVSRs on or close to the local road network is predicted to be local, short-term, continuous and temporary. It is predicted that the impact will affect the receptors directly. The results of the assessment indicate that adverse significance criteria are not

exceeded at any NVSRs due to construction traffic noise; the magnitude of impact from traffic generation on the local road network is, therefore, considered **negligible to low**. The effect on NVSRs will, therefore, be of **negligible to minor adverse** significance. Due to the minimal traffic generation at night, any night-time noise would be of **negligible** impact.

6.5.31 The effect on users of the PRoWs will be no different than those already experienced from existing traffic movements on the local road network.

DC Cable Route Decommissioning

6.5.32 The future decommissioning of the DC Cable Route has minimal potential to result in adverse effects. Noise emissions would be controlled by future best practice, and are likely to be similar or no worse than those that occurred during the construction phase. However, there may be additional receptors, residential or otherwise, which do not currently exist.

6.5.33 With appropriate best practice, it is not anticipated that decommissioning of the DC Cable Route will result in any adverse impact greater than **negligible**.

6.5.34 The effect on NVSRs will, therefore, be of **negligible** significance.

7 Mitigation

7.1 Overview of Mitigation

7.1.1 This section outlines what mitigation measures have been assumed in the basic noise and vibration assessment but also considers what additional mitigation may be required beyond what has been assumed would normally be applied to schemes of this type and which has been assumed for the primary assessment. This mitigation falls into two main areas; design mitigation which applies to the fundamental design of the scheme; and mitigation applied during construction which will demonstrate Best Practicable Means. These aspects are discussed below.

7.2 Design Mitigation

7.2.1 The proposed DC cable route including associated TWAs and TCCs has been developed through an iterative process considering a number of factors including proximity to NVSRs. As far as possible, the distance between NVSRs and the base scheme design has been maximised in order to reduce potential impacts.

7.3 Construction Mitigation

7.3.1 These measures are incorporated into how the proposed DC underground cable will be constructed and will be incorporated into the construction of the UK Onshore Scheme.

7.3.2 Construction will be undertaken in accordance with a Construction Environmental Management Plan (CEMP) which will include mitigation measures with respect to reducing the impact of construction related noise and vibration.

7.3.3 The CEMP will be finalised prior to the start of construction. This will be developed by the selected Contractor(s) to ensure that mitigation measures with respect to construction noise are selected to reflect the detailed scheme design including a more precise construction programme and schedule of construction plant and activities. This will then be shared and agreed with the LPAs along the route. A written scheme for noise management measures will be agreed with the LPAs prior to the start of construction and incorporated into the CEMP.

7.3.4 As a guiding practice, noise emissions will be minimised as far as is reasonably practicable in accordance with the approved code of practice, BS 5228:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites: Part 1 Noise [Ref 15-1].

7.3.5 Best Practicable Means (BPM) will include, but not be limited to:

- the use of quieter alternative methods, plant and/or equipment, where reasonably practicable;

- the use of site hoardings, enclosures, acoustic barriers, portable screens and/or screening nosier items of plant;
- maintaining and operating all vehicles, plant and equipment in an appropriate manner, to ensure that extraneous sound from mechanical vibration, creaking and squeaking is kept to a minimum; and
- using designated routes for construction related traffic.

7.3.6 To minimise adverse vibration as far as is reasonably practicable, the following mitigation measures will be implemented and where adverse effects could arise:

- low vibration working methods will be employed; plant will be carefully selected to minimise the potential for vibration;
- vibration will be controlled at source and the spread of vibration will be limited;
- where processes could potentially give rise to significant levels of vibration, on-site vibration levels will be monitored regularly by a suitably qualified person appointed specifically for the purpose; and
- plant and/or methods of working likely to cause significant levels of vibration at sensitive receptors will be replaced by other less intrusive plant and/or methods of working.

7.3.7 Further guidance is provided in BS 5228:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites: Part 2 Vibration.

7.3.8 Non-acoustic mitigation measures, such as noise insulation or temporary rehousing, may also be considered under particular, exceptional circumstances.

7.4 Further Considerations

7.4.1 Where non-negligible construction noise impacts are identified, all reasonably practicable measures will be implemented to reduce the effects of construction noise and vibration. This particularly applies to works that are required during the evening or night-time periods including 24-hour working.

7.4.2 Once this has been done, any works which are predicted to result in significant residual noise or vibration effects will be assessed in detail and the quantification of any effects issued to the relevant local authorities: ELDC, BBC, NKDC and SHDC as applicable to the area where the works are required and the NVSRs affected. This will be by means of an 'Application for Prior Consent for Works on Construction Sites' under Section 61 of the Control of Pollution Act 1974 (Ref 15-16). This may require multiple applications/consents but the LPAs will be consulted well in advance of any requirement to agree the temporal and spatial scope of any applications and where these may be required. These applications will specify all appropriate matters including the required working hours.

8 Residual Effects

8.1 Mitigation Summary

8.1.1 In addition to the mitigation discussed in Section 7 above, further mitigation, as to be identified through the CEMP, or through the Section 61 process, will be applied during the construction phase. These measures cannot be committed to at this stage of the assessment.

8.2 Construction Effects

8.2.1 As specific mitigation measures cannot be committed to at this stage of the assessment, as a worst-case assessment, residual construction effects remain unchanged from those identified in Section 6 above.

8.2.2 BPM will be applied to all construction works as a fundamental principle. Where non-negligible construction noise impacts are identified, and all reasonably practicable measures have been considered, any works which are predicted to have residual noise effects will be assessed in detail and the quantification of any effects issued to the relevant local authority. This will be by agreement but most likely by means of an 'Application for Prior Consent for Works on Construction Sites' under Section 61 of the Control of Pollution Act 1974 (Ref 15-16).

Decommissioning

8.2.3 In the future, the proposed DC cable route may be decommissioned. The effects in relation to noise and vibration will be no worse than, but are likely to be similar to or less than, those that occurred during the construction phase.

9 Monitoring

9.1 Proposed Monitoring

9.1.1 Monitoring of noise and vibration for the purpose of evaluating noise emissions to the environment and environmental protection may be undertaken, and are described below in outline. Monitoring would be finalised as part of detailed design/pre-construction requirements and incorporated into the CEMP.

Construction Phase

9.1.2 Construction noise monitoring, as a minimum, will be considered:

- at the reasonable and justifiable request of the LPA, i.e. where significant noise or vibration levels could occur at any NVSRs;
- where any Section 61 consent requires;
- where the contractor/s or developer receive a substantiated complaint; and/or
- where construction activities are anticipated to result in noise levels exceeding any construction noise limits agreed with the local planning authorities or included in the final CEMP.

9.1.3 Monitoring of construction vibration will be undertaken where construction works may result in significant vibration effects at existing vibration-sensitive infrastructure/property. These are only likely if/where percussive piling or other impulsive construction techniques may be required and if NVSRs are located close by.

Decommissioning

9.1.4 The same or similar monitoring will be carried out for this phase as carried out for the construction phase in agreement with the LPAs.

10 Cumulative Effects

10.1.1 This section considers inter-project cumulative effects only. The cumulative assessment chapter (ES-2-D.01 Chapter 28 Cumulative Effects) considers intra-project cumulative effects, also identifying the cumulative external projects considered within the assessment.

10.2 Scope of Cumulative Assessment

10.2.1 Inter-relationships are the impacts and associated effects of the DC cable project with other different projects on the same receptors. Given that the DC cable has no operational noise or vibration effects, the only cumulative effects that could arise would be during the construction phase.

10.3 Cumulative Effects

Construction Noise and Vibration Effects

10.3.1 The temporary effects of cable route construction may affect receptors sensitive to noise or vibration in conjunction with consecutive or parallel cumulative construction works of other projects. The worst case scenario, for noise, would occur as a result of an overlap of construction programmes, resulting in the greatest potential for cumulative construction noise impacts on NVSRs. Due to the short distances over which any vibration levels attenuate to baseline, there would be no cumulative vibration effects.

10.3.2 The combined effects of construction works for different projects tend not to be greater than the effects associated with each project individually unless they are very close, i.e. it is most unlikely that any additional NVSRs will be subject to a significant adverse effect due to the cumulative works, above those NVSRs already identified for an adverse effect due to each work individually. Nor would NVSRs predicted to experience an impact from the development alone be likely to experience an increased impact due to the cumulative developments.

10.3.3 Similarly, intra-project effects as a result of the cumulation of DC cable and converter station construction works and infrastructure are unlikely to result in effects greater than reported in each separate assessment.

10.3.4 The construction/installation of the DC cable will occur from the landfall to the converter station. The majority of this will be by simple trenching which is a relatively rapid process and hence no one receptor will be affected for more than a few weeks. Longer term works will occur at the landfall, at joint bays and at special crossings with the greatest amount of time at the landfall and major crossings. However, these effects will still be of relatively short duration relative to other longer term elements of the construction such as the converter station.

10.3.5 Consequently, the cumulative effects due to construction works overlapping with other projects would be unlikely to be greater than for the project alone.

Operational Noise and Vibration Effects

10.3.6 There would be no operational noise or vibration effects associated with the DC cable. There would, therefore, be no resulting cumulative effects.

11 Summary of Assessment

11.1 Summary

Overview of Baseline Conditions

11.1.1 The area surrounding the proposed DC cable route is mostly quiet and rural. Away from the larger roads and conglomerations of houses, representative noise levels are generally below 60 dB L_{Aeq} during the day; 50 dB L_{Aeq} during the evening and 40 dB L_{Aeq} at night. At the more urban fringes and nearer main roads, levels are higher but still relatively low.

Overview of Residual Effects

11.1.2 A summary of residual effects is provided in Table 15.25.

11.1.3 During construction, for the proposed landfall site, a significant adverse effect is predicted for residential properties within 100 m of the worksite during daytime works. If significant works occur during the night, the distance for which a significant effect would occur increases to 615 m.

11.1.4 During construction, for the trenched DC cable works, where these are predominantly limited to the daytime period, significant adverse effects are predicted only for residential properties within 40 m of the DC cable working width. However, these would be very short-term.

11.1.5 During construction, for the TCAs, including the DC cable joint bays but excluding trenchless crossing works, significant adverse effects are predicted for residential properties within 50 m of the TCAs during the day; and 315 m for any night works.

11.1.6 During construction, for the TCAs where trenchless crossing works are proposed, significant adverse effects are predicted for residential properties within 100 m of the TCAs during the day; and 615 m for any night works.

11.1.7 During construction, no significant effects are predicted associated with off-site vehicle movements.

11.1.8 Beyond the residential properties within the distances identified above, properties would experience an effect of **negligible to minor adverse** significance.

11.1.9 Users of PRoW (whether crossing or running adjacent to the cable route) would not experience any effects of adverse significance.

11.1.10 Construction vibration effects would not be significant.

11.1.11 There will be no operational noise or vibration effects.

Residual Effects in East Lindsey District Council

11.1.12 During construction, for the proposed landfall site, a significant adverse effect is predicted for residential properties within 100 m of the worksite during daytime works. If significant works occur during the night, the distance for which a significant effect would occur increases to 615 m.

11.1.13 During construction, for the trenched DC cable works, where these are predominantly limited to the daytime period, significant adverse effects are predicted only for residential properties within 40 m of the DC cable working width. However, these would be very short-term.

11.1.14 During construction, for the TCAs, including the DC cable joint bays but excluding trenchless crossing works, significant adverse effects are predicted for residential properties within 50 m of the TCAs during the day; and 315 m for any night works.

11.1.15 During construction, for the TCAs where trenchless crossing works are proposed, significant adverse effects are predicted for residential properties within 100 m of the TCAs during the day; and 615 m for any night works.

11.1.16 During construction, no significant effects are predicted associated with off-site vehicle movements.

11.1.17 Beyond the residential properties within the distances identified above, properties would experience an effect of **negligible to minor adverse** significance.

11.1.18 Users of PRoW (whether crossing or running adjacent to the cable route) would not experience any effects of adverse significance.

11.1.19 Construction vibration effects would not be significant.

11.1.20 There will be no operational noise or vibration effects.

Residual Effects in Boston Borough Council

11.1.21 During construction, for the trenched DC cable works, where these are predominantly limited to the daytime period, significant adverse effects are predicted only for residential properties within 40 m of the DC cable working width. However, these would be very short-term.

11.1.22 During construction, for the TCAs, including the DC cable joint bays but excluding trenchless crossing works, significant adverse effects are predicted for residential properties within 50 m of the TCAs during the day; and 315 m for any night works.

11.1.23 During construction, for the TCAs where trenchless crossing works are proposed, significant adverse effects are predicted for residential properties within 100 m of the TCAs during the day; and 615 m for any night works.

11.1.24 During construction, no significant effects are predicted associated with off-site vehicle movements.

11.1.25 Beyond the residential properties within the distances identified above, properties would experience an effect of **negligible to minor adverse** significance.

11.1.26 Users of PRoW (whether crossing or running adjacent to the cable route) would not experience any effects of adverse significance.

11.1.27 Construction vibration effects would not be significant.

11.1.28 There will be no operational noise or vibration effects.

Residual Effects in North Kesteven District Council

11.1.29 During construction, for the trenched DC cable works, where these are predominantly limited to the daytime period, significant adverse effects are predicted only for residential properties within 40 m of the DC cable working width. However, these would be very short-term.

11.1.30 During construction, for the TCAs, including the DC cable joint bays but excluding trenchless crossing works, significant adverse effects are predicted for residential properties within 50 m of the TCAs during the day; and 315 m for any night works.

11.1.31 During construction, for the TCAs where trenchless crossing works are proposed, significant adverse effects are predicted for residential properties within 100 m of the TCAs during the day; and 615 m for any night works.

11.1.32 During construction, no significant effects are predicted associated with off-site vehicle movements.

11.1.33 Beyond the residential properties within the distances identified above, properties would experience an effect of **negligible to minor adverse** significance.

11.1.34 Users of PRoW (whether crossing or running adjacent to the cable route) would not experience any effects of adverse significance.

11.1.35 Construction vibration effects would not be significant.

11.1.36 There will be no operational noise or vibration effects.

Residual Effects in South Holland District Council

11.1.37 During construction, for the trenched DC cable works, where these are predominantly limited to the daytime period, significant adverse effects are predicted only for residential properties within 40 m of the DC cable working width. However, these would be very short-term.

11.1.38 During construction, for the TCAs, including the DC cable joint bays but excluding trenchless crossing works, significant adverse effects are predicted for residential properties within 50 m of the TCAs during the day; and 315 m for any night works.

11.1.39 During construction, for the TCAs where trenchless crossing works are proposed, significant adverse effects are predicted for residential properties within 100 m of the TCAs during the day; and 615 m for any night works.

11.1.40 During construction, no significant effects are predicted associated with off-site vehicle movements.

11.1.41 Beyond the residential properties within the distances identified above, properties would experience an effect of **negligible to minor adverse** significance.

11.1.42 Users of PRoW (whether crossing or running adjacent to the cable route) would not experience any effects of adverse significance.

11.1.43 Construction vibration effects would not be significant.

11.1.44 There will be no operational noise or vibration effects.

Table 15.25 Summary of Assessment: Noise & Vibration (Proposed DC Cable Route)				
Description of Receptor	**Value / Sensitivity**	**Description of Residual Effect**	**Significance**	**Significant**
Residential Receptors	Medium	Landfall Construction Works Noise	Moderate Adverse (residential NVSRs within 100 m, daytime) Moderate Adverse (residential NVSRs within 615 m, night time)	Yes
Residential Receptors	Medium	Trenched DC cable route - Construction Works Noise (daytime only)	Moderate Adverse (residential NVSRs within 40 m)	Yes
Residential Receptors	Medium	Temporary Works Areas, including the DC cable joint bays	Moderate Adverse (residential NVSRs within 50 m, daytime) Moderate Adverse (residential NVSRs within 315 m, night time)	Yes
Residential Receptors	Medium	Trenchless Construction works (excluding Landfall)	Moderate Adverse (residential NVSRs within 100 m, daytime) Moderate Adverse (residential NVSRs within 615 m, night time)	Yes
Residential Receptors	Medium	Construction Traffic (daytime only)	Minor Adverse	No
Residential Receptors	Medium	Construction Traffic (night-time)	Negligible	No
Residential Receptors	Medium	Construction Vibration	Negligible	No
Residential Receptors	Medium	Operational Noise	None	No
Residential Receptors	Medium	Operational Vibration	None	No
Users of PRoW (where crossing or running parallel to the CR)	Low	Construction Noise	Negligible / Minor Adverse	No

12 References

Ref 15-1. British Standards Institution (BSI) (2014). BS 5228-1:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites -- Part 1: Noise.

Ref 15-2. The Highways Agency (2011). Design Manual for Roads and Bridges (DMRB), Volume 11, Section 3, Part 7 'Noise and Vibration'.

Ref 15-3. British Standards Institution (BSI) (2014). BS 5228-2:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites - Part 2: Vibration.

Ref 15-4. British Standards Institution (1993). BS 7385-2:1993 'Evaluation and measurement of vibration in buildings - Part 1: Guide for measurement of vibrations and evaluation of their effects on buildings'.

Ref 15-5. HMSO (1974) Control of Pollution Act 1974.

Ref 15-6. Department for Environment, Food and Rural Affairs (Defra) (2010). Noise Policy Statement for England.

Ref 15-7. Department for Communities and Local Government (DCLG) (2012). National Planning Policy Framework.

Ref 15-8. Department for Communities and Local Government (DCLG) (2014). National Planning Practice Guidance: Noise.

Ref 15-9. The Stationery Office Limited (HMSO) (1990). Environmental Protection Act, Chapter 43, Part III.

Ref 15-10. The Stationery Office Limited (HMSO) (1995). Statutory Nuisance (Appeals) Regulations 1995.

Ref 15-11. British Standards Institution (BSI) (2014a). British Standard 4142: Methods for rating and assessing industrial and commercial sound.

Ref 15-12. British Standards Institution (BSI) (1991). BS 7445-2:1991. Description and measurement of environmental noise. Guide to the acquisition of data pertinent to land use

CONTACT US

You can find out more information by:

calling our freephone number:
0800 731 0561

Sending an email to:
vikinglink@communityrelations.co.uk

Writing to our freepost address at:
FREEPOST VIKING LINK

Visiting our website at:
www.viking-link.com

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