

# Outer Dowsing Offshore Wind

## Outline Documents

### Document 8.1.1 Outline Noise and Vibration Management Plan

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## Table of Contents

Acronyms & Definitions .....	3
Abbreviations / Acronyms .....	3
Terminology .....	3
Units .....	5
Reference Documentation.....	7
1 Introduction.....	8
1.1 Purpose of this Outline Noise and Vibration Management Plan .....	8
1.2 Scope of this Outline Noise and Vibration Management Plan.....	8
2 Objectives .....	9
3 Relevant Standards.....	10
3.1 British Standard 5228:2009 + A1:2014 Part 1: Noise .....	10
3.2 British Standard 5228:2009+A1:2014 Part 2: Vibration .....	11
4 Statutory and Policy Context.....	13
5 Management Measures.....	14
5.1 Selection of Measures .....	14
5.2 General Noise and Vibration Management.....	15
5.3 Erection of Physical Barriers .....	17
5.4 Vibration from Percussive Piling (if required) .....	17
5.5 Vibration from other Construction Works .....	18
5.6 Construction Working Hours .....	18
5.7 Notifications and Contacts .....	18
5.8 Monitoring.....	19
6 Pre-Commencement.....	20

## Table of Tables

Table 3.1 Construction noise residential receptors – example threshold values .....	11
Table 3.2 Risk of complaints from vibration levels.....	11
Table 4.1 Legislation and policy context.....	13
Table 5.1 Potential detailed design mitigation measures relating to noise and vibration. ....	14

## Acronyms & Definitions

### Abbreviations / Acronyms

BBC	Boston Borough Council
CLO	Community Liaison Officer
CoCP	Code of Construction Practice
ECC	Export Cable Corridor
EIA	Environmental Impact Assessment
ELDC	East Lindsey District Council
EPA	Environmental Protection Act
ES	Environmental Statement
HDD	Horizontal Directional Drilling
HGV	Heavy Goods Vehicle
LPA	Local Planning Authority
MLWS	Mean Low Water Springs
NSIP	Nationally Significant Infrastructure Projects
NSR	Noise Sensitive Receptors
NVMP	Noise and Vibration Management Plan
PPV	Peak Particle Velocity
SHDC	South Holland District Council

### Terminology

Term	Definition
400kV cables	High-voltage cables linking the OnSS to the NGSS.
400kV cable corridor	The 400kV cable corridor is the area within which the 400kV cables connecting the onshore substation to the NGSS will be situated.
The Applicant	GT R4 Ltd. The Applicant making the application for a DCO. The Applicant is GT R4 Limited (a joint venture between Corio Generation, TotalEnergies and Gulf Energy Development (GULF)), trading as Outer Dowsing Offshore Wind. The Project is being developed by Corio Generation (a wholly owned Green Investment Group portfolio company), TotalEnergies and GULF.
Baseline	The status of the environment at the time of assessment without the development in place.
Cable ducts	A duct is a length of underground piping which is used to house the Cable Circuits.
Development Consent Order (DCO)	An order made under the Planning Act 2008 granting development consent for a Nationally Significant Infrastructure Project (NSIP).
Effect	Term used to express the consequence of an impact. The significance of an effect is determined by correlating the magnitude of an impact with the sensitivity of a receptor, in accordance with defined significance criteria.

Term	Definition
EIA Regulations	Infrastructure Planning (Environmental Impact Assessment) Regulations 2017.
Environmental Impact Assessment (EIA)	A statutory process by which certain planned projects must be assessed before a formal decision to proceed can be made. It involves the collection and consideration of environmental information, which fulfils the assessment requirements of the Environmental Impact Assessment Regulations, including the publication of an Environmental Statement (ES).
Environmental Statement (ES)	The suite of documents that detail the processes and results of the Environmental Impact Assessment (EIA).
Export cables	High voltage cables which transmit power from the Offshore Substations (OSS) to the Onshore Substation (OnSS) via an Offshore Reactive Compensation Platform (ORCP) if required, which may include one or more auxiliary cables (normally fibre optic cables).
Haul Road	The track within the onshore ECC which the construction traffic would use to facilitate construction.
High Voltage Alternating Current (HVAC)	High voltage alternating current is the bulk transmission of electricity by alternating current (AC), whereby the flow of electric charge periodically reverses direction.
Impact	An impact to the receiving environment is defined as any change to its baseline condition, either adverse or beneficial.
Intertidal	The area between Mean High-Water Springs (MHWS) and Mean Low Water Springs (MLWS)
Joint bays	An excavation formed with a buried concrete slab at sufficient depth to enable the jointing of high voltage power cables.
Landfall	The location at the land-sea interface where the offshore export cables and fibre optic cables will come ashore.
Mitigation	Mitigation measures are commitments made by the Project to reduce and/or eliminate the potential for significant effects to arise as a result of the Project. Mitigation measures can be embedded (part of the Project design) or secondarily added to reduce impacts in the case of potentially significant effects.
National Grid Onshore Substation (NGSS)	The National Grid substation and associated enabling works to be developed by the National Grid Electricity Transmission (NGET) into which the Project's 400kV cables would connect.
National Policy Statement (NPS)	A document setting out national policy against which proposals for Nationally Significant Infrastructure Projects (NSIPs) will be assessed and decided upon
Onshore Export Cable Corridor (ECC)	The Onshore Export Cable Corridor (Onshore ECC) is the area within which the export cable running from the landfall to the onshore substation (OnSS) will be situated.
Onshore Infrastructure	The combined name for all onshore infrastructure associated with the Project from landfall to grid connection.
Onshore substation (OnSS)	The Project's onshore HVAC substation, containing electrical equipment, control buildings, lightning protection masts,

Term	Definition
	communications masts, access, fencing and other associated equipment, structures or buildings; to enable connection to the National Grid
Order Limits	The area subject to the application for development consent. The limits shown on the works plans within which the Project may be carried out.
The Planning Inspectorate	The agency responsible for operating the planning process for Nationally Significant Infrastructure Projects (NSIPs).
Pre-construction and post-construction	The phases of the Project before and after construction takes place.
Project	Outer Dowsing Offshore Wind, an offshore wind generating station together with associated onshore and offshore infrastructure.
Receptor	A distinct part of the environment on which effects could occur and can be the subject of specific assessments. Examples of receptors include species (or groups) of animals or plants, people (often categorised further such as 'residential' or those using areas for amenity or recreation), watercourses etc.
Transition Joint Bay (TJB)	The offshore and onshore cable circuits are jointed on the landward side of the sea defences/beach in a Transition Joint Bay (TJB). The TJB is an underground chamber constructed of reinforced concrete which provides a secure and stable environment for the cable.
Trenchless technique	Trenchless technology is an underground construction method of installing, repairing and renewing underground pipes, ducts and cables using techniques which minimize or eliminate the need for excavation. Trenchless technologies involve methods of new pipe installation with minimum surface and environmental disruptions. These techniques may include Horizontal Directional Drilling (HDD), thrust boring, auger boring, and pipe ramming, which allow ducts to be installed under an obstruction without breaking open the ground and digging a trench.

## Units

Decibel (dB)	The scale on which sound pressure level is expressed. It is defined as 20 times the logarithm of the ratio between the root-mean-square pressure of the sound field and a reference pressure ( $2 \times 10^{-5}$ Pa).
dB(A)	A-weighted decibel. This is a measure of the overall level of sound across the audible spectrum with a frequency weighting (i.e. 'A' weighting) to compensate for the varying sensitivity of the human ear to sound at different frequencies
L <sub>Aeq</sub>	L <sub>Aeq</sub> is defined as the notional steady sound level which, over a stated period of time, that would contain the same amount of acoustical energy as the A - weighted fluctuating sound measured over that period.
L <sub>10</sub> & L <sub>90</sub>	If a non-steady noise is to be described, it is necessary to know both its level and the degree of fluctuation. The Ln indices are used for this purpose, and

	<p>the term refers to the level exceeded for n% of the time. Hence L10 is the level exceeded for 10% of the time and as such can be regarded as the 'average maximum level'. Similarly, L90 is the 'average minimum level' and is often used to describe the background noise. It is common practice to use the L10 index to describe traffic noise.</p>
L <sub>Amax</sub>	<p>L<sub>Amax</sub> is the maximum A - weighted sound pressure level recorded over the period stated. L<sub>Amax</sub> is sometimes used in assessing environmental noise where occasional loud noises occur, which may have little effect on the overall Leq noise level but will still affect the noise environment. Unless described otherwise, it is measured using the 'fast' sound level meter response.</p>
PPV	<p>Peak Particle Velocity - Vibration is an oscillatory motion. The magnitude of vibration can be defined in terms of displacement (how far from the equilibrium position that something moves), velocity (how fast something moves), or acceleration (the rate of change of velocity). Standards for the assessment of building damage are usually given in terms of peak velocity (usually referred to as Peak Particle Velocity, or PPV) in <math>\text{mms}^{-1}</math>.</p>
hr	Hour

## Reference Documentation

Document Number	Title
6.1.26	Noise and Vibration
8.1	Outline Code of Construction Practice



# 1 Introduction

## 1.1 Purpose of this Outline Noise and Vibration Management Plan

1. This Outline Noise and Vibration Management Plan (NVMP) has been prepared as part of the Outline Code of Construction Practice (CoCP) (document reference 8.1) submitted alongside the Environmental Statement (ES).
2. This is an outline document that, by reference to the assessments reported in the ES, sets out the key elements that will be secured in the detailed NVMP which the Applicant will be required to submit to the relevant Local Planning Authority (LPA) for approval.
3. This Outline NVMP sets out the noise and vibration management techniques which may (subject to the final design of the proposed Project) be implemented by the Applicant and its contractors during the construction of the onshore works and should be read in conjunction with the Outline CoCP, its supporting appendices, and the assessment of the Project's construction noise (Volume 1, Chapter 26: Noise and Vibration (document reference 6.1.26)).

## 1.2 Scope of this Outline Noise and Vibration Management Plan

4. This Outline NVMP relates to the onshore elements of the Project only (i.e., landward of Mean Low Water Springs (MLWS)). This document does not relate to offshore works seaward of MLWS that are principally marine activities.

## 2 Objectives

5. Construction activities by their very nature can generate adverse noise and vibration impacts on noise sensitive receptors (NSRs) in close proximity to the development site(s). In particular, noise and vibration associated with construction plant and drilling equipment are potential sources for adverse noise and vibration effects.
6. The landfall site, other trenchless crossing sites (sites where the Project will undertake trenchless techniques, such as Horizontal Directional Drilling (HDD)), the Onshore Substation (OnSS), and the onshore Export Cable Corridor (ECC) are located in rural areas. Baseline noise levels at the NSRs potentially affected by the project have been measured as low, except where the receptors are in close proximity to existing highway infrastructure.
7. The principal contractor's objective will be to control and limit noise and vibration levels, so far as is reasonably practicable and to minimise disturbance to sensitive receptors.

### 3 Relevant Standards

#### 3.1 British Standard 5228:2009 + A1:2014 Part 1: Noise

8. BS 5228-1 sets out a methodology for predicting noise levels arising from a wide variety of construction and related activities and contains tables of sound power levels generated by a wide variety of mobile and fixed plant equipment.
9. Compliance with BS 5228-1 is expected as a minimum standard when assessing the impact of construction noise upon the existing noise environment at nearby sensitive receptors.
10. Noise levels generated by construction operations and experienced at local receptors will depend upon a number of variables, the most significant of which are likely to be:
  - The amount of noise generated by plant and equipment being used at the development site, generally expressed as a sound power level;
  - The periods of operation of the plant at the development site, known as the “on-time”;
  - The distance between the noise source and the receptor, known as the “stand-off”;
  - The attenuation due to ground absorption or barrier screening effects; and
  - Reflections of noise due to the presence of hard vertical faces such as walls.
11. BS 5228-1 gives several examples of acceptable noise limits for construction or demolition noise. For this assessment, as baseline noise data is available, it is proposed that the ABC method will be used to determine the threshold value at the receptor locations.
12. Under the ABC method, a threshold value noise level is determined by establishing the existing ambient noise level at each location. This measured ambient noise level is then rounded to the nearest whole 5dB(A), and the threshold noise value for each receptor is then established from Table E.1 of BS 5228-1. This threshold value is the  $L_{Aeq,T}$  noise level that should not be exceeded at the receptor location by operations at the site.
13. If the threshold value is exceeded, then the effect of construction noise upon nearby receptors may be significant. BS 5228-1 states that the significance of the effect will depend upon *“other project-specific factors, such as the number of receptors affected and the duration and character of the impact.”* Professional judgement will be used to determine whether an effect is considered to be significant, and commentary explaining the reasons for this judgement will be provided. In accordance with this method, the threshold noise levels for a potentially significant effect are as detailed in Table 3-1 .

Table 3-1 Construction noise residential receptors – example threshold values

Assessment Category and Threshold Value Period	Threshold Value in Decibels (dB)		
	Category A <sup>A)</sup>	Category B <sup>B)</sup>	Category C <sup>C)</sup>
Night-time (23:00-07:00)	45	50	55
Evenings and weekends <sup>D)</sup>	55	60	65
Daytime (07:00-19:00) and Saturdays (07:00-13:00)	65	70	75

A) Category A: threshold values to use when ambient noise levels (when rounded to the nearest 5dB) are less than these values.  
 B) Category B: threshold values to use when the ambient noise levels (when rounded to the nearest 5dB) are the same as category A values.  
 C) Category C: threshold values to use when the ambient noise levels (when rounded to the nearest 5dB) are higher than category A values.  
 D) 19:00-23:00 weekdays, 13:00-23:00 Saturdays and 07:00-23:00 Sundays.

14. Note that the threshold values in Table 3-1 above, are considered to be guideline noise limits externally at the closest noise sensitive window. They are not considered as internal noise limits within the relevant building.

### 3.2 British Standard 5228:2009+A1:2014 Part 2: Vibration

15. British Standard 5228:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites – Part 2: Vibration (BS 5228-2) provides recommendations for basic methods of vibration control, relating to construction and open sites where work activities/operations generate significant vibration levels.

16. The majority of people are known to be very sensitive to vibration, the threshold of perception being typically in the Peak Particle Velocity (PPV) range of between 0.14mm/s and 0.30mm/s. Vibration levels above these values can cause disturbance. BS 5228-2 provides guidance on the effects of vibration as shown in Table 3-2.

Table 3-2 Risk of complaints from vibration levels

Vibration Level, mm/s <sup>A), B), C)</sup>	Effect
0.14	Vibration might be just perceptible in the most sensitive situations for most vibration frequencies associated with construction. At lower frequencies, people are less sensitive to vibration.
0.30	Vibration might be just perceptible in residential environments.
1.00	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.
10.00	Vibration is likely to be intolerable for any more than a very brief exposure to this level.

Vibration Level, Effect  
mm/s<sup>A), B), C)</sup>

- A) The magnitudes of the values presented apply to a measurement position that is representative of the point of entry into the recipient.
- B) A transfer function (which relates an external level to an internal level) needs to be applied if only external measurements are available.
- C) Single or infrequent occurrences of these levels do not necessarily correspond to the stated effect in every case. The values are provided to give an initial indication of potential effects, and where these values are routinely measured or expected then an assessment in accordance with BS 6472-1 or -2, and/or other available guidance, might be appropriate to determine whether the time varying exposure is likely to give rise to any degree of adverse comment

17. High vibration levels generally arise from ‘heavy’ construction works such as piling, deep excavation, dynamic ground compaction or drilling.
18. Annex E of BS 5228-2 contains empirical formulae derived by Hiller and Crabb (2000) from field measurements relating to resultant PPV, with a number of other parameters for vibratory compaction, dynamic compaction, percussive and vibratory piling, the vibration of stone columns and tunnel boring operations. These prediction equations are based on the energy approach. Use of these empirical formulae enables resultant PPV to be predicted and for some activities (vibratory compaction, vibratory piling and vibrated stone columns) they can provide an indicator of the probability of these levels of PPV being exceeded.
19. The empirical equations for predicting construction-related vibration provide estimates in terms of PPV. Therefore, the consequences of predicted levels in terms of human perception and disturbance can be established through direct comparison with the BS 5228-2:2009+A1:2014 guidance vibration levels shown in Table 3-2.

### 3.3 Air Quality Technical Advisory Group 09

20. Air Quality Technical Advisory Group 09 (AQTAG09) provides guidance on the effects of industrial noise on wildlife and is intended to be used to assess the potential adverse impact of sound, of an industrial and/or commercial nature on wildlife. The guidance specifies that, where specific noise from industry, measured at the habitat is below the levels in Table 3-3 it is considered unlikely that it will have an adverse impact on designated species. Where noise levels are exceeded further, more detailed assessment will be required.

Table 3-3 AQTAG Specific Noise Levels

Parameter	Noise Level, dB
L <sub>Amax,F</sub>	80
L <sub>Aeq,1hr</sub>	55

## 4 Statutory and Policy Context

21. The relevant legislation and planning policy for offshore renewable energy Nationally Significant Infrastructure Projects (NSIPs), specifically in relation to noise and vibrations are outlined in Table 4-1.

Table 4-1 Legislation and policy context

Legislation/policy	Key provisions
Overarching National Policy Statement for Energy (EN-1).	Overarching National Policy Statement for Energy (EN-1) is part of a suite of NPSs issued by the Secretary of State of Department for Energy Security and Net Zero (DESNZ). It sets out the government's policy for delivery of major energy infrastructure.
National Policy Statement for Renewable Energy Infrastructure (EN-3).	Taken together with the Overarching National Policy Statement for Energy (EN-1), provides the primary policy for decisions by the Secretary of State on applications they receive for nationally significant renewable energy infrastructure.
BS 5228 'Code of Practice for Noise and Vibration Control on Construction and Open Sites' - Part 1: Noise and Part 2: Vibration	Provides guidance on how to manage and mitigate noise emanating from construction and open sites, as well as methods for calculation and assessment.
Environmental Protection Act 1990 (EPA)	Part III of the EPA provides powers for Local authorities to issue abatement notices where a statutory nuisance exists.
Control of Pollution Act 1974 (CoPA)	Sections 60 and 61 of Part III of the CoPA provide powers to Local authorities for controlling noise from construction activities.

22. The main objectives with regard to managing construction noise are to:

- Comply with relevant legislation and standards relating to construction noise and the requirements of the Development Consent Order (DCO); and
- To control and limit noise and vibration levels, so far as is reasonably practicable and to minimise disturbance to residents and sensitive receptors.

23. For the purposes of assessing impacts associated with construction induced vibration, the guidance within BS 5228-2 (as referenced in Section 3.2) has been used to derive reasonable limits of 0.3mm/s which with reference to Table 3-2 is the level of vibration which is just perceptible in residential environments. Where vibration levels are predicted to exceed 'just perceptible' levels, appropriate mitigation measures may need to be introduced to control the effects; however these will be specified within the final NVMP as further described in Sections 5.4 and 5.5.

## 5 Management Measures

### 5.1 Selection of Measures

24. This section sets out the selection of general and specific noise and vibration mitigation measures which will be considered by the Applicant, in respect of the onshore works associated with the Project.
25. The extent to which any or all of the measures are contained within the final NVMP will be subject to detailed design and will also be dependent on the construction methods selected. The final NVMP will be submitted for approval by the relevant LPAs; East Lindsey District Council (ELDC), Boston Borough Council (BBC) and South Holland District Council (SHDC) (in consultation with Lincolnshire County Council (LCC)).
26. Examples of what these mitigation measures may be and an indication of how much mitigation they may provide, are given in Table 5-1 below.

Table 5-1 Potential detailed design mitigation measures relating to noise and vibration.

Mitigation Measure <sup>1</sup>	Indicative Noise Level Reduction	Justification for indicative Noise Level Reduction
Localised acoustic screening providing partial line of sight between noise source and receiver	Up to 5 dB(A)	Section F.2.2.2 of BS 5228-1:2009+A1:2014 states: <i>'if there is a barrier or other topographic feature between the source and the receiving position, assume an approximate attenuation of 5 dB when the top of the plant is just visible to the receiver over the noise barrier, and of 10 dB when the noise screen completely hides the sources from the receiver'</i>
Localised acoustic screening preventing any line of sight between noise source and receiver	Up to 10 dB(A)	
Fitting more efficient exhaust sound reduction equipment to earth moving plant	5 to 10 dB(A)	Table B.1 of BS 5228-1:2009+A1:2014
Enclose breakers and rock drills in portable or fixed acoustic enclosures with suitable ventilation	Up to 20 dB(A)	Table B.1 of BS 5228-1:2009+A1:2014
Use rotary drills and boring plant inside acoustic shed with adequate ventilation	Up to 15 dB(A)	Table B.1 of BS 5228-1:2009+A1:2014

<sup>1</sup> To be tested against the EIA significance of effect criteria

Mitigation Measure <sup>1</sup>	Indicative Noise Level Reduction	Justification for indicative Noise Level Reduction
Limiting the simultaneous use of plant	Up to 3 dB(A)	Halving the amount of plant being utilised simultaneously thus halving the sound energy being generated could provide a 3 dB reduction.
Re-positioning plant as far away from Noise Sensitive Receptors (NSR) as reasonably practicable	Up to 6 dB(A)	Doubling the distance between a noise source and a receiver can provide up to a 6 dB reduction.
Avoiding or limiting the use of particularly noisy items of plant at night as far as reasonably practicable	Varies	Would depend on which items of plant would not be utilised during the night-time.
Limiting or eliminating certain works during more sensitive periods	Varies	Would depend on what works/plant was limited or eliminated.
Use of electric or hybrid construction plant	Varies	Dependant on item of plant.

## 5.2 General Noise and Vibration Management

27. Construction works will be undertaken in accordance with the best practicable means (as defined in Section 72 of the Control of Pollution Act 1974) to minimise noise and vibration effects. Noise control measures will be consistent with the recommendations of the current version of BS 5228 - Part 1: Noise and Part 2: Vibration. Construction contractors would carry out the works in a manner which seeks to minimise noise and vibration wherever feasible, taking account of statutory requirements and legislation. The following measures will be applied as and where practicable:

- There will be a preference for the selection and use of plant fitted with effective silencers and noise insulation where practicable. Where practicable, works will limit the use of particularly noisy plant at certain times, i.e., do not use particularly noisy plant early in the morning;
- The number of plant items in use at any one time will be limited to the works requirements where practicable;
- Where feasible, HGV deliveries of consumables shall be scheduled to avoid contributing at peak noise periods;
- Access routes, particularly for HGV and construction plant, shall be routed where possible to minimise proximity to NSRs;
- Vehicles not waiting or queuing up with engines running on the site or the public highway;
- Vehicles properly maintained to comply with noise emissions standards;
- The design of critical infrastructure such as the OnSS shall favour construction methods that facilitate noise and vibration mitigation or minimisation;



- Plant maintenance operations will be undertaken routinely and as far away from NSRs as is practicable;
  - The works will be phased, where practicable, to maximise the benefit from perimeter structures;
  - There will be a preference for compressors and mobile generators brought on to site to be silenced or sound reduced models fitted with acoustic enclosures;
  - The speed of vehicle movements will be limited to below 15 miles per hour on unbound haul roads and/or trackway;
  - Operations will be designed to be undertaken with any directional noise emissions pointing away from NSRs where practicable;
  - The use of pink noise reversing alarms that produce a “static” sound as opposed to a beep will be used where reasonably practicable to reduce the noise generated by reversing beepers on site vehicles;
  - Construction plant will be regularly serviced and maintained and operated in accordance with manufacturer’s instructions - plant that is intermittently used should be shut down in the intervening periods between work or throttled down to a minimum;
  - The use of local noise screening or site hoardings to reduce noise where necessary;
  - The appointment of a site contact to whom complaints/ queries about construction activity can be directed - any complaints will be investigated, and action taken where appropriate;
  - Establishing a community engagement process, through the Stakeholder Communications Plan, including informing local residents about the construction works, detailing the timing and duration of any particularly noisy elements, and providing a contact telephone number to them;
  - Reasonable steps will be taken to limit the number of vehicles waiting to deliver materials to the proposed development;
  - Construction that would be closest to nearby residential receptors will be undertaken as efficiently and quickly as reasonably possible; and
  - With the exception of generators, pumps and electric plant, all plant and equipment would be expected to be shut down when not in use.
28. Site personnel will be informed about the need to minimise noise as well as the health hazards of exposure to excessive noise. Their training will include guidance relating to the proper use and maintenance of tools and equipment, the positioning of machinery on site to reduce noise emissions to neighbouring residents, the avoidance of unnecessary noise when carrying out manual operations and when operating plant and equipment and where required specific receptors will be identified to ensure compliance.
29. Construction contractors will adhere to the codes of practice for construction working set out in BS 5228 ‘Code of Practice for noise and vibration control on construction and open sites’ insofar as these are reasonably practicable and applicable to the construction works.

### 5.3 Erection of Physical Barriers

30. To minimise the effects of construction noise at the nearest receptors, temporary noise barriers may be erected at appropriate locations. The barriers would be located to ensure that an enhanced level of noise attenuation is provided where required.
31. The barrier locations would be determined by the Applicant during detailed design stage in consultation with the LPAs, taking into account the methods of construction to be used which will be detailed within the Construction Method Statements (CMSs) which will form part of the final CoCP. An outline of these methods is included in the Outline CMS which forms Appendix 1 to the Outline CoCP (document reference 8.1.1), in particular:
- Where required temporary noise barriers will be constructed prior to the site preparation of the temporary construction compound or cable route and will remain in place until the site preparation phase is completed;
  - Temporary noise barriers, where required, will be installed at work areas and/or equipment in order to provide screening for sources located at low heights (note however that it is likely to be impractical to provide noise barriers that are high enough to screen operations such as the trenchless drilling rig); and
  - Consideration will be given to the potential effect of noise reflection from acoustic barriers impacting upon other receptors.
  - All temporary barriers will be maintained in good order to ensure they continue to provide the appropriate amount of noise attenuation.

#### 5.3.1 Landfall - Anderby Marsh and Wolla Bank Reedbed Nature Reserves - Screening Bund

32. Though as stated in Paragraph 31 the barrier locations would be determined by the Applicant during detailed design stage, the Anderby Marsh and Wolla Bank Reedbed Nature Reserves are located in close proximity to the landfall and therefore a 4m meter screening bund has already been proposed on the eastern boundary of the construction area.

### 5.4 Vibration from Percussive Piling (if required)

33. As stated in paragraph 15, BS 5228-2 gives recommendations for basic methods of vibration control relating to construction and open sites where work activities/ operations generate significant vibration levels and Table 3-2 provides guidance on the effects of vibration.
34. At this stage in the Project development process, the exact location of infrastructure and the precise technologies and construction methods that will be employed are not yet defined. This includes the requirement for percussive piling during construction of the OnSS as well as the type of piler and ram weight (if required). These will be determined during detailed design.

35. It is anticipated that the PPV levels from piling operations would be below  $1.0 \text{ mms}^{-1}$  at the nearest vibration sensitive receptors to the OnSS, and that percussive piling works would only take place during the daytime period. The final NVMP will include predictions, and suitable mitigation measures where required, for PPV arising from percussive piling operations that will be informed by detailed design, for approval by the relevant LPA in advance of any percussive piling taking place. Based on the results of the vibration predictions, a vibration monitoring procedure at the relevant vibration sensitive receptors (VSRs) may also be included within the final NVMP.
36. Further to the above the relevant LPA and residents of the relevant VSRs will be informed ahead of the commencement of any proposed piling operations. The duration of the piling works would also be relayed.

## **5.5 Vibration from other Construction Works**

37. The relevant LPA and residents of the relevant VSRs would be informed if any construction works which have the potential to generate significant vibration levels are proposed in the near vicinity. These works could include underground tunnelling associated with the trenchless technique or sheet piling operations associated with the major drills.
38. At this stage in the Project development process, the exact location of the trenchless techniques and/or sheet piling rigs and precise technologies and construction methods that will be employed are not yet defined. The final NVMP will include refined predictions, and suitable mitigation measures where required, for PPV arising from drilling and sheet piling operations that will be informed by detailed design, for approval by the LPA in advance of any percussive piling taking place.
39. As per paragraph 36 of section 5.4 based on the results of the final vibration predictions for tunnelling and sheet piling, a vibration monitoring procedure at the relevant VSRs may also be included within the final NVMP.

## **5.6 Construction Working Hours**

40. The principal contractor shall only undertake construction activities associated with the Project in accordance with the controls on working hours as stated in the DCO and final CoCP unless agreed in advance with the relevant LPA.
41. If any out of hours works is agreed with the relevant LPA, the residents of the relevant receptors would be informed before the commencement of any out of hours works.

## **5.7 Notifications and Contacts**

42. Some aspects of construction activity, such as trenchless works, may give rise to greater noise levels at nearby properties.
43. Before the commencement of the trenchless works at a particular location, local residents will be informed by the Community Liaison Officer (CLO) that the works are taking place and on completion local residents will be informed that the works and associated noise impacts due to trenchless works will cease.

44. Contact details of the appointed CLO will also be made available to the relevant LPAs and local community for the duration of the construction period by the Applicant.

## **5.8 Monitoring**

### **5.8.1 Mitigation Measures**

45. The mitigation measures will be monitored by the appointed contractor throughout the construction phase. If nonconformity with any of the mitigation measures is identified, it will be recorded during a site audit and appropriate remedial actions will be implemented.

### **5.8.2 Noise Levels**

46. During the detailed design stage, the most sensitive receptors would be identified in relation to their proximity to construction operations and associated predicted noise levels.

47. At these locations it may be necessary to monitor noise levels to ensure that the noise levels generated by construction operations do not exceed the calculated threshold limits at the identified sensitive receptors.

48. Further to the above the exact monitoring procedure and subsequent actions if it is determined that the limits are being exceeded would be included within the final NVMP.

#### **5.8.2.1 Anderby Nature Reserve**

49. As outlined in Section 5.3 the Anderby Nature Reserve is located in close proximity to the Landfall Construction Area and noise mitigation has been proposed in the form of a 4m high screening bund.

50. In view of the above noise monitoring will be undertaken within the nature reserve at the closest approach to the landfall construction area whilst landfall operations are being undertaken to ensure that noise levels are within the specified limits.

51. Further to the above the exact monitoring procedure and subsequent actions if it is determined that the limits are being exceeded would be included within the final NVMP.

## 6 Pre-Commencement

52. The aspects of this outline NVMP that will be adhered to in carrying out 'pre-commencement' activities (where relevant to those activities), are as follows:

- Selection of Measures (as set out in Section 5.1);
- General Noise and Vibration Management (as set out in Section 0); and
- Monitoring (as set out in Section 5.8).