NORTH FALLS

Offshore Wind Farm

ENVIRONMENTAL STATEMENT

Appendix 26.3 Construction Noise and Vibrations Calculations

Document Reference:	3.3.62
Volume:	3.3
APFP Regulation:	5(2)(a)
Date:	July 2024
Revision:	0

Project Reference: EN010119

NORTH FALLS
Offshore Wind Farm

Project	North Falls Offshore Wind Farm
Document Title	Environmental Statement Appendix 26.3 Construction Noise and Vibrations Calculations
Document Reference	3.3.62
APFP Regulation	5(2)(a)
Supplier	Royal HaskoningDHV
Supplier Document ID	PB9244-RHD-ZZ-ON-TN-ON-0124

Revision	Date	Status/Reason for Issue	Originator	Checked	Approved
0	July 2024	Submission	RHDHV	NFOW	NFOW

Contents

Tables

Glossary of Acronyms

BNL	Basic Noise Level
CoCP	Code of Construction Practice
dB	Decibel
DCO	Development Consent Order
DEFRA	Department for Environment, Food and Rural Affairs
ES	Environmental Statement
HDD	Horizontal Directional Drilling
HGV	Heavy Goods Vehicle
LiDAR	Light detection and ranging
NVSR	Noise and vibration sensitive receptor
OS	Ordnance Survey
TCC	Temporary construction compound

Glossary of Terminology

The Project Or 'North Falls'	North Falls Offshore Wind Farm, including all onshore and offshore infrastructure.
Bentley Road improvement works	Works involving the widening and improvement of the carriageway along Bentley Road, required to facilitate heavy goods vehicle and abnormal indivisible load access to the onshore cable route and the onshore substation.
Landfall	The location where the offshore export cables come ashore at Kirby Brook.
Landfall compound	Compound at landfall within which horizontal directional drill (HDD) or other trenchless technique would take place.
Onshore cable route	Onshore route within which the onshore export cables and associated infrastructure would be located.
Onshore substation	A compound containing electrical equipment required to transform and stabilise electricity generated by the Project so that it can be connected to the national grid.
Onshore substation works area	Area within which all temporary and permanent works associated within the onshore substation are located, including onshore substation, construction compound, access, landscaping, drainage and earthworks.
For further explanation of acoustics specific terms, refer to Appendix 26.1 (Document Reference: 3.3.60).	

1 Introduction

1. This Appendix to the Environmental Statement (ES) for the proposed North Falls Offshore Wind Farm (herein 'the Project or 'North Falls') details the construction noise and vibration calculations reported in ES Chapter 26 Noise and Vibration (Document Reference: 3.1.28), including plant data, calculation procedures and results.

2. This assessment has been undertaken based on an understanding of the likely construction schedule, activities and plant to be used. This information may change once a construction contractor is appointed in advance of construction. The outline CoCP (Document Reference: 7.13) submitted with the Project's Development Consent Order (DCO) application will require that the final CoCP, submitted post-consent, will include a detailed construction noise and vibration assessment, including predictions of construction noise and vibration levels at nearby noise and vibration sensitive receptors (NVSRs) for comparison with suitable noise level limits. This assessment will be undertaken based on information provided by the appointed contractor and will identify the final mitigation measures to be incorporated.

2 Construction noise calculations

2.1 Construction scenarios and plant

3. Table 1 outlines the assumed construction phase noise sources that informed the noise predictions. Where practicable, noise source levels were taken using those available in BS 5228-1 :2009+A1:2014 'Code of practice for noise and vibration control on construction and open sites – Part 1: Noise' Annex C and incorporate on-time corrections as per the calculation methodology in BS 5228-1.

Table 1 Details of assumed construction plant

Activity / activity number	Plant	No.	Reference*	L_{Aeq} (dB) at 10m	On-time (%)
Landfall – Scoped out (no receptors within 650m)					
Nearshore					
Dredging	Grab hopper dredging ship	1	Table C.7 – Ref 2	82	100
Onshore cable route					
Establish access and temporary construction compounds (TCC) (including trenchless crossing compounds) / AC1	D6 Dozer	1	Table C2 - Ref 12	81	100
	30T excavator	2	Table C2 - Ref 16	75	100
	20T Dumper	3	Table C2 - Ref 31	87	100
	Smooth Drum vibratory road roller	1	Table C5 - Ref 20	75	100
	21T excavator	1	Table C2 - Ref 3	78	100
	5T Forward Tipping Dumper	1	Table C4 - Ref 7	78	100
	Loading shovel	1	Table C2 - Ref 27	80	100
	Tractor & fencing kit	1	Table C4 - Ref 74	80	100

Activity / activity number	Plant	No.	Reference*	L_{Aeq} (dB) at 10m	On-time (%)
	Tractor & trailer	1	Table C4 - Ref 75	79	70
	Tractor & Fuel bowser (or self-propelled)	1	Table C6 - Ref 36	89	10
	Tractor & Water bowser (for dust suppression)	1	Table C6 - Ref 38	83	25
	Grader	1	Table C6- Ref 31	86	100
	Telehandler	1	Table C4 - Ref 54	79	70
	Mobile self-contained welfare unit	2	Table C4 - Ref 78	66	25
	Mobile generator	2	Table C4 - Ref 84	74	25
	Temporary lighting	6	Table C4 - Ref 86	65	25
	Road surface paver & roller (not required for trenchless crossing compounds)	1	Table C5 - Ref 32	84	25
TCC Operations / AC2	Generator / Wheel Wash	2	Table C4 - Ref 84	74	100
	Telehandler	1	Table C4 - Ref 54	79	75
	Road Sweeper	1	Table C4 - Ref 90	76	10
Site preparation, including fencing, haul road construction and topsoil strip / AC3	D6 Dozer	1	Table C2 - Ref 12	81	100
	30T excavator	2	Table C2 - Ref 16	75	100
	20T Dumper	3	Table C2 - Ref 31	87	100
	Smooth Drum vibratory road roller	1	Table C5 - Ref 20	75	100
	21T excavator	1	Table C2 - Ref 3	78	100
	5T Forward Tipping Dumper	1	Table C4 - Ref 7	78	100
	Loading shovel	1	Table C2 - Ref 27	80	100
	Tractor & fencing kit	1	Table C4 - Ref 74	80	100
	Tractor & trailer	1	Table C4 - Ref 75	79	70
	Tractor & Fuel bowser (or self-propelled)	1	Table C6 - Ref 36	89	10
	Tractor & Water bowser (for dust suppression)	1	Table C6 - Ref 38	83	25
	Grader	1	Table C6- Ref 31	86	100
	Telehandler	1	Table C4 - Ref 54	79	70
	Mobile self-contained welfare unit	1	Table C4 - Ref 78	66	25
	Mobile generator	2	Table C4 - Ref 84	74	25
	Temporary lighting	12	Table C4 - Ref 86	65	25
Trenchless crossing operations / AC4	Generator	1	Table C4 - Ref 84	74	100
	Telehandler	2	Table C4 - Ref 54	79	75
	Vibratory Piling Rig	1	Table C3 - Ref 8	88	10
	Directional Drill Generator	1	Table C4 - Ref 96	77	100
	Mounting supports for directional drill (hydraulic hammer)	1	Table C4 - Ref 92	87	25
	Mud Pump	1	Provided by Riggall & Associates based on	80	100

Activity / activity number	Plant	No.	Reference*	L_{Aeq} (dB) at 10m	On-time (%)
			measurements made on previous projects		
	Mixing Tank	1	Provided by Riggall & Associates based on measurements made on previous projects	75	100
	Cuttings / Recycling Tank	1	Provided by Riggall & Associates based on measurements made on previous projects	80	100
Trench excavation and duct installation / AC5	30T excavator	2	Table C2 - Ref 16	75	100
	20T Dumper	2	Table C2 - Ref 31	87	100
	21T excavator	2	Table C2 - Ref 3	78	100
	5T Forward Tipping Dumper	2	Table C4 - Ref 7	78	100
	Loading shovel	2	Table C2 - Ref 27	80	50
	Trench Roller	2	Table C2 - Ref 40	73	50
	Tractor & trailer	1	Table C4 - Ref 75	79	50
	Tractor & Fuel bowser (or self-propelled)	1	Table C6 - Ref 36	89	10
	Tractor & Water bowser (for dust suppression)	1	Table C6 - Ref 38	83	25
	Telehandler	1	Table C4 - Ref 54	79	50
	Mobile self-contained welfare unit	1	Table C4 - Ref 78	66	25
	Crawler Crane	1	Table C4 - Ref 52	75	10
	Mobile generator	2	Table C4 - Ref 84	74	25
	Temporary lighting	8	Table C4 - Ref 86	65	25
	Pump	2	Table C6 - Ref 41	78	100
Trench backfill / AC6	30T excavator	2	Table C2 - Ref 16	75	100
	20T Dumper	2	Table C2 - Ref 31	87	100
	21T excavator	2	Table C2 - Ref 3	78	100
	5T Forward Tipping Dumper	2	Table C4 - Ref 7	78	100
	Loading shovel	2	Table C2 - Ref 27	80	100
	Trench roller	2	Table C2 - Ref 40	73	75
	Tractor & trailer	1	Table C4 - Ref 75	79	25
	Tractor & Fuel bowser (or self-propelled)	1	Table C6 - Ref 36	89	10
	Tractor & Water bowser (for dust suppression)	1	Table C6 - Ref 38	83	25
	Telehandler	1	Table C4 - Ref 54	79	25
	Mobile self-contained welfare unit	1	Table C4 - Ref 78	66	25
	Crawler Crane	1	Table C4 - Ref 52	75	10
	Mobile generator	2	Table C4 - Ref 84	74	25
	Temporary lighting	8	Table C4 - Ref 86	65	25

Activity / activity number	Plant	No.	Reference*	L_{Aeq} (dB) at 10m	On-time (%)
	Pump	2	Table C6 - Ref 41	78	100
Jointing Bay Excavation / AC7	30T excavator	2	Table C2 - Ref 16	75	100
	20T Dumper	2	Table C2 - Ref 31	87	100
	Smooth drum vibratory roller	1	Table C5 - Ref 20	75	10
	21T excavator	1	Table C2 - Ref 3	78	50
	5T Forward Tipping Dumper	1	Table C4 - Ref 7	78	50
	Tractor & Fuel bowser (or self-propelled)	1	Table C6 - Ref 36	89	10
	Tractor & Water bowser (for dust suppression)	1	Table C6 - Ref 38	83	25
	Mobile self-contained welfare unit	1	Table C4 - Ref 78	66	25
	Mobile generator	2	Table C4 - Ref 84	74	25
	Temporary lighting	4	Table C4 - Ref 86	65	25
	Pump	2	Table C6 - Ref 41	78	100
Jointing Bay Base Construction / AC8	Tractor & trailer	1	Table C4 - Ref 75	79	50
	Tractor & Fuel bowser (or self-propelled)	1	Table C6 - Ref 36	89	10
	Tractor & Water bowser (for dust suppression)	1	Table C6 - Ref 38	83	25
	Mobile concrete pump / cement mixer truck	1	Table C4 - Ref 20	80	50
	Telehandler	1	Table C4 - Ref 54	79	50
	Mobile self-contained welfare unit	1	Table C4 - Ref 78	66	25
	Mobile generator	2	Table C4 - Ref 84	74	50
	Temporary lighting	4	Table C4 - Ref 86	65	25
	Pump	2	Table C6 - Ref 41	78	100
Pulling and Connection of Cables / AC9	Tractor & Fuel bowser (or self-propelled)	1	Table C6 - Ref 36	89	10
	Tractor & cable drum trailer	1	Table C4 - Ref 74	80	50
	Cable winch	1	Assumed Value	83	50
	Mobile self-contained welfare unit	1	Table C4 - Ref 78	66	25
	Mobile generator	2	Table C4 - Ref 84	74	25
	Temporary lighting	4	Table C4 - Ref 86	65	25
	Pump	2	Table C6 - Ref 41	78	100
Backfill over Jointing Bay / AC10	D6 Dozer	2	Table C2 - Ref 12	81	100
	30T excavator	2	Table C2 - Ref 16	75	100
	20T Dumper	2	Table C2 - Ref 31	87	100
	21T excavator	1	Table C2 - Ref 3	78	100
	5T Forward Tipping Dumper	1	Table C4 - Ref 7	78	100
	Loading shovel	1	Table C2 - Ref 27	80	100
	Trench Roller	1	Table C2 - Ref 40	73	75

Activity / activity number	Plant	No.	Reference*	L_{Aeq} (dB) at 10m	On-time (%)
	Tractor & Fuel bowser (or self-propelled)	1	Table C6 - Ref 36	89	10
	Tractor & Water bowser (for dust suppression)	1	Table C6 - Ref 38	83	25
	Mobile self-contained welfare unit	1	Table C4 - Ref 78	66	25
	Mobile generator	2	Table C4 - Ref 84	74	25
	Temporary lighting	4	Table C4 - Ref 86	65	25
	Pump	2	Table C6 - Ref 41	78	100
Trench Route Reinstatement / Topsoil Reinstatement / AC11	D6 Dozer	2	Table C2 - Ref 12	81	100
	30T excavator	2	Table C2 - Ref 16	75	100
	20T Dumper	2	Table C2 - Ref 31	87	100
	Smooth Drum vibratory roller	1	Table C5 - Ref 20	75	50
	21T excavator	1	Table C2 - Ref 3	78	100
	5T Forward Tipping Dumper	1	Table C4 - Ref 7	78	100
	Loading shovel	2	Table C2 - Ref 27	80	100
	Tractor & Fuel bowser (or self-propelled)	1	Table C6 - Ref 36	89	10
	Tractor & Water bowser (for dust suppression)	1	Table C6 - Ref 38	83	25
	Mobile self-contained welfare unit	1	Table C4 - Ref 78	66	25
	Mobile generator	2	Table C4 - Ref 84	74	25
	Temporary lighting	8	Table C4 - Ref 86	65	25
Haul Road Removal, Removal of fencing and Reinstatement / AC12	D6 Dozer	2	Table C2 - Ref 12	81	100
	30T excavator	2	Table C2 - Ref 16	75	100
	20T Dumper	2	Table C2 - Ref 31	87	100
	Smooth Drum vibratory roller	1	Table C5 - Ref 20	75	50
	21T excavator	1	Table C2 - Ref 3	78	100
	5T Forward Tipping Dumper	1	Table C4 - Ref 7	78	100
	Loading shovel	2	Table C2 - Ref 27	80	100
	Tractor & fencing kit	1	Table C4 - Ref 74	80	50
	Tractor & trailer	1	Table C4 - Ref 75	79	50
	Tractor & Fuel bowser (or self-propelled)	1	Table C6 - Ref 36	89	10
	Tractor & Water bowser (for dust suppression)	1	Table C6 - Ref 38	83	25
	Tractor & soil tiller, roller, seeder	1	Table C4 - Ref 74	80	25
	Mobile self-contained welfare unit	2	Table C4 - Ref 78	66	25
	Mobile generator	2	Table C4 - Ref 84	74	25
	Temporary lighting	12	Table C4 - Ref 86	65	25
TCC and Access Road Removal	D6 Dozer	2	Table C2 - Ref 12	81	100
	30T excavator	2	Table C2 - Ref 16	75	100

Activity / activity number	Plant	No.	Reference*	L_{Aeq} (dB) at 10m	On-time (%)
(including trenchless crossing compounds) / AC13	20T Dumper	2	Table C2 - Ref 31	87	100
	Smooth Drum vibratory roller	1	Table C5 - Ref 20	75	50
	21T excavator	1	Table C2 - Ref 3	78	100
	5T Forward Tipping Dumper	1	Table C4 - Ref 7	78	100
	Loading shovel	2	Table C2 - Ref 27	80	100
	Tractor & fencing kit	1	Table C4 - Ref 74	80	50
	Tractor & trailer	1	Table C4 - Ref 75	79	50
	Tractor & Fuel bowser (or self-propelled)	1	Table C6 - Ref 36	89	10
	Tractor & Water bowser (for dust suppression)	1	Table C6 - Ref 38	83	25
	Tractor & soil tiller, roller, seeder	1	Table C4 - Ref 74	80	25
	Mobile self-contained welfare unit	2	Table C4 - Ref 78	66	25
	Mobile generator	2	Table C4 - Ref 84	74	25
	Temporary lighting	6	Table C4 - Ref 86	65	25
Onshore substation (construction)					
Ground works / formation of platform / AC14	Excavator (earthworks)	6	Not provided	74	100
	Excavator (hydraulic breaker)	4		85	100
	Dozer	4		79	75
	Air compressor	4		72	100
	Dump truck	8		77	70
	Generator	2		72	100
	Crusher	2		88	80
Building foundation works / AC15	Large rotary bored piling rig	1		83	100
	Tracked drilling rig with hydraulic drifter	1		82	100
	Crane mounted auger	1		79	100
	Mini piling rig	2		76	100
	Compressor for mini piling	1		75	100
	Dump truck	4		77	50
	Truck mixer with pump	2		75	10
	Excavator (earthworks)	3		74	80
	Grinder	5		80	50
	Compressor	2		72	100
	Generator	2		72	100
Building fabrication and HV Plant Installation / AC16	Mobile crane	1		74	50
	Lorry	3		75	25
	MEWP	2		78	75
	Dump truck	4		77	10
	Compressor	1		72	100

Activity / activity number	Plant	No.	Reference*	L_{Aeq} (dB) at 10m	On-time (%)
	Forklift truck	2		77	50
	Grinder	5		80	50
	Pneumatic chipper / drill	3		86	50
	Scaffolding	1		72	25
Bentley Road improvement works					
Road widening and junction improvements / AC17	Excavator	2	Taken from BS5228-1 Annex D	74	100
	Dump Truck	4		77	70
	Asphalt spreader with support lorry	1		78	100
	Vibratory Roller	2		78	70
	Grader	1		84	100
	Lorry	3		75	25
	MEWP	2		50	75
	Generator	2		72	100
Crushing / AC18	Crusher	2		88	80
* Refers to BS5228-1 unless stated otherwise					

4. Noise modelling scenarios for the works during core hours (07:00 to 19:00 Monday to Saturday) were derived from the proposed construction phase programme and are as shown in Table 2.

Table 2 Modelling Scenarios for Core Hours Works

Scenario Number	Location of Activity	Activities Modelled
SC1	Onshore cable route	TCC and site access establishment (AC1)
SC2		Onshore cable route site preparation including fencing, haul road construction, topsoil strip (AC3) and TCC activities (AC2)
SC3		Onshore cable route trench excavation and duct installation (AC5), trench backfill (AC6), trenchless crossing works (AC4) and TCC activities (AC2)
SC4		Onshore cable route trench reinstatement and topsoil reinstatement (AC11); haul road removal, removal of fencing and reinstatement (AC12) and TCC activities (AC2)
SC5		Establish trenchless crossing compounds (AC1) and TCC activities (AC2)
SC6		Trenchless crossing compound reinstatement (AC13) and TCC activities (AC2)
SC7		Jointing bay excavation (AC7) and TCC activities (AC2)
SC8		Jointing bay base construction (AC8) and TCC activities (AC2)
SC9		Pulling and connection of cables (AC9) and TCC activities (AC2)
SC10		Backfill over jointing bays (AC10) and TCC activities (AC2)
SC11		TCC reinstatement (AC13)
SC12	Onshore substation	Ground works / formation of platform (AC14)
SC13		Building foundation works (AC15)
SC14		Building fabrication and high voltage (HV) plant installation (AC16)

Scenario Number	Location of Activity	Activities Modelled
SC15	Bentley Road Improvement works	Bentley Road improvement works (AC17) and crusher at TCC (AC18)
SC16		A120 Junction improvements (AC17) and crusher at TCC (AC18)

Note: All scenarios include worst case haul route vehicles.

2.2 Modelling procedures

5. The calculations of construction noise were undertaken using SoundPLAN (V9.0) noise modelling software. This software implements the sound propagation calculation methodology set out in BS5228-1. Calculations were undertaken for each construction phase specified in Table 1.

6. Landfall impacts were scoped out of the assessment. There are no NSVR's within the 650m study area.

7. Activities undertaken along the onshore cable route were split into one of five groups with a modelling methodology as follows:

   - Delivery vehicles on haul routes – the BS5228-1 haul route methodology was used, a vehicle sound power level of 111dB L_{WA} (BS5228-1 Table C11 – Ref 6) was assigned and a traveling speed of 10mph with the worst case expected number of movements per hour along the entire length of the haul route for a worst-case assessment.
   - Activities AC3, AC5, AC6, AC11 and AC12 all move slowly along the onshore cable route – line sources were created 25m inside either edge of the onshore boundary of the cable route and split into lengths equivalent to one day's progression. Some slow-moving line sources will impact receptors consecutively. Where this is the case (AC5 followed by AC6 and AC11 followed by AC12) the contributions were summed from line sources which are 200m apart. Levels were or calculated to represent the level exceeded for at least 10 days.
   - Activities AC1 and AC13 (trenchless crossing compounds only), AC4, AC14, AC15 and AC16 are all at specified locations. An area source was created representing plant working evenly across the works area.
   - The TCCs are to be located within a wider area but the final location has not yet been specified. Modelling of the associated activities (AC1, AC2 and AC13) The item of equipment with the highest noise emissions has been located at the closest approach to the receptor of the wider area. Remaining plant noise emissions were spread over a 5,000m^2 (50% of the area of the final TCC) area at the closest approach of the wider area to the relevant NVSR.
   - Activities AC7, AC8, AC9 and AC10 will be at the jointing bays but the locations have not been specified. All noise emitting equipment was assumed to be at one point at the closest approach to any receptor of two lines tracking 25m inside either edge of the onshore cable route.

2.2.1 Modelling input data

8. Inputs into the noise models include ground topography, ground type, and buildings to form a 3D representation of the study area. Modelling input data for these calculations are detailed in Table 3.

Table 3 Noise model input data

Data	Usage	Source file	Origin
OS mapping	Locations of buildings in study area	OS_MasterMap_669253_880737	E-mapsite
		OS_MasterMap_717065_930746	North Falls Offshore Wind Ltd
LiDAR composite Digital Terrain Model	Ground topography in study area	LIDAR-DTM-1m-2020-TM02ne LIDAR-DTM-1m-2020-TM21nw	Environment Agency (2020) LIDAR Composite DSM 2020 – 1m. Defra Data Services Platform. Available at https://environment.data.gov.uk/DefraDataDownload/?Mode=survey
Construction plant information	Plant type, numbers, sound power levels, %on-time for each construction activity	North Falls Landfall and Onshore Cable Route Construction Metrics (Section 5 CR01 Variation).xlsx	North Falls Offshore Wind Ltd
		PDS Onshore Substation Metrics.xlsx	

2.2.2 Acoustic model settings

9. Acoustic modelling has been undertaken using the following model settings:

- Maximum search radius of 3000m;
- Maximum number of reflections: 3;
- Daytime and evening / weekend noise predictions carried out at ground floor level i.e. 1.5m above ground. Night-time predictions carried out at first floor level i.e. 4m above ground;
- Side diffraction enabled;
- Building heights set to 6m; and
- Areas of hard ground were identified from the OS mapping and the remainder of the study area was set to soft ground.

3 Predicted construction noise levels

10. The complete results of the onshore cable route construction works (core hours only) noise level predictions are presented in Table 4.

Table 4 Onshore cable route construction noise levels, core working hours

Receptor	Modelled construction noise level (dB $L_{Aeq,T}$) level exceeded for at least 10 days										
	SC1	SC2	SC3	SC4	SC5	SC6	SC7	SC8	SC9	SC10	SC11
CRR1	72	58	68	59	62	66	73	66	67	72	71
CRR2	61	54	64	56	58	62	63	57	57	62	60
CRR3	53	58	68	61	61	66	69	63	63	68	52
CRR4	52	58	67	60	60	65	68	62	62	67	51
CRR5	50	59	67	60	60	65	66	59	60	65	49
CRR6	50	59	70	62	64	68	75	68	68	73	50
CRR7	56	61	71	63	65	69	81	74	75	80	56
CRR8	45	52	66	59	59	64	68	61	62	67	45
CRR9	55	58	69	60	63	68	74	68	68	73	55
CRR10	44	52	63	54	57	62	58	51	51	56	44
CRR11	47	52	61	53	54	59	58	51	52	57	46
CRR12	56	57	65	58	58	63	64	58	58	63	55
CRR13	55	53	61	54	55	59	56	51	51	55	54
CRR14	49	59	65	59	59	63	65	58	59	64	49
CRR15	50	58	67	59	61	65	68	61	62	67	50
CRR16	51	58	68	61	62	66	68	62	62	67	51
CRR17	49	55	65	57	59	63	64	58	58	63	49
CRR18	62	55	59	56	53	57	58	53	53	57	61
CRR19	64	55	67	58	61	66	75	68	68	74	63
CRR20	58	53	64	54	57	62	63	57	57	62	56
CRR21	51	54	61	56	54	59	59	53	53	58	50
CRR22	46	54	63	56	57	61	62	55	56	61	46
CRR23	46	53	61	55	54	59	57	51	52	56	46

Receptor	Modelled construction noise level (dB $L_{Aeq,T}$) level exceeded for at least 10 days										
	SC1	SC2	SC3	SC4	SC5	SC6	SC7	SC8	SC9	SC10	SC11
CRR24	48	58	66	59	59	64	64	57	57	62	48
CRR25	45	54	60	55	53	58	60	53	54	58	45
CRR26	47	57	61	58	54	58	63	56	57	61	47
CRR27	43	50	58	51	51	56	56	50	50	55	43
CRR28	51	53	59	55	53	57	62	56	56	61	50
CRR29	79	56	58	56	57	58	57	56	56	57	78
CRR30	49	56	63	57	56	61	63	56	57	62	48
CRR31	53	50	55	51	50	53	53	49	49	53	52
CRR32	52	49	58	51	52	56	57	51	51	56	50
CRR33	57	55	62	55	56	60	58	53	53	57	56
CRR34	64	56	66	57	60	65	65	59	60	64	63
CRR35	55	58	63	59	58	62	62	57	57	61	55
CRR36	57	61	73	64	66	71	74	68	68	73	57
CRR37	52	58	66	60	60	64	65	59	59	64	52
CRR38	57	61	69	63	63	67	74	67	67	72	57

11. Table 5 details expected noise levels at receptors from out of hours working (trenchless crossings i.e. AC4 in Table 1), reported night-time impacts are from works at crossings where regular 24-hour working may be required.

Table 5 Onshore cable route construction noise levels during out of core hours works (trenchless crossings)

Receptor	Predicted construction noise level (dB $L_{Aeq,T}$)		Closest trenchless crossing compound
	Evenings and Weekends	Night-time	
CRR1	60	32	TX-03 North and TX-04 South
CRR2	56	31	TX-03 North and TX-04 South
CRR3	60	36	TX-05 South
CRR4	59	37	TX-05 South
CRR5	60	36	TX-05 South
CRR6	63	36	TX-05 South
CRR7	64	37	TX-05 South
CRR8	59	36	TX-05 North
CRR9	62	42	TX-07 North
CRR10	52	46	TX-09 North
CRR11	50	50	TX-12 North
CRR12	57	44	TX-15 South
CRR13	50	39	TX15 North
CRR14	57	35	TX-20 South
CRR15	60	38	TX-20 South
CRR16	61	37	TX-20 North
CRR17	57	40	TX-21 South
CRR18	48	48	TX-23 South
CRR19	57	57	TX-23 North and TX-24 South
CRR20	54	54	TX-24 South
CRR21	52	52	TX-24 North
CRR22	56	56	TX-26 North
CRR23	51	51	TX-26 North
CRR24	57	40	TX-28 South
CRR25	51	38	TX-29 North
CRR26	51	39	TX-30 South
CRR27	49	43	TX-30 South
CRR28	51	51	TX-31 South
CRR29	43	43	TX-31 North
CRR30	56	56	TX-31 South
CRR31	44	44	TX-31 North
CRR32	48	46	TX-32 North and TX-33 South

Receptor	Predicted construction noise level (dB $L_{Aeq,T}$)		Closest trenchless crossing compound
	Evenings and Weekends	Night-time	
CRR33	52	34	TX-33 North Compound
CRR34	58	40	TX-32 North and TX-33 South
CRR35	54	34	TX-37 South
CRR36	66	31	TX-37 North
CRR37	59	27	TX-38 North
CRR38	62	20	TX40 North

12. The results of the onshore substation construction noise calculations are presented in Table 6.

Table 6 Calculated onshore substation construction noise levels

NVSR	Calculated construction noise level (dB $L_{Aeq,T}$)			
	Ground works / formation of platform	Building foundation works	Access road and car parking works	Building fabrication and HV Plant Installation
SSR1	47	43	44	46
SSR2	47	42	44	45
SSR3	48	44	45	46
SSR4	50	47	48	49
SSR5	49	45	46	47
SSR6	48	45	46	47
SSR7	59	57	57	58
SSR8	57	53	54	55
SSR9	53	48	50	51
SSR10	46	42	43	44
SSR11	45	40	42	43
SSR12	46	42	43	45

13. The complete results of the calculations of Bentley Road construction noise are provided in ES Chapter 26 Noise and Vibration (Document Reference: 3.1.28); hence, they are not detailed in this Appendix.

4 Construction vibration calculations

14. The vibration calculations for impacts upon humans (i.e. PPV levels 0.3 to 10 $mm.s^{-1}$) assume a frequency independent vibration transfer function (level multiplied by 1.8) between outdoors and indoors, based upon measurements by D.J Martin (1980) described in the TRRL report 'Ground vibrations from impact pile driving during road construction'.

15. The operation of HDD rigs is likely to generate similar levels of vibration to rotary bored piling due to the similar mechanisms involved. Table D.6 of BS 5228-2:2009+A1:2014 'Code of practice for noise and vibration control on construction and open sites – Part 2: Vibration' shows that vibration from

rotary bored piling activities is unlikely to exceed 0.3mm.s^{-1} at a distance of approximately 20m (measured vibration levels in row 103).

16. The vibration predictions for HDD identified the driving energy of the drill to produce a PPV of 0.3mm.s^{-1} at 20m to be 380kJ. This was used to calculate the distances at which the vibration criteria would occur.

17. The ground compaction predictions have been based on operation of a large twin drum roller which is 1.2m wide and the drum vibration amplitude is 0.5mm. This is considered representative of a reasonable worst-case.

5 References

BSI (2014). BS 5228-1:2009+A1:2014 “Code of practice for noise and vibration control on construction and open sites – Part 1: Noise”.
BSI (2014). BS 5228-2:2009+A1:2014 “Code of practice for noise and vibration control on construction and open sites – Part 2: Vibration”.
Environment Agency (2020) LIDAR Composite DSM 2020 – 1m. Defra Data Services Platform. Available at https://environment.data.gov.uk/DefraDataDownload/?Mode=survey

NORTH FALLS

Offshore Wind Farm

sse Renewables | RWE

HARNESSING THE POWER OF NORTH SEA WIND

North Falls Offshore Wind Farm Limited

A joint venture company owned equally by SSE Renewables and RWE.

To contact please email contact@northfallsoffshore.com

North Falls Offshore Wind Farm Limited Registered Address: Windmill Hill Business Park, Whitehill Way, Swindon, Wiltshire, SN5 6PB, United Kingdom

Registered in England and Wales Company Number: 12435947