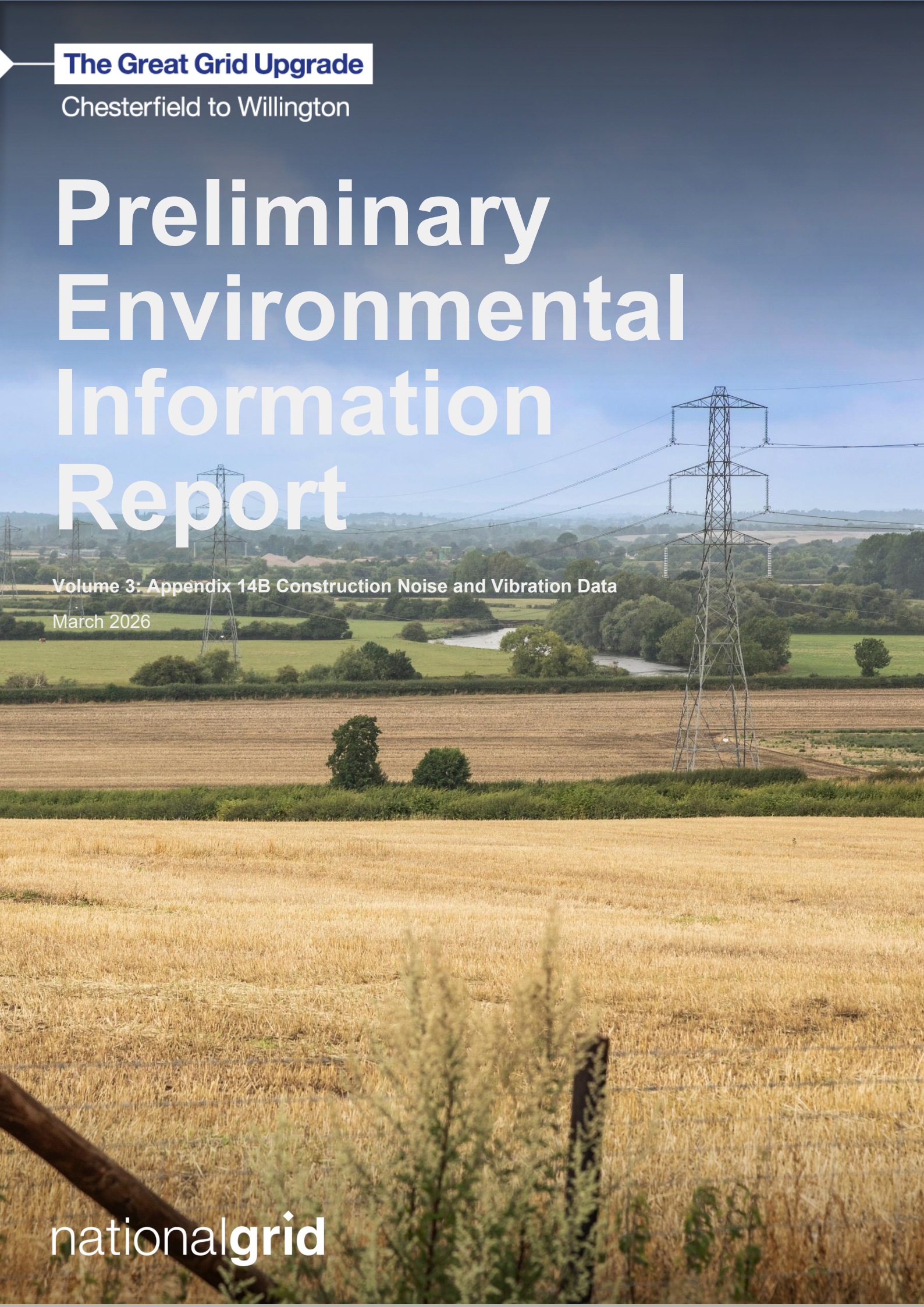
The Great Grid Upgrade

Chesterfield to Willington

Preliminary Environmental Information Report

Volume 3: Appendix 14B Construction Noise and Vibration Data

March 2026



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14B. Introduction

14B.1 Overview

14B.1.1 This appendix has been produced to accompany **Chapter 14 Noise and Vibration** in **Volume 1** of the Preliminary Environmental Information Report for the Chesterfield to Willington Project (the Project). It outlines the data sources, assumptions and methodologies used to evaluate the potential noise and vibration impacts arising from construction activities on noise sensitive receptors and vibration sensitive receptors.

14B.1.2 The data and assumptions presented in this appendix are preliminary and subject to evolution in the ongoing design. It has been prepared in collaboration with the Main Works Contractor and also based on professional experience on similar projects.

14B.2 Construction Noise

Introduction

14B.2.1 The likely noise impacts arising from the construction phase of the Project have been assessed in accordance with BS 5228-1 (Ref 14B.1), using the programme and configuration of plant items provided by the construction contractors.

14B.2.2 Preliminary construction noise level predictions have been carried out, and the distances for potential medium or large construction noise impacts have been determined, in accordance with the assessment criteria in **Chapter 14 Noise and Vibration**.

Construction Activities and Plant Data

14B.2.3 At this preliminary stage of the assessment, this appendix focuses on key construction activities, likely to generate the highest noise levels, as having potential to result in significant noise effects. Key activities considered at this stage are:

- enabling works for the overhead lines;
- overhead lines, construction and removal (where modifications are required to third party services);
- underground cable construction activities; and
- construction of a new Chesterfield Substation.

Enabling works for the overhead lines

14B.2.4 The activities for this construction stage include vegetation clearance, bellmouth construction, haul road and enabling works, foundations and piling operations. These activities are not expected to occur simultaneously and any effects are usually short term, when plant is operating close to receptors. The highest noise producing activity has been predicted for enabling works, which is assumed to be piling. It therefore follows that the noise effects from other activities are likely to be no greater than those for piling.

14B.2.5 **Table 14B.1** presents the plant items for the activity and their associated sound level data.

Table 14B.1: Activity plant and noise data – enabling works for the overhead lines

Construction Activity	Item	Data Source	Sound Pressure Level at 10 m Per Unit (dBA)	Number of Items	Percentage (%) On-Time	Resultant Sound Power Level (dBA)
Piling operations	Piling rig (rotary bored)	BS 5228-1 Annex C.3.14	83	4	80	116
	Attendance crane	BS 5228-1 Annex C.4.41	71	4	100	105

Overhead lines infrastructure construction

14B.2.6 **Table 14B.2** presents the plant items for the activities identified for the construction of the overhead line and pylons (as well as the removal and diversion of existing third party overhead lines and pylons) and their associated sound level data.

Table 14B.2: Activity plant and noise data – overhead lines infrastructure construction

Construction Activity	Item	Data Source	Sound Pressure Level at 10 m Per Unit (dBA)	Number of Items	Percentage (%) On-Time	Resultant Sound Power Level (dBA)
Vehicles for each activity	Low loader	BS 5228-1 Annex C.2.31	71	1	40	95
	Flat bed artic	BS 5228-1 Annex C.4.53	77	5	20	105
	Hiab 4x4	BS 5228-1 Annex C.4.53	77	1	20	98
	3T tipper - logistics	BS 5228-1 Annex C.6.23	82	1	20	103
	Transit - site personnel	Library data	72	5	20	100
	Pick up - (Engineering, Supervision, HSQE)	Library data	72	3	20	98
	Private vehicles - site personnel	Library data	72	5	20	100
Site set up / removal	Telehandler (10 m, 10 T)	BS 5228-1 Annex C.2.35	71	1	80	98
	Tower lights	BS 5228-1 Annex C.4.87	65	2	70	94
	Excavator (20 T)	BS 5228-1 Annex C.2.3	78	1	100	106

Construction Activity	Item	Data Source	Sound Pressure Level at 10 m Per Unit (dBA)	Number of Items	Percentage (%) On-Time	Resultant Sound Power Level (dBA)
	Road runner tractor	BS 5228-1 Annex C.2.30	79	1	50	104
	Quad puller / Tensioner	Supplier's data	78	1	60	104
	Tractor winch	Supplier's data	69	1	60	95
	Generator (10 kVA)	BS 5228-1 Annex C.4.76	61	1	70	87
Pylon assembly	Telehandler (10 m, 10 T)	BS 5228-1 Annex C.2.35	71	1	50	96
	Tower lights	BS 5228-1 Annex C.4.87	65	2	70	94
	Telehandler (360 Roto 10 T)	BS 5228-1 Annex C.2.35	71	1	25	93
	Generator (10 kVA)	BS 5228-1 Annex C.4.76	61	1	70	87
Pylon erection	Telehandler (10 m, 10 T)	BS 5228-1 Annex C.2.35	71	1	40	95
	Tower lights	BS 5228-1 Annex C.4.87	65	2	70	94
	Telehandler (360 Roto 10 T)	BS 5228-1 Annex C.2.35	71	1	10	89

Construction Activity	Item	Data Source	Sound Pressure Level at 10 m Per Unit (dBA)	Number of Items	Percentage (%) On-Time	Resultant Sound Power Level (dBA)
	Generator (10 kVA)	BS 5228-1 Annex C.4.76	61	1	70	87
	Crane (400 T all-terrain)	BS 5228-1 Annex C.4.38	78	1	80	105
Stringing and clipping of conductors	Transit - welfare van	Library data	72	1	20	93
	Telehandler (10 m, 10 T)	BS 5228-1 Annex C.2.35	71	1	40	95
	Erection winch (5 T)	Supplier's data	76	1	100	104
	Tractor winch with Capstan (5 T)	Supplier's data	69	1	100	97
	Sagging tractor	Supplier's data	69	1	100	97
	MEWP/Crane	Supplier's data	70	1	100	98
	ATV & trailer	Supplier's data	69	1	100	97
Overhead lines removal (during removal and diversion of third party services)	Pulveriser mounted on excavator	BS 5228-1 Annex C.1.5	72	2	50	100
	Tracked excavator (loading dump truck)	BS 5228-1 Annex C.1.10	85	1	10	103
	Tracked excavator	BS 5228-1 Annex C.1.16	82	1	25	104

14B.2.7 There is a possibility for the use of helicopters and/or drones for the following activities:

- the installation and removal of conductors; and
- the installation and removal of protective netting across highways, railway lines, watercourses and other assets.

14B.2.8 However, details such as the time of operation, duration and extent of use regarding drones or helicopters are not known at this stage. As such, the noise impact from drones/helicopter operations have not been assessed at this stage but will be reviewed as part of the Environmental Statement (ES).

Underground cables

14B.2.9 It is assumed that the majority of the Project will be developed as an overhead line. However, underground cables may be required for some locations along the proposed route alignment. The activities shown in **Table 14B.3** are the typical activities associated with underground cable construction and have been included in this assessment. Whilst the majority of these works are proposed during the day, there is the potential for some to occur during the night-time.

Table 14B.3: Construction activity plant and noise data – underground cables

Construction Activity	Item	Data Data Source	Sound Pressure Level at 10 m Per Unit (dBA)	Number of Items	Percentage (%) On-Time	Resultant Sound Power Level (dBA)
Excavation and trenching	Road breaker (hand-held pneumatic)	BS 5228-1 Annex C.5.3	82	1	50	107
	Tracked excavator	BS 5228-1 Annex C.1.16	82	1	50	107
	Road planer	BS 5228-1 Annex C.5.7	82	1	50	107
	Water tanker extracting water (vacuum pump)	BS 5228-1 Annex C.4.89	79	1	100	107
	Petrol hand-held circular saw	BS 5228-1 Annex C.4.70	91	1	25	113
Trenchless crossings[1]	Generator (10 kVA)	BS 5228-1 Annex C.4.76	61	1	50	86

[1] Specific technique not finalised at this stage

Construction Activity	Item	Data Data Source	Sound Pressure Level at 10 m Per Unit (dBA)	Number of Items	Percentage (%) On-Time	Resultant Sound Power Level (dBA)
	Slurry separation plant	BS 5228-1 Annex C.4.20 (+5 dB)	85	1	100	113
	Wheeled excavator	BS 5228-1 Annex C.4.10	66	1	40	90
	Excavator (35 T)	BS 5228-1 Annex C.2 19	77	1	40	101
	Crane	BS 5228-1 Annex C.4.43	70	1	40	94
	Dumper	BS 5228-1 Annex C.4.3	73	1	100	101
	HGV deliveries	BS 5228-1 Annex C.1 11	80	1	20	101
	McLaughlin WH 225 boring machine	BS 5228-1 Annex C.3.14 (-2 dB)	82	1	100	110
	Water pumps	BS 5228-1 Annex C.2 45	65	1	100	93

Construction of new Chesterfield Substation

14B.2.10 **Table 14B.4** presents the typical activities and plant items for the construction of the new substation and their associated sound level data.

Table 14B.4: Construction activity plant and noise data – construction of new substation

Construction Activity	Item	Data Data Source	Sound Pressure Level at 10 m Per Unit (dBA)	Number of Items	Percentage (%) On-Time	Resultant Sound Power Level (dBA)
Site clearance	Tracked excavator (20 T)	BS 5228-1 Annex C.2.3	78	2	100	109
	Wheeled backhoe	BS 5228-1 Annex C.4.66	69	1	100	97
	Dumper	BS 5228-1 Annex C.4.3	73	2	50	101
	Dozer	BS 5228-1 Annex C.2.13	78	2	50	106
	Generator (10 kVA)	BS 5228-1 Annex C.4.76	61	1	70	87
	Tower lights	BS 5228-1 Annex C.4.87	65	2	70	94
Earthworks	Tracked excavator (20 T)	BS 5228-1 Annex C.2.3	78	2	100	109
	Wheeled backhoe	BS 5228-1 Annex C.4.66	69	1	100	97
	Dumper	BS 5228-1 Annex C.4.3	73	2	75	103
	Dozer	BS 5228-1 Annex C.2.13	78	2	50	106
	Telehandler (10 m, 10 T)	BS 5228-1 Annex C.2.35	71	2	50	99
	Generator (10 kVA)	BS 5228-1 Annex C.4.76	61	1	70	87
	Tower Lights	BS 5228-1 Annex C.4.87	65	2	70	94
Piling	Piling rig	BS 5228-1 Annex C.3.14	83	1	100	111
	Attendance crane	BS 5228-1 Annex C.4.41	71	2	100	102

Construction Activity	Item	Data Data Source	Sound Pressure Level at 10 m Per Unit (dBA)	Number of Items	Percentage (%) On-Time	Resultant Sound Power Level (dBA)
Foundations	Concrete mixer	BS 5228-1 Annex C.4.22	76	1	70	102
	Concrete pump	BS 5228-1 Annex C.3.25	78	1	70	104
	Water pumps	BS 5228-1 Annex C.2 45	65	1	10	83
	Generator (10 kVA)	BS 5228-1 Annex C.4.76	61	1	70	87
	Tower lights	BS 5228-1 Annex C.4.87	65	2	70	94
	Poker vibrators	BS 5228-1 Annex C.4.33	78	1	70	104
Backfilling and roadway construction	Tracked excavator (20 T)	BS 5228-1 Annex C.2.3	78	2	70	107
	Road roller	BS 5228-1 Annex C.5.19	80	1	70	106
	Generator (10 kVA)	BS 5228-1 Annex C.4.76	61	1	70	87
	Tower lights	BS 5228-1 Annex C.4.87	65	2	70	94
Structure installations	Articulated dump truck (40 T)	BS 5228-1 Annex C.6.26	79	2	50	107
	Attendance crane	BS 5228-1 Annex C.4.41	71	2	20	95
	Crane (400 T all-terrain)	BS 5228-1 Annex C.4.38	78	1	20	99

Construction Hours

14B.2.11 The proposed core construction working hours for the overhead line works are:

- 7am – 7pm on Monday to Friday; and
- 8am – 5pm on Saturday, Sunday and Bank Holidays.

14B.2.12 The proposed core construction working hours for the new Chesterfield Substation are:

- 7am – 7pm on Monday to Friday; and
- 8am – 1pm on Saturday.

14B.2.13 As described in **Chapter 4 Description of the Project**, some works may take place outside of the proposed hours above. However, at this stage of the Project, the assessment has focussed on the proposed core hours only. Further assessment will take place at the ES stage.

Preliminary Construction Noise Impacts

14B.2.14 Category A thresholds (ABC method in BS 5228-1, Table E.1) expressed as façade levels, are provided for weekday daytime, weekday evenings, Saturdays and Sundays. However, in respect of the Project, the proposed core construction hours are daytime and weekend, as provided in paragraphs 14B.2.11 and 14B.2.12.

14B.2.15 **Table 14B.5** provides indicative distances where Category A thresholds may be exceeded during the daytime and weekends. These distances represent the point at which the impact magnitude is classified as medium or large. The construction noise thresholds, expressed as façade levels, are:

- 65 dB $L_{Aeq,T}$ for weekdays daytime 7am – 7pm and Saturdays 7am – 1pm; and
- 55 dB $L_{Aeq,T}$ for Saturdays 1pm – 11pm and Sundays 7am – 11pm.

Table 14B.5: Construction activity noise 'Category A' threshold distances – unmitigated

Construction Stage	Activity	Activity Sound Power Level (dBA)	Distance (m) for Category A Threshold	
			Weekday Daytime 65 dB $L_{Aeq,T}$	Evenings and Weekends 55 dB $L_{Aeq,T}$
Enabling works for the overhead lines	Piling operations	116	200	631
Overhead lines construction and removal	Site set up / removal	113	141	447
	Pylon assembly	110	100	316
	Pylon erection	111	112	355
	Stringing and clipping of conductors	111	112	355
	Overhead lines removal	107	71	224
Underground cables	Excavation and trenching	116	200	631
	Trenchless crossings (auger/micro-tunnelling drive compound)	115	178	562

Construction Stage	Activity	Activity Sound Power Level (dBA)	Distance (m) for Category A Threshold	
			Weekday Daytime 65 dB $L_{Aeq,T}$	Evenings and Weekends 55 dB $L_{Aeq,T}$
Construction of new Chesterfield Substation (general assumption for substation, based on experience of similar projects)	Site clearance	111	112	-
	Earthworks	112	126	-
	Piling	112	126	-
	Foundations	109	89	-
	Backfilling and roadway construction	110	100	-
	Structure installations	108	79	-

14B.2.16 It should be noted that the noise levels in **Table 14B.5** do not take into account any mitigation measures such as screening from site hoarding.

14B.3 Construction Vibration

Introduction

14B.3.1 Predictions for construction-related vibration have been carried out in accordance with the methodologies and empirical data presented in BS 5228-2 (Ref 14B.2).

14B.3.2 At this stage, the type and number of vibration-generating construction plant items, the programme and working methodologies to be applied have not been confirmed; these would be based on the developed design, the ground conditions, and methodologies selected by the Main Works Contractor.

14B.3.3 Ground-borne vibration calculations have been performed for driven piling (pylon foundations, substation construction), which is typically the most significant source of vibration. Although rotary bored piling is the preferred piling technique for the construction of the Project, and it is likely that this technique will normally be used, driven piling has been assumed in the assessment of construction vibration, to account for situations where it may be required. This represents a worst-case assessment, as vibration levels from other construction plant are generally lower. As the design progresses it will be understood whether there are other vibration generating activities which need to be assessed.

Construction Vibration

14B.3.4 Where piling is required, it has the potential to generate vibration impacts. The extent of these impacts is primarily determined by the piling method, distance between the piling activity and nearby receptors, as well as the nature of the underlying ground conditions. Since the specific piling locations and techniques have not yet been finalised, it is not currently feasible to undertake a detailed vibration assessment. However, for construction vibration a Study Area of 100 m from construction activities has been adopted.

Construction Vibration Predictions

14B.3.5 Peak particle velocity (PPV) levels, expressed in millimetres per second (mm/s), generated by piling activities can be predicted using the empirical formulae and guidance set out in Table E1 of BS 5228-2. These formulae allow for the estimation of vibration levels by taking into account the type of activity, the characteristics of the equipment used, and the distance between the source and the receptor. The formula for driven piling is:

$$V_{res} \leq K_p[\frac{\sqrt{w}}{r^{1\cdot3}}]$$

Where:

$Vres$ = Resultant PPV, in mm/s;

Kp = Scaling factor (depending on soil conditions);

W = Nominal hammer energy, in joules (J); and

r = Slope distance from the pile toe, in m.

Assumptions

14B.3.6 In order to undertake the vibration assessment, the following conservative assumptions have been included for driven piling:

- scaling factor of 1.5 for stiff cohesive soil conditions; and
- typical value of nominal hammer energy of 50 kJ.

Results

14B.3.7 Although rotary bored piling is the preferred piling technique for the construction of the Project and will normally be used, driven piling has been assumed as a worst case for the vibration assessment.

14B.3.8 The equation for driven piling has been used to predict the distances within which the threshold values for human comfort impacts from vibration are exceeded, for both medium and large impacts (1 mm/s and 10 mm/s respectively) and these are provided in **Table 14B.6**.

Table 14B.6: Indicative construction vibration threshold distances for driven piling

Activity	Distance for Medium Impacts (m)	Distance for Large Impacts (m)
Driven Piling	88	15

References

Ref 14B.1 British Standards Institution (2014). BS 5228-1:2009+A1:2014 Code of Practice for Noise and Vibration Control on Construction and Open Sites – Part 1: Noise.

Ref 14B.2 British Standards Institution (2014). BS 5228-2:2009+A1:2014 Code of Practice for Noise and Vibration Control on Construction and Open Sites – Part 2: Vibration.

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