Fosse Green Energy

Environmental Statement
Appendix 11-D: Construction and Operational Noise Modelling

Fosse Green Energy Limited

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1. Noise Modelling

1.1.1 In order to determine potential noise emissions from the Proposed Development, noise prediction models have been prepared using the CadnaA® v2025 software package. The following assumptions were applied in noise models:

a. The ground acoustic absorption has been set to 0.8 (i.e. assumed soft ground conditions which is considered appropriate for predominantly open grass field and farmland);

b. The maximum order of reflections was 1;

c. Air temperature was assumed to be 10 degrees Celsius and humidity 80%, which represent typical annual average weather conditions in Lincolnshire;

d. Building massing in the surrounding area outside of the DCO Site Boundary has been sourced from Ordnance Survey Open Map data and modelled with a standard height of 7m.

e. Land topography has been sourced from Ordnance Survey Open Map data;

f. No boundary fences/walls have been included in the noise model; and

g. Receiver points have been modelled as 1.5m above local ground level (representative of ground floor windows) for daytime noise.

2. Construction Noise

2.1.1 CadnaA® noise mapping software was used to predict construction noise levels at the selected receptors. The construction noise model followed the procedures for prediction of demolition and construction noise set out in BS 5228-1. Sound power levels for each of the following construction activities have been calculated:

a. Noise Generating Activity (NGA) 1 – Construction of the Battery Energy Storage Systems (BESS) and On-site Substation, Inverters, Transformers, and ground-mounted solar PV panel arrays;

b. NGA2 – Cable installation (general works); and

c. NGA3 – Cable installation (HDD activities).

2.1.2 Noise source data for construction plant are presented in **Table 1**. Construction noise predictions were carried out to represent a worst-case scenario where all plant is operational on-site simultaneously. Consequently, construction noise predictions may overestimate construction noise levels so can be considered to represent a reasonable worst case scenario.

Table 1: Construction Plant

Work Package	Plant / Equipment	BS 5228 Reference	Sound Power Lw (dBA)	Quantity
Construction of inverters and transformers	Tracked excavator	C.2, Item 14	107	1
	Wheeled loader	C.2, Item 27	108	1
	Wheeled mobile telescopic crane	C.4, Item 38	112	1
	Dump truck (tipping fill)	C.2, Item 30	107	2
	Telescopic handler	C.2, Item 35	99	1
	Cement mixer truck (discharging)	C.4, Item 18	103	1
PV Module Construction	Articulated dump truck	C.5, Item 16	104	4
	Wheeled mobile telescopic crane	C.4, Item 38	106	4
	Vibratory roller	C.5, Item 27	95	4
	Off road telehandler	C.2, Item 35	99	4
	Diesel generator	C.4, Item 85	94	4
	Driven piles	Pauselli Self-propelled pile driver MOD. 900	113	4

Work Package	Plant / Equipment	BS 5228 Reference	Sound Power Lw (dBA)	Quantity
	Cement mixer truck (discharging)	C.4, Item 18	103	1
	Dumper	C.4, Item 9	105	4
Construction of centralised BESS, distributed BESS and Onsite Substation	Tracked excavator	C.2, Item 14	107	2
	Lorry	C.2, Item 34	108	4
	Telescopic handler	C.2, Item 35	99	2
	Driven piles	Pauselli Self-propelled pile driver MOD. 900	113	1
	Wheeled mobile crane	C.3, Item 30	98	4
	Hand-held welder (welding piles)	C.3, Item 31	101	4
	Generator for welding	C.3, Item 32	101	4
	Gas cutter (cutting top of pile)	C.3, Item 34	96	4
	Mobile telescopic crane	C.4, Item 41	99	2
	Lifting platform	C.4, Item 57	95	4
	Site lift for workers	C.4, Item 62	94	4
	Diesel generator	C.4, Item 85	94	2
Cable Installation	Tracked excavator	C.4, Item 63	105	2
	Wheeled backhoe loader	C.4, Item 66	97	2
	Dumper	C.4, Item 9	105	4
	Telescopic handler	C.4, Item 55	98	2
	Vibratory roller	C.5, Item 27	95	2
Horizontal Directional Drill	Directional drill (generator)	C.2, Item 44	105	1
	Water pump	C.2, Item 45	93	1
	Tracked excavator	C.2, Item 14	107	1
	Drilling rig	C.3, Item 15	110	1

3. Construction Vibration

3.1.1 Data from driven piling activities was referenced from Table D.2 of BS 5228-2 to determine the likely level of vibration that may be experienced during piling works. Regression analysis was undertaken to determine a formula for calculating the PPV from piling activities. This analysis is presented in **Plate 1**.

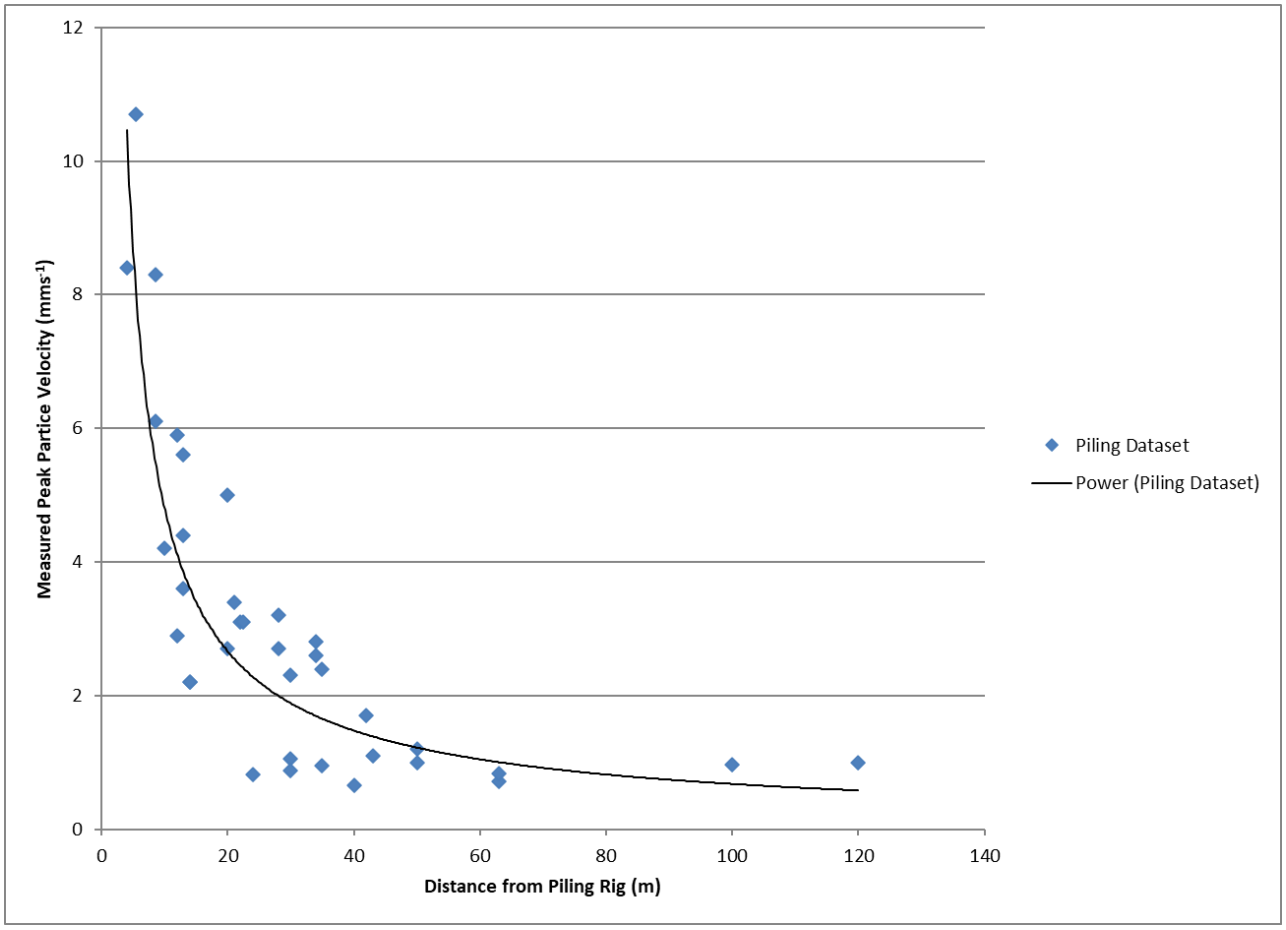

Plate 1: Driven Piling Data Regression Analysis

3.1.2 Data from bored piling activities was referenced from Table D.6 of BS 5228-2 to determine the likely level of vibration that may be experienced during piling works. Regression analysis was undertaken to determine a formula for calculating the PPV from bored piling activities. This analysis is presented in **Plate 2**.

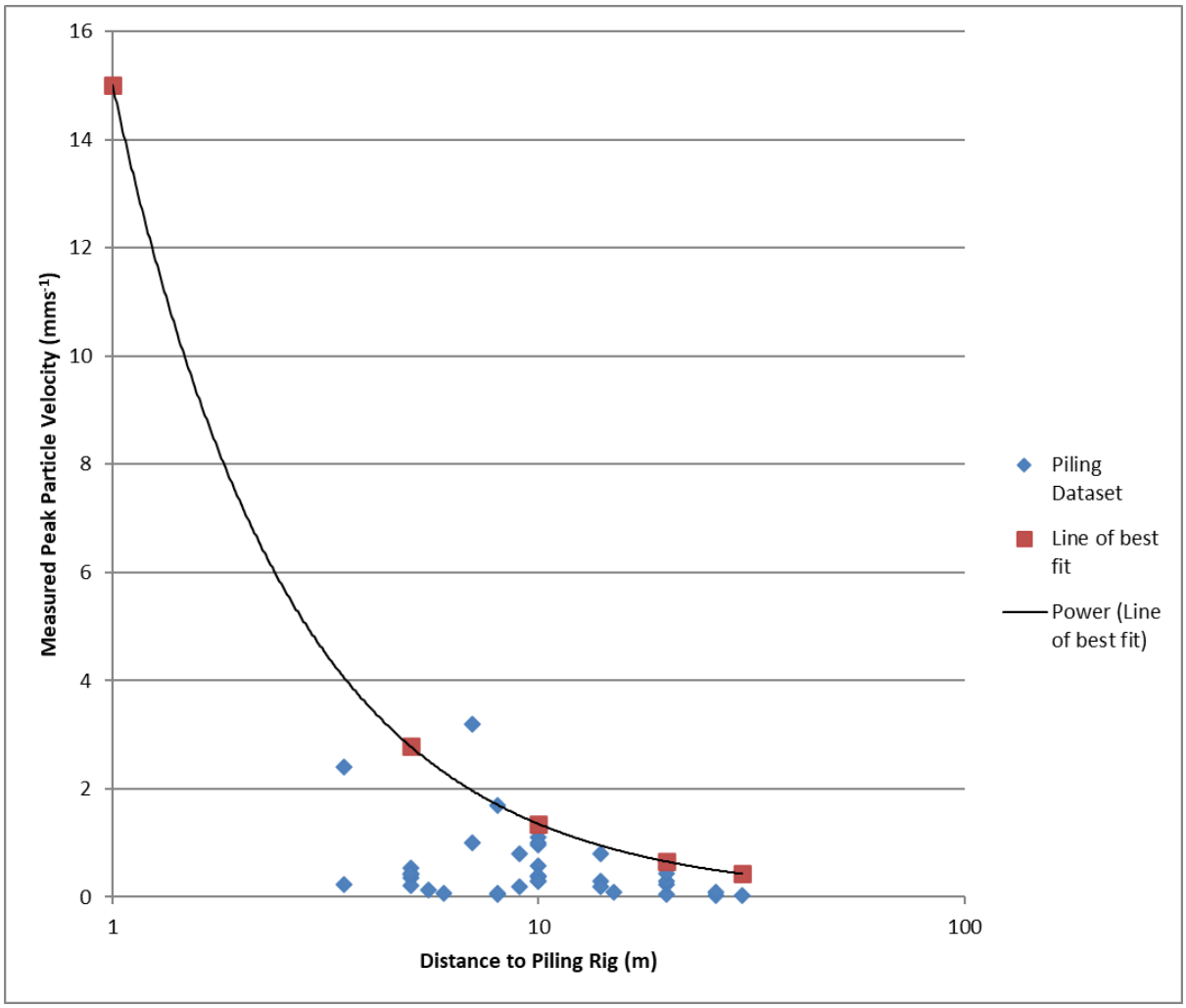

Plate 2: Bored Piling Data Regression Analysis

4. Construction Traffic Data

4.1.1 Data used in the calculation of construction traffic noise effects are presented in **Table 2**.

Table 2: Construction Traffic Noise Assessment Data

Road	2032 Baseline		2032 Baseline with Construction Traffic	
	Total	HGV%	Total	HGV%
A46 west of Halfway House Roundabout	38,736	10	39,214	10
Halfway House Lane	3,237	4	3,715	6
The Avenue	119	6	597	19
A46 east of Halfway House Roundabout	43,353	9	43,459	9
Haddington Lane (between Fosse Lane and Old Haddington Lane)	4,460	5	4,789	6
Fosse Lane (north of Haddington Lane)	3,020	3	3,020	3
Old Haddington Lane (between Haddington Lane and A46)	3,610	5	3,939	7
A46 east of Fosse Lane	36,473	8	37,087	8
Haddington Lane (south of Old Haddington Lane)	6,171	8	6,785	9
Stone Lane	78	2	78	2
South Hykeham Road	5,701	4	5,989	6
Church Road (east of Bassingham Road)	6,478	4	6,478	4
Bassingham Road (southwest of Bridge Road)	1,366	2	1,654	8
Haddington Lane (south of Stone Lane)	2,140	4	2,285	4
Norton Lane	469	2	469	2
Moor Lane	2,483	7	2,961	9
Bassingham Road (between Moor Lane and Clay Lane)	2,109	3	2,616	2
Clay Lane	122	6	629	1

Road	2032 Baseline		2032 Baseline with Construction Traffic	
	Total	HGV%	Total	HGV%
Unnamed Road (south of Halfway House Roundabout)	11,770	6	12,248	7
Fosse Lane (between A46 and Haddington Lane)	2,743	7	3,072	9
Broughton Lane (south of Hill Rise)	2,314	5	2,374	6
Hill Rise	188	4	248	17
Broughton Lane (north of Hill Rise)	2,243	18	2,303	19
Blackmoor Road	7,373	25	7,433	25
B1178 Tower Lane	6,390	21	6,450	21
A15 Sleaford Road (between Tower Lane and Heath Lane)	17,717	18	17,777	18
A15 Sleaford Road (between Heath Lane and Green Man Road)	14,903	8	14,963	8
A15 Sleaford Road (between Green Man Road and Unnamed Road)	15,425	19	15,485	20
Green Man Road	2,151	6	2,211	7
Unnamed Road between A15 Sleaford Road and High Dike	529	19	589	23
Heath Lane	2,511	7	2,571	9
A607 Grantham Road (south of Coleby)	6,842	5	6,902	5
A607 Grantham Road (north of Coleby)	7,592	4	7,652	4
Fen Lane	4	15	64	57
Clay Lane (north of Main Street)	204	21	204	21
Haddington Lane (Between Butts Lane and Dovecote Lane)	1,355	14	1,550	12

Road	2032 Baseline		2032 Baseline with Construction Traffic	
	Total	HGV%	Total	HGV%
Halfway House Roundabout (Halfway House Lane/A46(E)/Unnamed Road/A46(W))	48,808	9	49,287	9
A46 EB On-Slip and Off-Slip (Fosse Lane(N)/Fosse Lane(E)/Haddington Lane)	5,275	4	5,843	6
A46 WB On-Slip and Off-Slip (Haddington Lane(W)/Old Haddington Lane/Haddington Lane)	7,384	5	7,999	6
Haddington Lane(N)/Butts Lane/Haddington Lane(S)/Stone Lane	8,295	6	8,790	7
Bridge Road/Church Road/Bassingham Road	7,229	4	7,517	5
Haddington Lane/Bassingham Road/Moor Lane	4,280	5	4,829	5
Unnamed Road/Moor Lane/Norton Lane	3,737	4	4,215	6
North Hykeham Roundabout (A46(N)/ Newark Road/ A46(S)/ Middle Lane)	36,473	8	37,087	8
A607 / White Lane / Church Lane	14,226	4	14,286	4
B1178 Tower Lane / A15 Sleaford Road	20,073	6	20,133	6
A15 Sleaford Road / Metheringham Heath Lane / Heath Lane	25,113	7	25,173	7
A15 Sleaford Road / Green Man Road	22,361	7	22,421	8

5. Operational Noise

5.1 Modelling Methodology

5.1.1 Operational noise was modelled in CadnaA®, which employs the noise prediction routines commonly used in the UK (e.g. ISO 9613 Acoustics – Attenuation of Sound during Propagation Outdoors – Part 1: Calculation of the absorption of sound by the atmosphere (1993) and Part 2: General Method of Calculation (1996). The following assumptions and parameters have been used to prepare the noise model:

a. Sound source heights for inverters and transformers have been based on information specification sheets provided by the Applicant;

b. The central inverter option was modelled, which is considered to be the worst-case option in terms of noise compared to string inverters;

c. In a lack of specific sound data for the Onsite Substation, sound data has been used based on previous assessments;

d. The Proposed Development will utilise approximately 300 batteries either distributed throughout the Principal Site (referred to as 'distributed' arrangement) and located alongside the Solar Stations, or located at a single BESS Compound (referred to as 'centralised' arrangement). A total of 600 units have been modelled for the BESS Battery Containers, and 290 central inverters have been modelled covering both distributed and centralised layout options; and

e. Modelling assumes the DCO Site is continuously operational during daytime and night-time.

5.1.2 Tracker systems that orient the solar PV modules towards the sun have not been included in the model as their noise levels are unlikely to cause disturbance, as explained in **Section 5.5**.

5.2 Sound Level Data – Central Inverters and Standalone Transformers

5.2.1 The proposed inverters that have been modelled using manufacturer's data for the E-Storage MV Skid Manufacturer noise data for these inverters quotes a highest sound pressure level of 61 dB(A) 1m from the unit when operating at 100%. The operating load of units would vary depending on prevailing weather conditions so assuming 100% load is worst-case.

5.2.2 The highest level of noise occurs at the side where cooling fans are located. As the orientation of inverters would not be known until the detailed design, the cooling fan noise level has been applied on all sides of the inverter to retain flexibility in design. This is considered to represent a worst-case and as actual plant selected for the final design will produce lower levels of noise as cooling fans are only located on one side of the inverter.

5.2.3 Central inverters have been modelled as vertical area sources with a source height of 2.5m.

5.2.4 Standalone transformers associated with the inverters will have noise emissions approximately 10dB(A) below that of the inverters. Noise from standalone transformers will not be audible above noise from the inverters and have not been included in the modelling.

5.3 Sound Level Data – BESS Battery Containers

5.3.1 Noise predictions of the proposed battery storage units are based on manufacturer's data for the E-Storage Solbank 3. This unit has been modelled at a fan speed of 80%, which is considered sufficient for UK temperatures. The cooling fans are located at the short end of the unit with the highest noise levels measured at 72dB at a distance of 1m. Noise levels at the long ends of the unit are measured as a maximum of approximately 55 dB. To retain flexibility in the design, both short ends of the unit have been modelled using 72dB at 1m and both long sides modelled using 55dB at 1m.

5.3.2 Battery storage units have been modelled as vertical area sources with a source height of 2.9m.

5.4 Sound Level Data – Onsite Substation Transformers

5.4.1 Sound level data of Onsite Substation transformers at the Proposed Development are based on similar rated transformers for solar plant developments from AECOM library data. An assumed sound power level of 95dB(A) has been applied for transformers within the substation areas. Substation transformers have been modelled as vertical and horizontal area sources with a source height of 7m.

5.5 Tracker Motor Noise

5.5.1 The Proposed Development will utilise either fixed south facing or single axis tracker solar PV panel arrangement. A single axis tracker system moves the solar PV modules throughout the day to maximise their efficiency by keeping them oriented towards the sun. The noise from each solar PV panel tracker motor will be less than 40dB at a 1m distance. At this level, noise is unlikely to be perceptible at sensitive receptors. As such, noise emissions from tracker motors have not been considered in the operational noise assessment.