Fosse Green Energy

Preliminary Environmental Information Report

VOLUME

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Appendix 11-D: Construction and Operational Noise Modelling

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Table of Contents

1. Noise Modelling 1
2. Construction Noise 1
3. Construction Vibration 4
4. Construction Traffic Data 5
5. Operational Noise 7
5.1 Modelling Methodology 7
5.2 Sound Level Data – Central Inverters and Standalone Transformers 8
5.3 Sound Level Data – BESS Battery Containers 8
5.4 Sound Level Data – Onsite Substation Transformers 8
5.5 Tracker Motor Noise 9

Plates

Plate 1: Driven Piling Data Regression Analysis 4
Plate 2: Bored Piling Data Regression Analysis 5

Tables

Table 1: Construction Plant 2
Table 2: Construction Traffic Noise Assessment Data 5

1. Noise Modelling

1.1.1 In order to determine potential operational noise emissions from the Proposed Development, noise prediction models have been prepared using the CadnaA® v2022 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 is typical annual average weather conditions in Lincolnshire;

d. Building massing in the surrounding area outside of the 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 Substations, 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 as worst case.

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
	Cement mixer truck (discharging)	C.4, Item 18	103	1
	Dumper	C.4, Item 9	105	4
Construction of 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

Work Package	Plant / Equipment	BS 5228 Reference	Sound Power Lw (dBA)	Quantity
	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**.

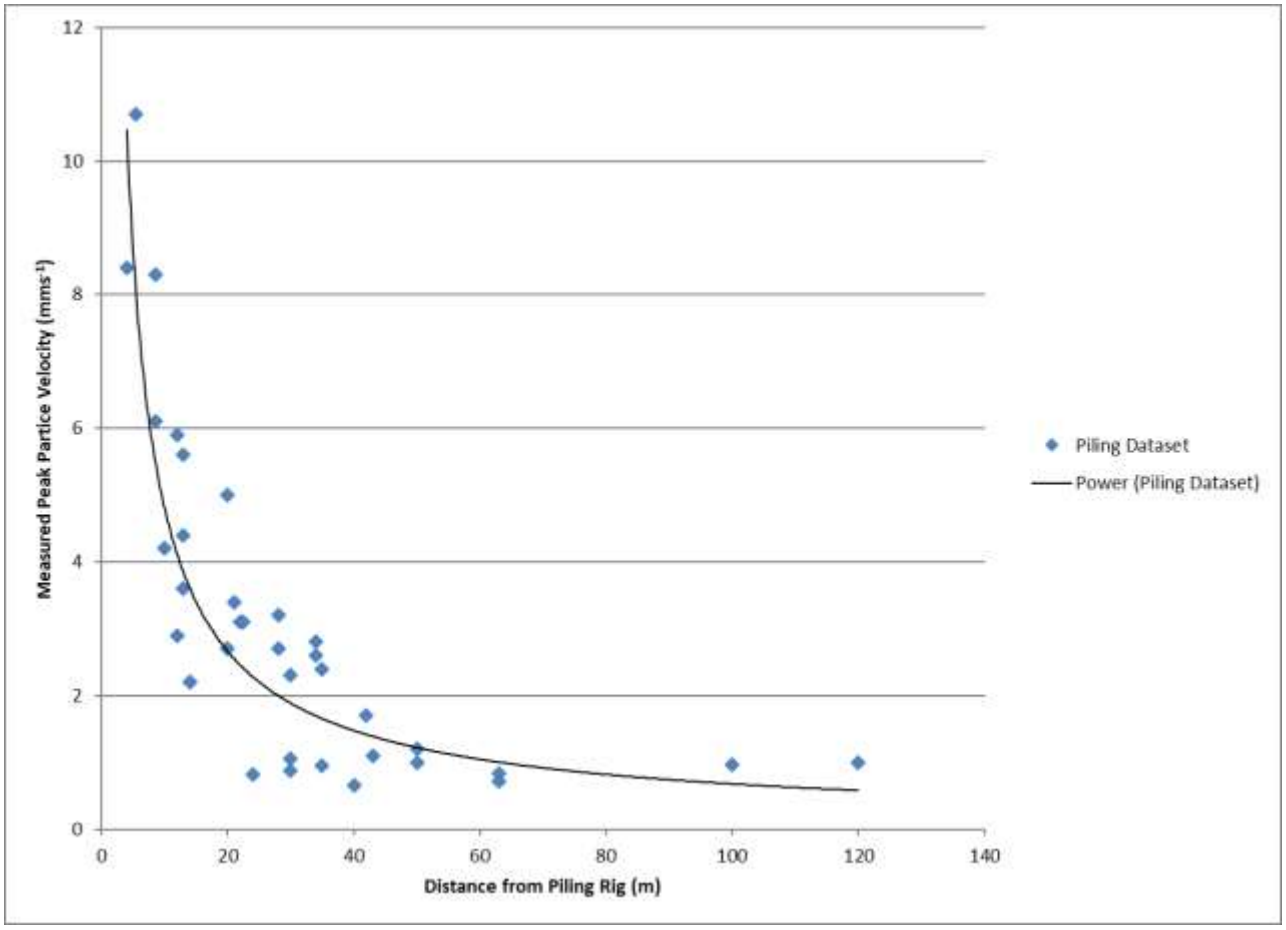

Plate 1: Driven Piling Data Regression Analysis

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**.

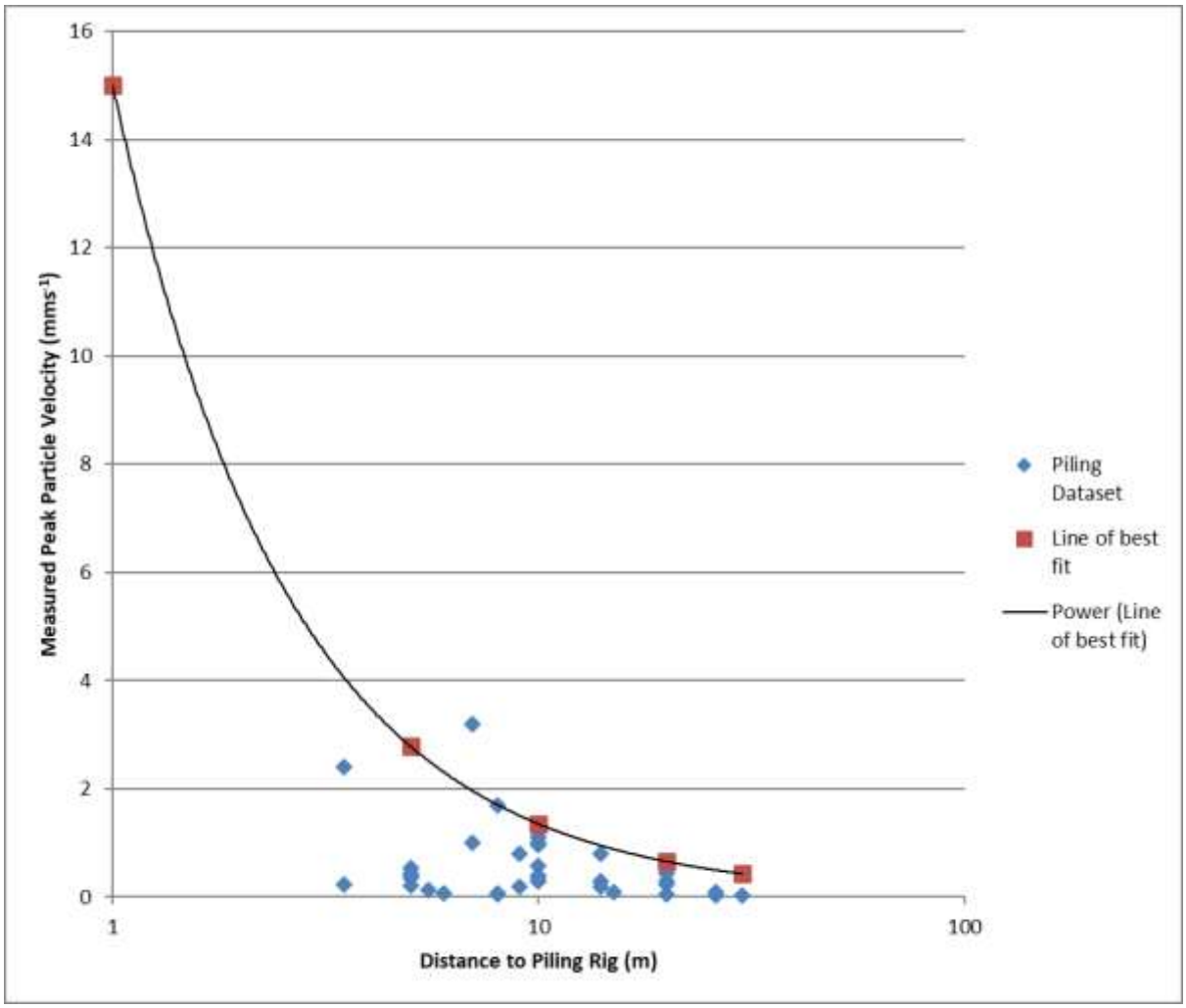

Plate 2: Bored Piling Data Regression Analysis

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

Ref	Road	2032 Baseline		2032 Baseline with Construction Traffic	
		Total	HGV%	Total	HGV%
RL1	A46 west of Halfway House Roundabout	38,017	11	38,305	11
RL2	Halfway House Lane	4,974	4	5,076	5
RL3	The Avenue	125	6	227	18
RL4	A46 east of Halfway House Roundabout	42,543	9	42,831	9

Ref	Road	2032 Baseline		2032 Baseline with Construction Traffic	
		Total	HGV%	Total	HGV%
RL5	Haddington Lane (between Fosse Lane and Old Haddington Lane)	4,615	5	4,816	5
RL6	Fosse Lane (north of Haddington Lane)	3,123	3	3,145	3
RL7	Old Haddington Lane (between Haddington Lane and A46)	4,081	5	4,282	6
RL8	A46 east of Fosse Lane	35,722	10	36,010	10
RL9	Haddington Lane (south of Old Haddington Lane)	6,371	8	6,657	8
RL10	Stone Lane	73	2	73	2
RL11	South Hykeham Road	5,695	4	5,784	5
RL12	Church Road (east of Bassingham Road)	6,703	4	6,703	4
RL13	Bassingham Road (southwest of Bridge Road)	1,414	2	1,503	3
RL14	Haddington Lane (south of Stone Lane)	2,210	4	2,312	5
RL15	Norton Lane	486	2	486	2
RL16	Moor Lane	2,570	7	2,643	8
RL17	Bassingham Road (between Moor Lane and Clay Lane)	2,183	3	2,227	3
RL18	Clay Lane	127	6	172	4
RL19	Unnamed Road (south of Halfway House Roundabout)	11,935	6	12,007	6
RL20	Fosse Lane (between A46 and Haddington Lane)	2,839	7	3,039	7
RJ1	Halfway House Roundabout (Halfway House Lane/A46(E)/Unnamed Road/A46(W))	47,896	9	48,271	9
RJ2	A46 EB On-Slip and Off-Slip (Fosse Lane(N)/Fosse	5,275	4	5,534	5

Ref	Road	2032 Baseline		2032 Baseline with Construction Traffic	
		Total	HGV%	Total	HGV%
	Lane(E)/Haddington Lane)				
RJ3	A46 WB On-Slip and Off-Slip (Haddington Lane(W)/Old Haddington Lane/Haddington Lane)	8,065	5	8,409	5
RJ4	Haddington Lane(N)/Butts Lane/Haddington Lane(S)/Stone Lane	7,713	5	7,927	5
RJ5	Bridge Road/Church Road/Bassingham Road	7,480	4	7,570	4
RJ6	Haddington Lane/Bassingham Road/Moor Lane	4,428	5	4,473	5
RJ7	Unnamed Road/Moor Lane/Norton Lane	3,866	4	3,939	5
RJ8	North Hykeham Roundabout (A46(N)/ Newark Road/ A46(S)/ Middle Lane)	45,004	8	45,379	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 client;

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 Site (referred to as 'DC-coupled' arrangement) and located alongside the Solar Stations, or located at a single BESS Compound (referred to as 'AC-coupled' arrangement). A total of 600 units have been modelled for the BESS Battery Containers, and 290 central inverters have been modelled covering both AC and DC layout options; and

e. Modelling assumes the 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 as representative of SMA central inverters (model Sunny Central Up). Manufacturer noise data for these inverters quotes a sound pressure level of 63 dB(A) 10m from the unit. These are considered to represent a worst-case and it is likely that actual plant selected for the final design will produce lower levels of noise.

5.2.2 Central inverters have been modelled as vertical area sources with a source height of 2m.

5.2.3 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 measured noise data provided by SUNGROW. Noise measurements around a battery storage unit provides a worst-case sound pressure level of 59dB(A) at a measurement distance of 1m, which has been used to model noise emissions. Battery storage units have been modelled as vertical area sources with a source height of 2.5m.

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 string's tracker motor will be less than 40dB at a 1m distance. As this level of noise would be unlikely to cause disturbance, noise emissions from tracker motors have not been considered in the operational noise assessment.