Tillbridge
Solar

Tillbridge Solar

PEI Report Volume II Appendix 13-4: Noise Modelling
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Table of Contents

Tables

1. Introduction

1.1.1 In order to determine potential operational noise emissions from the Scheme, noise prediction models have been prepared using the SoundPLAN® version 8.2 software package. The following assumptions were applied in noise models:

- The ground acoustic absorption has been modelled based on recommended absorption coefficients from OS Mapping land use categories, and have been assumed to be largely soft (G=0.8) in all areas not defined in this way;
- The maximum order of reflections was 3;
- Air temperature was assumed to be 10 degrees and humidity 70%;
- No buildings have been included in the model;
- Land topography has been sourced from publicly available Defra LIDAR data;
- No boundary fences/walls have been included in the noise model; and
- Receiver points have been modelled as free-field 1.5 m above local ground level (representative of ground floor windows) for daytime noise and 4 m above ground (representative of first floor windows) for night-time noise.

2. Construction Noise

2.1.1 SoundPLAN 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:

- Scenario 1 – Construction of the main substation;
- Scenario 2 – Construction of BESS, inverters and transformers;
- Scenario 3 – Construction of PV modules;
- Scenario 4 – Cable installation; and
- Scenario 5 – Horizontal Directional Drilling.

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. 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 BESS, 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	1
	Wheeled mobile telescopic crane	C.4, Item 38	106	1
	Diesel generator	C.4, Item 85	94	1
	Continuous flight auger piling	C.3, Item 17	104	1
	Cement mixer truck (discharging)	C.4, Item 18	103	1
	Dumper	C.4, Item 9	105	1
Construction of main substation	Tracked excavator	C.2, Item 14	107	2
	Lorry	C.2, Item 34	108	4
	Telescopic handler	C.2, Item 35	99	2
	Continuous flight auger piling	C.3, Item 17	104	1
	Wheeled mobile crane	C.3, Item 30	98	4

Work Package	Plant / Equipment	BS 5228 Reference	Sound Power Lw (dBA)	Quantity
	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	1
	Wheeled backhoe loader	C.4, Item 66	97	1
	Dumper	C.4, Item 9	105	2
	Telescopic handler	C.4, Item 55	98	1
	Vibratory roller	C.5, Item 27	95	1
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 31	110	1

3. Construction Traffic Noise

3.1.1 Construction traffic noise calculations have followed guidance from BS 5228-1 Annex F F.2.5 'Method for mobile plant using a regular well-defined route (e.g.haul roads)' using formula:

$$L_{Aeq,T} = L_{WA} – 33 + 10\log_{10}Q – 10\log_{10}V – 10\log_{10}d$$

Where:

L_{WA} is the sound power level of the vehicle, in decibels (dB);

Q is the number of vehicles per hour;

V is the average vehicle speed, in kilometres per hour (km/h); and

d is the lateral distance of the receiving position from the centre of the haul road, in metres (m).

3.1.2 The construction traffic is anticipated to result in up to 120 heavy-duty vehicles per 12-hour day, and up to 700 other (i.e. light) vehicles per 12-hour day. These values are to be compared against measured sound levels 5 m from the road centre with a speed limit of 30 miles per hour, approximately 48 km/h. It has been assumed that all vehicles will travel on average at the posted speed limit. The calculation is set out in Table 2.

Table 2: Construction Traffic Noise Calculation

Heavy Duty Vehicles		Other (light) vehicles	
L_{WA}, dB	110	L_{WA}, dB	99
Q, veh/h	10	Q, veh/h	58.3
V, km/h	48	V, km/h	48
d, m	5	d, m	5
$L_{Aeq,1h}$, dB	63.2	$L_{Aeq,1h}$, dB	59.9
		Total $L_{Aeq,1h}$, dB	**64.9**

4. Operational Noise

Modelling Methodology

4.1.1 Operational noise was modelled in SoundPLAN 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:

- Sound source heights for inverters and transformers have been based on measurements of Power Electronics central inverters at a similar existing facility;
- No specific layout has been assumed for the substations, with the sound sources spread evenly across the proposed substation footprint;
- 139 Solar Stations have been identified, with six BESS modules and one inverter per Station;
- 21200 tracking motors are identified, spread across approximately 9 million square metres of PV panel surface area, resulting in approximately 428 square meter area per motor; and
- Modelling assumes the site is continuously operational during daytime and night-time as a worst-case assumption, based on the possibility for some sound sources to operate in the early mornings and late evenings, particularly in the summer.

Sound Level Data – Inverters and Transformers

4.1.2 The proposed inverters are represented by indicative sound source data based on measurements of Power Electronics central inverters at a similar existing facility, giving a total sound power of approximately 88 dB;

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

4.1.4 Inverters have been modelled as vertical area sources with a source height of 3 m.

Sound Level Data – BESS Battery Storage Units

4.1.5 Battery storage module sound power levels have been based on AECOM library sound power data for battery storage module cooling systems, giving a sound power of 71 dB(A). Battery storage cooling fans have been modelled as point sources with a source height of 2 m.

Sound Level Data – Substation Plant

4.1.6 Sound level data of substation transformers at the Scheme are based on similar rated transformers for solar plant developments from AECOM library data. An assumed sound power level of 95 dB(A) has been applied for transformers within substation areas. Substation transformers have been modelled as horizontal area sources with a source height of 3.5 m.

4.1.7 Sound level data of shunt reactors at the Scheme are based on similar rated shunt reactor for National Grid substation developments from AECOM library data. An assumed sound power level of 82 dB(A) has been applied for shunt reactors within substation areas. Shunt reactors have been modelled as horizontal area sources with a source height of 4 m.

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