Arklow Bank Wind Park 2

Environmental Impact Assessment Report

Volume III, Appendix 8.2: Dogger Bank Piling Report (RFI March 2026)

sse Renewables

Contents

Figures

Tables

Revision	Date	Status	Author	Reviewed by	Approved by
1.0	23/01/2026	Final (External)	Sure Partners Limited	GoBe Consultants	Sure Partners Limited

1. Introduction

The Environmental Impact Assessment Report (EIAR) for Arklow Bank Wind Park 2 included the assessment of airborne noise from the installation of monopiles using impact piling. Assumed sound power levels of between 149.1 and 150.7 dB L_{WA} were included in the assessment. These assumed sound power levels were calculated using an empirical model provided to SSE Renewables by an external consultancy, hereafter referred to as the historic model. The historic model has not been verified.

The sound power levels derived using the historic model and presented in the Arklow Bank Wind Park 2 EIAR are higher than assumed values for similar comparable projects, including those of other Irish Phase One offshore wind projects, as shown in Table 1.

Table 1: Assumed Sound Power Levels Presented in other EIARs

Project	Hammer Energy Range (kJ)	Assumed Sound Power Level Range (dB L_{WA})
Awel y Môr[1]	3,000 – 5,000	137 – 139
Codling Wind Park[2]	4,400	145
Dublin Array[3]	6,400	140
NISA[4]	5,000	139
Oriel[5]	2,500 – 4,000	137 – 139
Thanet[6,7]	2,700 – 5,000	143 – 145

There is scant information on the reason for this range in, or source of, these sound power levels. The EIA documentation suggests that levels were assumed based on a limited number of measurement campaigns from historic data relating to much smaller piles and hammer energies, which were extrapolated to much larger piles and hammer energies.

As a result, SSE Renewables undertook a measurement exercise during the installation of monopiles at Dogger Bank B to (i) determine real-life sound power levels associated with the installation of XXL

[1] Awel y Môr Offshore Wind Farm, Environmental Statement. Volume 3, Chapter 10: Noise and Vibration, 2022.

[2] Codling Wind Park, Environmental Impact Assessment Report Volume 3 Chapter 24 Noise and Vibration. 2024

[3] Dublin Array, EIAR Volume 3: Offshore Infrastructure Assessment Chapters. Chapter 16: Noise and Vibration (Terrestrial Receptors), 2025.

[4] NISA - North Irish Sea Array, Environmental Impact Assessment Report. Volume 5: Wider scheme aspects. Chapter 30: Noise and Vibration, 2024.

[5] Oriel Windfarm, Environmental Impact Assessment Report - Volume 2C. Appendix 25-2: Noise Modelling Methodology, 2024.

[6] Vattenfall Wind Power Ltd, Thanet Extension Offshore Wind Farm – Environmental Statement Volume 3 Chapter 10: Noise and Vibration, 2018.

[7] Vattenfall Wind Power Ltd, Thanet Extension Offshore Wind Farm – Annex 10.2: Noise and Vibration Supporting Statement, 2018.

monopiles using impact hammers, (ii) validate or otherwise the historic model provided and (iii) refine or revise the prediction model if required.

2. Dogger Bank B Measurements and Derived Sound Power Levels

Noise measurements were conducted on the installation vessel during the installation of 12 XXL monopiles at Dogger Bank B during August and September 2024. The monopiles had a diameter of 8 m at the head of the monopile and were installed with a consented limit on hammer energies of 4,000 kJ.

Measurements of sound pressure level were converted to sound power levels by reversing the methodology of ISO 9613-2:2024[8]. Average sound power level values were calculated for each 25 cm of penetration depth alongside whole-pile averages.

Whole-pile average sound power levels were derived for each monopile, which ranged from 133 to 136 dB L_{WA}, with a mean of 135 dB L_{WA}. Maximum hammer energies varied for each monopile, with a range below the consented limit. The corresponding average one-third octave band sound power level spectrum is shown in Figure 1.

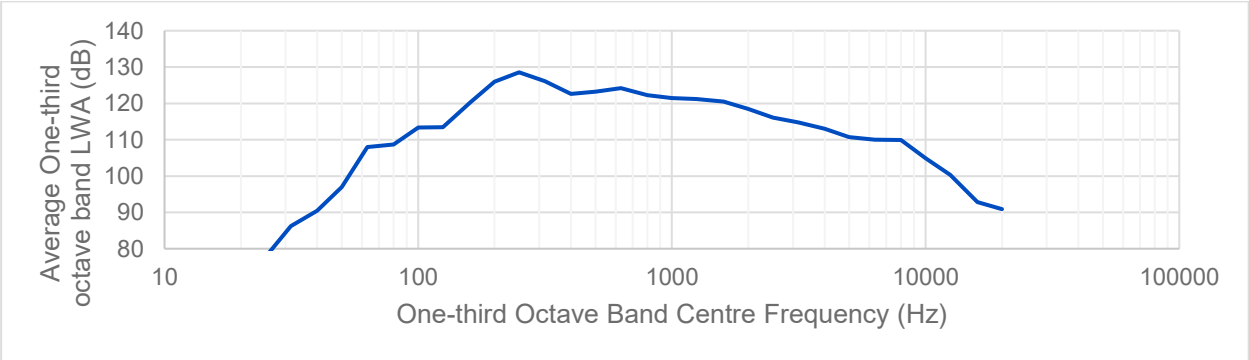

Figure 1: Sound power level spectra for the full duration of each monopile installation

3. Validation of the Historic Model and Derivation of Novel Model

The historic model calculates noise levels at discrete samples of the monopile installation. This allows for consideration of changes to the blow rate, hammer energy and exposed pile length throughout the installation. From this, a whole-installation average sound power level can be calculated. For each of the 12 monopiles, the sound power levels calculated using the historic method were compared with the measurement-derived sound power levels. Figure 2 shows one such comparison, demonstrating that the historic model significantly overpredicts sound power levels.

The complete dataset was used to develop a novel multiple linear regression model, hereafter referred to as the novel model. The novel model found that the exposed pile length is the dominant factor in predicting sound power levels, which correlates with previous findings[9]. The predictions using the novel

[8] ISO 9613-2:2024 Acoustics — Attenuation of sound during propagation outdoors. Part 2: Engineering method for the prediction of sound pressure levels outdoors

[9] C. Birch and S. Stephenson, Predicting and assessing airborne noise from offshore piling of wind turbine foundations, Acoustics 2021.

model are also shown in Figure 2, showing much better correlation. The novel model is found to predict levels with an expanded uncertainty of 2.2 dB with a 95% confidence factor. By comparison, the historic model is found to predict levels with an expanded uncertainty of 17.2 dB with a 95% confidence factor.

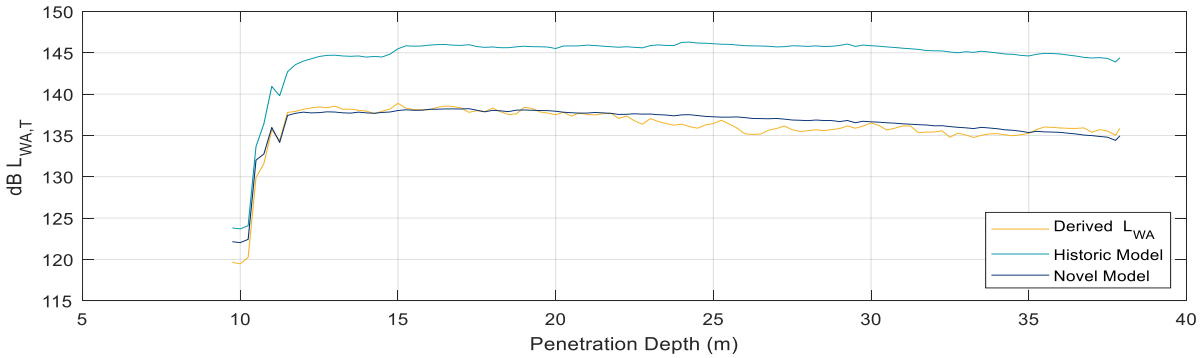

Figure 2 Comparison of derived and predicted sound power levels throughout the installation of a monopile

Figure 3 compares the whole-pile derived sound power levels with those predicted using both the historic and novel models. The historic model significantly overpredicts levels (by approximately 8 dB), while the novel model aligns much more closely (with levels overpredicted by approximately 1 dB). This slight overprediction of the novel model indicates that the model is inherently conservatism, without being excessively conservative.

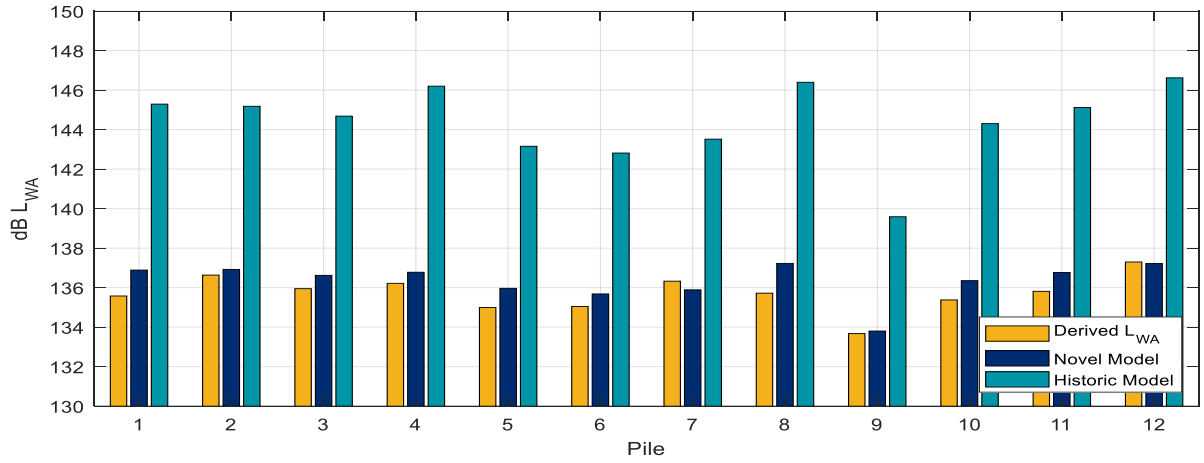

Figure 3: Comparison of Whole-Pile Derived and Modelled Sound Power Levels

In addition to the broadband sound power levels, the work identified amendments to the previously assumed sound power level spectrum. The historic model was provided with an associated octave band spectrum which was shown to have peak A-weighted energy at 1 kHz. As illustrated in Figure 1, the measurement campaign found the peak A-weighted energy at 250 Hz. Figure 4 compares octave band spectra of the historic and novel model. While the novel model results in lower broadband sound power levels, the dominance of lower frequency energy in the novel model offsets, to some extent, the reduction in predicted levels at large propagation distances.

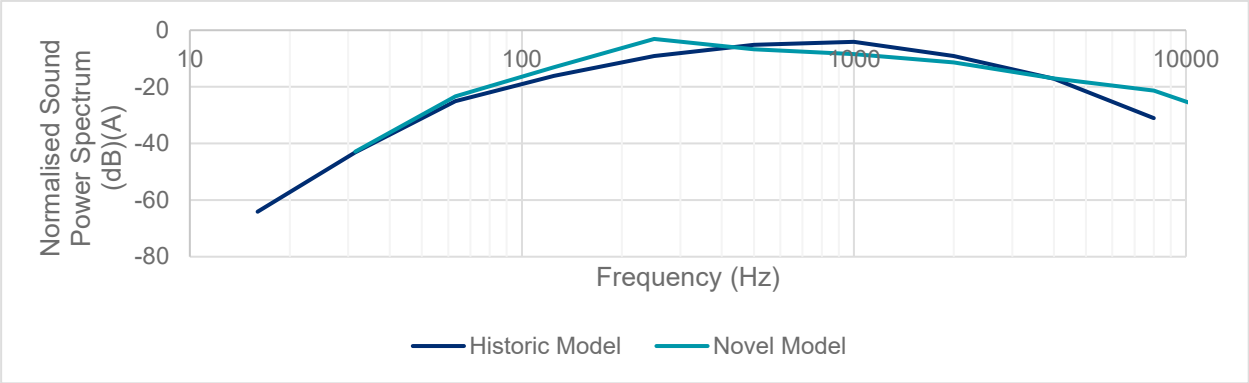

Figure 4: Comparison of Dogger Bank B and TNO spectra

4. Applicability of Novel Model to Arklow:

The applicability of the novel model to Arklow has been investigated. The novel model was derived from measurements taken on a single offshore wind farm, Dogger Bank B. Differences of key parameters from Dogger Bank B and Arklow Bank Wind Park 2 are illustrated in Table 2. The comparison shows that the maximum hammer energies are comparable alongside a small extrapolation for monopile diameters of less than 40%. With respect to noise, which often follows a logarithmic relationship, this degree of extrapolation is considered to be acceptable. Water depths of Arklow Wind Park 2 are similar although slightly less than the measurement campaign. The seabed conditions in the which the monopiles are installed are sandy for both the measurement campaign and Arklow.

Table 2: Comparison of Dogger Bank B and Arklow Bank Wind Park 2 Piling and Environmental Parameters

Parameter	Dogger Bank B	Arklow Bank Wind Park 2
Maximum hammer energy (kJ)	4,000	3,500
Monopile diameter (m)	8.0 (head) – 8.8 (toe)	Up to 11
Water depths (m)	23 – 33*	21 – 31

**Water Depths at the 12 monopiles measured*

Not all parameters used to derive the historic model are known. However, the hammer energy of the underlying measurements is known to be 380 kJ with a diameter of 4.6 m. The use of the historic model for Arklow would result in extrapolation of 920% with respect to hammer energy and 230% with respect to monopile diameter.

It is therefore concluded that the use of the novel method is considered to be significantly more robust than the historic model.

5. Conclusions

A review of recent EIARs identified that sound power levels from pile driving of XXL monopiles predicted using the historic model were significantly higher than assumed for other projects, despite comparable hammer energies. There is a scarcity of measured noise levels from impact driving of monopiles, and the data used for other EIARs stems from significantly smaller piles.

A measurement campaign was conducted to derive sound power levels during the installation of twelve monopiles at Dogger Bank B offshore wind farm. The derived sound power levels for the 12 monopiles varied from 133 to 136 dB L_{WA}.

Derived sound power levels were compared against predictions made using the historic model, which found the historic model significantly overpredicted sound power levels.

A novel model was derived from the measurement campaign, which correlates much more closely with the derived sound power levels.

The applicability of the novel model to Arklow Bank Wind Park 2 was investigated. It was found that the novel model is considerably more robust than the historic model.

It is therefore recommended that any future predictions of sound power levels from impact driving of XXL monopiles in relation to Arklow Bank Wind Park 2 uses the novel model.