Awel y Môr Offshore Wind Farm

Level B Harassment Threshold Comparison Note

Marine Licence Submission 1

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Fferm Wynt Alltraeth
AWEL Y MÔR
Offshore Wind Farm

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Contents

Figures

Tables

1 Introduction

1 This note has been prepared in response to the Written Representation from Natural Resources Wales (NRW) (see Applicant's response to REP1-080-2.7.5.d.i – vi in REP2-002).

2 NRW advised that the Applicant includes an analysis using a fixed threshold, such as 160 dB re 1 µPa SPL_{rms}, for impulsive noise for bottlenose dolphin (Level B harassment: NMFS 1995, 2005) to calculate the number of dolphins disturbed, and as a useful comparison against the results of the proxy Dose Response (D/R) analysis. The NRW rationale behind this being because they opine that the D/R curves are developed from fine scale behaviour and therefore even if these species started to respond at similar sound levels, there would be no guarantee that the probability curve will have the same shape for different species.

2 Level B Harassment

2.1 Introduction

3 The National Marine Fisheries Service (NMFS) uses the Level B harassment threshold to predict marine mammal behavioural harassment. This threshold predicts that Level B harassment will occur when an animal is exposed to received levels above 160 dB re 1 µPa (rms) for non-explosive impulsive (e.g., seismic airguns, impact pile driving) or intermittent (e.g. scientific, non-tactical sonar) sound sources (Guan and Brookens, 2021; NMFS, 2022). The Level B harassment threshold originates from a study on a grey whale mother and calf, which were shown to exhibit avoidance responses when exposed to air gun playback signals at levels above 160 dB re 1µParms (Malme et al., 1984).

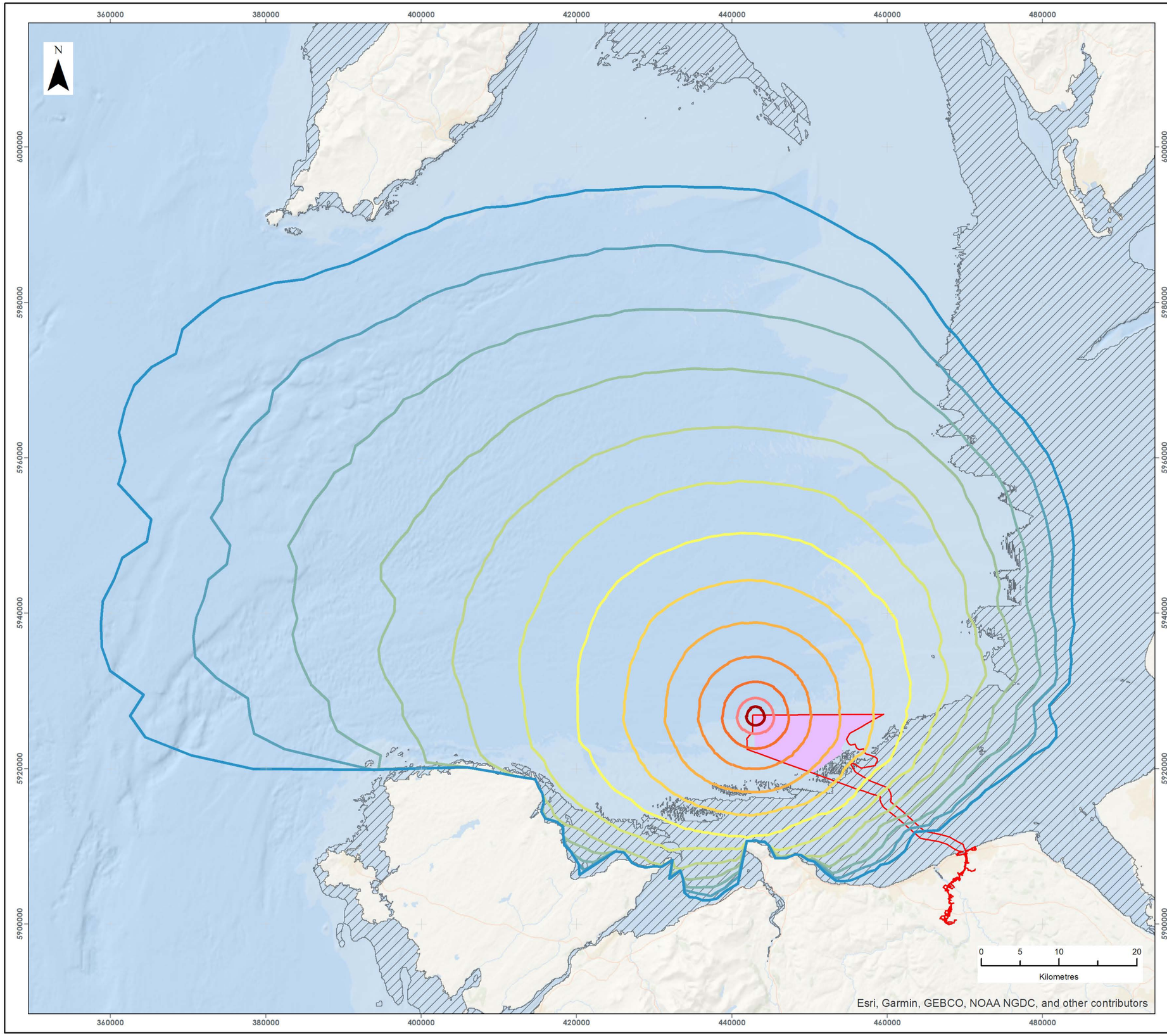
4 Level B harassment is defined by NOAA (2005) as 'acts that have the potential to disturb (but not injusr) a marine mammal or marine mammal stock in the wind by disrupting behavioural patterns including, but not limited to, migration, breathing, nursing, breeding, feeding or sheltering.'

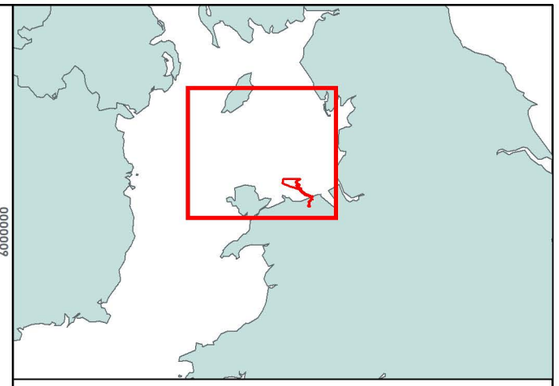
2.2 Comparison to D/R Function

5 The Applicant has undertaken underwater noise modelling for the Level B harassment threshold (represented in Figure 2) and compared it against the D/R modelling (represented in Figure 1) for the NW monopile at maximum hammer energy as a worst-case. The numbers of potentially impacted individuals are presented in Table 1. The outputs show that significantly fewer bottlenose dolphins are predicted to experience behavioural disturbance using the Level B harassment threshold (NOAA, 2005) compared to the use of the harbour porpoise D/R function for impact pile driving (Graham et al., 2017) (Table 1). It is acknowledged that neither approach/threshold is specific to bottlenose dolphin response to pile driving, however in the absence of species-specific empirical data, a range of proxies is useful to provide context on the potential extent of disturbance.

Table 1: Number of bottlenose dolphins predicted to experience behavioural disturbance using two different approaches: the harbour porpoise D/R function and the Level B harassment threshold.

	MONOPILE 5,000KJ	
	NW	SE
D/R CURVE	23	16
LEVEL B HARASSMENT	5	4





LEGEND

- Order Limits
- Array Area
- 20 m Depth Contour

NW Monopile Disturbance Dose-Response Contours

- 120 SELss dB re 1 µPa²s
- 125 SELss dB re 1 µPa²s
- 130 SELss dB re 1 µPa²s
- 135 SELss dB re 1 µPa²s
- 140 SELss dB re 1 µPa²s
- 145 SELss dB re 1 µPa²s
- 150 SELss dB re 1 µPa²s
- 155 SELss dB re 1 µPa²s
- 160 SELss dB re 1 µPa²s
- 165 SELss dB re 1 µPa²s
- 170 SELss dB re 1 µPa²s
- 175 SELss dB re 1 µPa²s
- 180 SELss dB re 1 µPa²s

Data Source:
Subacoustech Enviromental Ltd

PROJECT TITLE:

AWEL Y MÔR OFFSHORE WINDFARM

FIGURE TITLE:

Bottlenose Dolphin Dose-Response Function

VER	DATE	REMARKS	Drawn	Checked
1	16/11/2022	For Issue	RRS	RM

FIGURE NUMBER:

Figure 1

SCALE:	PLOT SIZE:	DATUM:	PROJECTION:
1:500,000	A3	WGS84	UTM30N

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AWEL Y MÔR Offshore Wind Farm

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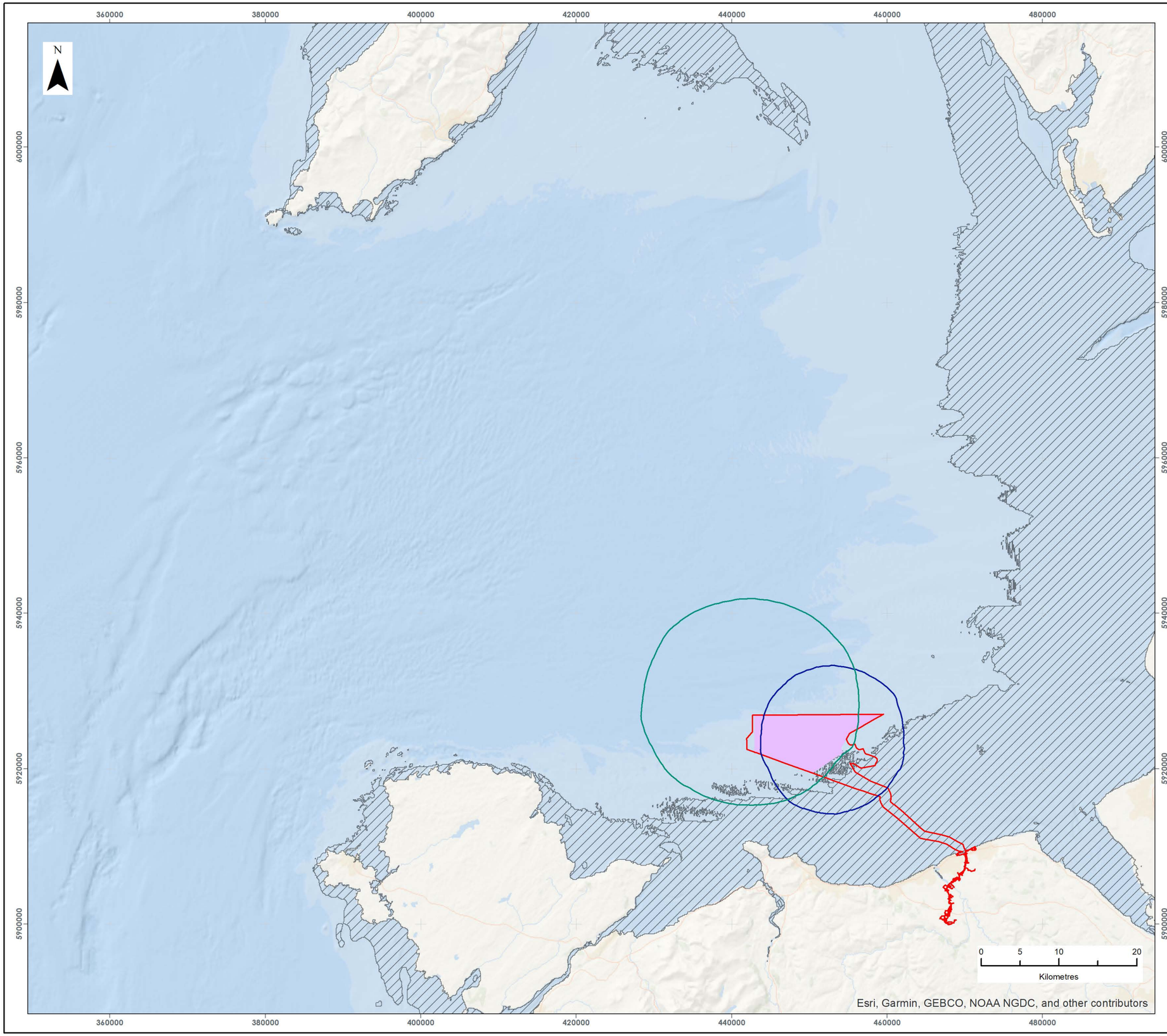

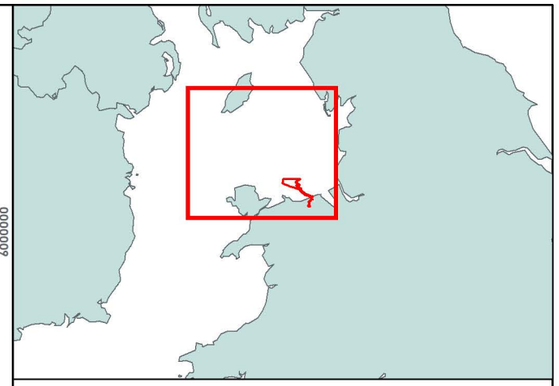

LEGEND

- Order Limits
- Array Area
- 20 m Depth Contour
- AyM NW Mono 5000kJ (160dB RMS)
- AyM SE Mono 5000kJ (160dB RMS)

Data Source:
Subacoustech Enviromental Ltd

PROJECT TITLE:

AWEL Y MÔR OFFSHORE WINDFARM

FIGURE TITLE:

Bottlenose Dolphin Level B Harassment

VER	DATE	REMARKS	Drawn	Checked
1	16/11/2022	For Issue	RRS	RM

FIGURE NUMBER:

Figure 2

SCALE:	PLOT SIZE:	DATUM:	PROJECTION:
1:500,000	A3	WGS84	UTM30N

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AWEL Y MÔR Offshore Wind Farm

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3 Conclusion

6 The outputs of the comparison exercise between the D/R analysis and the modelling of Level B harassment thresholds clearly indicate that the magnitude of effect of underwater noise on bottlenose dolphin is more precautionary when using the D/R approach. Therefore, the Applicant can confirm that the conclusions drawn with the Environmental Statement and Report to Inform Appropriate Assessment (RIAA) using the D/R approach remain valid.

4 References

Graham, I. M., A. Farcas, N. D. Merchant, and P. Thompson. 2017. Beatrice Offshore Wind Farm: An interim estimate of the probability of porpoise displacement at different unweighted single-pulse sound exposure levels, Prepared by the University of Aberdeen for Beatrice Offshore Windfarm Ltd.

Guan, S., and T. Brookens. 2021. The Use of Psychoacoustics in Marine Mammal Conservation in the United States: From Science to Management and Policy. Journal of Marine Science and Engineering 9(5):507.

Malme, C., P. Miles, C. Clark, P. Tyack, and J. Bird. 1984. Investigations of the Potential Effects of Underwater Noise from Petroleum Industry Activities on Migrating Gray Whale Behavior—Phase II, U-S. Department of the Interior Minerals Management Service.

NMFS. 2022. National Marine Fisheries Service: Summary of Marine Mammal Protection Act Acoustic Thresholds.

NOAA. 2005. Endangered Fish and Wildlife; Notice of Intent to Prepare an Environmental Impact Statement., Federal Register 70: 1871-1875.

5 Appendix A: Underwater Noise Modelling Report

Project title	Additional underwater noise modelling at Awel y Môr covering the NOAA Level B Harassment Threshold
Project number	P274
Author(s)	Richard Barham, Tim Mason
Company	Subacoustech Environmental Ltd.
Report number	P274IR0301
Date of issue	11 November 2022

Introduction

Following the external examination of the EIA for Awel y Môr, Natural Resources Wales (NRW) have advised that the "Level B harassment" thresholds from NOAA (2005)[1] for bottlenose dolphin should be modelled to help assess the number of animals disturbed from impact piling noise during construction of Awel y Môr. The levels presented in this report should be considered in context with the previous underwater noise modelling produced for Awel y Môr.

Criteria

NOAA (2005) states that marine mammals are likely to be disturbed in a manner that qualifies as Level B harassment when exposed to underwater noise above RMS received levels of 160 dB re 1 µPa for impulsive or intermittent sources (including impact piling driving).

Level B harassment is defined by NOAA as "acts that have the potential to disturb (but not injure) a marine mammal or marine mammal stock in the wild by disrupting behavioural patterns, including, but not limited to, migration, breathing, nursing, breeding, feeding, or sheltering."

It is worth noting that the Level B harassment criterion is based on limited data and may not be relevant to species in UK waters or these conditions.

Results

Table 1 to Table 3 presents the modelled impact ranges for the 160 dB SPL_{RMS} acoustic threshold covering all the modelling scenarios from the previous modelling. Impact piling for WTG foundations at the NW and SE extents of the site with monopile and multi-leg pile foundation options, and a coastal location for cofferdam installation at high and low tides. For each scenario the impact ranges have been given for the soft start (at a reduced blow energy) and the full energy of the piling hammer, representing the range of predicted impacts.

The impact range results have also been provided as GIS shapefiles.

Table 1 Summary of the predicted SPL_{RMS} impact ranges at the NW location considering the NOAA (2005) Level B harassment threshold

NW location	Monopile foundations		Multi-leg foundations	
	Soft start energy: 750 kJ	Full energy: 5000 kJ	Soft start energy: 450 kJ	Full energy: 3000 kJ
Area	230 km^2	580 km^2	120 km^2	470 km^2
Maximum range	9.3 km	16 km	6.6 km	14 km
Minimum range	7.8 km	11 km	5.9 km	10 km
Mean range	8.6 km	14 km	6.3 km	12 km

[1] National Oceanic and Atmospheric Administration (NOAA) (2005). *Endangered fish and wildlife; Notice of intent to prepare an Environmental Impact Statement.* Federal Register 70: 1871-1875.

Table 2 Summary of the predicted SPL_{RMS} impact ranges at the SE location considering the NOAA (2005) Level B harassment threshold

SE location	Monopile foundations		Multi-leg foundations	
	Soft start energy: 750 kJ	Full energy: 5000 kJ	Soft start energy: 450 kJ	Full energy: 3000 kJ
Area	110 km^2	280 km^2	56 km^2	210 km^2
Maximum range	6.8 km	12 km	4.8 km	10 km
Minimum range	5.0 km	7.3 km	3.8 km	6.6 km
Mean range	5.9 km	9.3 km	4.2 km	8.2 km

Table 3 Summary of the predicted SPL_{RMS} impact ranges at the cofferdam location (covering both high and low tides) considering the NOAA (2005) Level B harassment threshold

Cofferdam location	High Tide (MHWS +8.0 m)		Low Tide (MLWS +0.6 m)	
	Soft start energy: 60 kJ	Full energy: 300 kJ	Soft start energy: 60 kJ	Full energy: 300 kJ
Area	0.02 km^2	0.59 km^2	< 0.01 km^2	0.03 km^2
Maximum range	90 m	440 m	< 50 m	110 m
Minimum range	80 m	430 m	< 50 m	100 m
Mean range	90 m	430 m	< 50 m	110 m

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