LLŶR FLOATING OFFSHORE WIND PROJECT

Llŷr 1 Floating Offshore Wind Farm

Environmental Statement

Volume 6: Appendix 21C, Annex B - Common Dolphin Impact Assessment Comparison Using Site-Specific Density

August 2024

Prepared by: Llŷr Floating Wind Ltd

FLOVENTIS ENERGY

Document Status

Version	Authored by	Reviewed by	Approved by	Date
FINAL	HiDef Aerial Surveying Ltd	HiDef Aerial Surveying Ltd	AECOM	August 2024

Approval for Issue

Prepared by	HiDef Aerial Surveying Ltd
Prepared for	Llŷr Floating Wind Limited
Approved by	Jay Hilton-Miller

Acronyms and abbreviations

Acronym, Abbreviation or Unit	Definition	Acronym, Abbreviation or Unit	Definition
%	Percentage	MU	Management Unit
CI	Confidence/Credible Interval	n	Number
DAS	Digital Video Aerial Survey	S02	Survey 02
HiDef	HiDef Aerial Surveying Ltd	SCANS	Small Cetaceans in the European Atlantic waters and North Sea
IAMMWG	Inter-Agency Marine Mammal Working Group	SNCB	Statutory Nature Conservation Body
km^2	Square kilometre	UXO	Unexploded ordnance
Llŷr	Llŷr Floating Offshore Wind Project		

Glossary of project terms

Term	Definition
The Applicant	The developer of the Project, Llŷr Floating Wind Limited
Array	All wind turbine generators, inter array cables, mooring lines, floating sub-structures and supporting subsea infrastructure within the Array Area, as defined, when considered collectively, excluding the offshore export cable(s).
Array Area	The area within which the wind turbine generators, inter array cables, mooring lines, floating sub-structures and supporting subsea infrastructure will be located
Floventis Energy	A joint venture company between Cierco Ltd and SBM Offshore Ltd of which Llŷr Floating Wind Limited is a wholly owned subsidiary.
Landfall	The location where the offshore export cable(s) from the Array Area, as defined, are brought onshore and connected to the onshore export cables (as defined) via the transition joint bays (TJB).
Llŷr 1	The proposed Project, for which the Applicant is applying for Section 36 and Marine Licence consents. Including all offshore and onshore infrastructure and activities, and all project phases.
Marine Licence	A licence required under the Marine and Coastal Access Act 2009 for marine works which is administered by Natural Resources Wales (NRW) Marine Licensing Team (MLT) on behalf of the Welsh Ministers.
Offshore Development Area	The footprint of the offshore infrastructure and associated temporary works, comprised of the Array Area and the Offshore Export Cable Corridor, as defined, that forms the offshore boundary for the S36 Consent and Marine Licence application
Offshore Export Cable	The cable(s) that transmit electricity produced by the WTGs to landfall.
Offshore Export Cable Corridor (OfECC)	The area within which the offshore export cable circuit(s) will be located, from the Array Area to the Landfall.
Onshore Development Area	The footprint of the onshore infrastructure and associated temporary works, comprised of the Onshore Export Cable Corridor and the Onshore

Term	Definition
	Substation, as defined, and including new access routes and visibility splays, that forms the onshore boundary for the planning application.
Onshore Export Cable(s)	The cable(s) that transmit electricity from the landfall to the onshore substation
Onshore Export Cable Corridor (OnECC)	The area within which the onshore export cable circuit(s) will be located.
proposed Project	All aspects of the Llŷr 1 development (i.e. the onshore and offshore components).
Onshore Substation	Located within the Onshore Development Area, converts high voltage generated electricity into low voltage electricity that can be used for the grid and domestic consumption.
Section 36 consent	Consent to construct and operate an offshore generating station, under Section 36 (S.36) of the Electricity Act 1989. This includes deemed planning permission for onshore works.

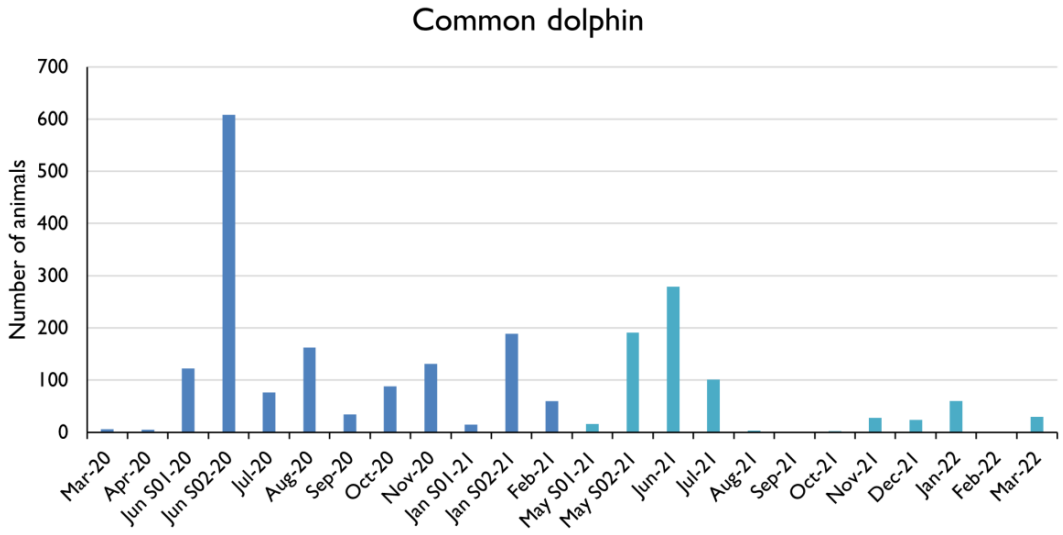
Contents

List of Tables

List of Figures

21.C – ANNEX B: COMMON DOLPHIN IMPACT ASSESSMENT COMPARISON USING SITE-SPECIFIC DENSITY

1. This **Annex B** to the **Appendix 21C: Marine Mammal Underwater Noise Assessment** presents a comparative assessment using the Llŷr marine megafauna Digital Aerial Survey (DAS) absolute density estimates for common dolphin.
2. JNCC written advice 04 August 2023 'we recommend taking the precautionary approach and using densities based on the survey data for common dolphins. An alternative option would be to take both densities forward to the assessment to enable a comparison'. This **Annex B** fulfils the alternative option as recommended.
3. DAS site-specific densities reflect sightings data within the Llŷr marine megafauna survey area during each survey flown. The variability and seasonality of animals detected is informative in terms of site characterisation and potential patterns of use. Whether it is appropriate to assume that the resultant absolute density estimates can be extrapolated beyond the site survey area needs to be considered in the context of other density estimates at a comparable or regional scale.
4. Common dolphins were the most abundant marine mammal encountered in the DAS, with a major peak in June 2020. Monthly detections ranged from five to 608 animals in Year 1, and between zero and 179 animals in Year 2 (**Appendix 21A: Marine Mammal and Megafauna Baseline**). The peak occurrence of common dolphin in both years was in June (**Annex B Figure 21C-1**). The timing of the observed peak occurrence is consistent with the pattern of occurrence presented in Evans and Waggitt (2023).
5. The large number of temporally discrete common dolphin DAS detections is likely to reflect a large group(s) of animals passing through during the June 2020 (Survey 02; S02) survey.
6. A total number of 2,230 common dolphins over the two years were recorded across the whole Llŷr marine megafauna survey area.



Annex B Figure 21C-1. Number of common dolphins recorded between March 2020 and March 2022 in the Llŷr marine megafauna DAS area (Appendix 22A)

7. Full details of the data analysis undertaken to derive density estimates from DAS data are presented in **Section 21.2.1** of **Appendix 21A: Marine Mammal and Megafauna Baseline.** A brief summary of the methodology is reproduced here.

8. Availability bias for common dolphin was derived using the equation provided by Laake *et al.* (1997), after Paxton *et al.* (2016). The approach was applied using estimated common dolphin mean surface and dive times taken from Evans, P. (*pers comm*) as cited in Paxton *et al.* (2016).

9. Model-based estimates calculated average relative (uncorrected) and absolute (corrected for availability bias) densities for the whole survey period of 1.06 animals/km^2 (95% Confidence / Credible Interval (CI) 0.64 – 1.70) and 15.97 animals/km^2 (95% CI 9.65 – 25.62), respectively. This equates to mean abundance estimates of 793 animals (95% CI 723 – 862) and 11,966 animals (95% CI 10,911 – 13,008), respectively. Mean densities were estimated to be higher in the summer than the winter for both relative and absolute estimates over the Llŷr marine megafauna survey area (**Appendix 21A: Marine Mammal and Megafauna Baseline**).

10. For comparison, design-based methods across the entire survey programme, resulted in an average absolute density (corrected for availability bias) of 17.41 animals/km^2 (95% CI 12.01 – 22.81) in the Llŷr marine megafauna survey area, and so similar to model-based.

11. It is useful to compare the site survey results for the Erebus project (Darias-O'Hara *et al.*, 2021) due to its proximity to the proposed Project. The average relative density was estimated at 1.52 animals/km^2 (similar to Llŷr). Absolute density estimates were also calculated but used diving rates for groups recorded in south Australia by Bilgmann *et al.* (2018), an alternative approach to Llŷr. A 94% availability rate of groups was used and resulted in an absolute density estimate over the 24-month period only slightly greater than the relative estimate, at 1.61 animals/km^2.

12. The absolute density estimates from Llŷr and Erebus are significantly different (**Annex B Table 21C-1**), whilst the uncorrected for both Llŷr and Erebus are similar. This is driven by the choice of method to correct estimates for availability bias. There is high uncertainty in the actual correction for availability bias due to the lack of available dive duration data for common dolphin. Only two approaches (for Llŷr and Erebus) have been applied to date in UK common dolphin assessments but neither has been endorsed by Statutory Nature Conservation Bodies (SNCBs) and both are based on very limited evidence. Currently, there is no available guidance to inform the method choice. Further research is required before there can be confidence in the methodology of availability bias corrections.

13. Comparison of the relative areas of SCANS-IV (Block CS-C) and the Llŷr marine megafauna survey area, shows that the DAS area is approximately 1.77% of the SCANS-IV Block CS-C, highlighting the relatively small size of the Llŷr marine megafauna survey area.

14. If a comparison is made between the abundance estimates from the DAS analysis, and the estimated abundance within SCANS-IV Block CS-C (30,301 (95%CI 17,888 – 51,902)), the uncorrected estimate (793 individuals) is 2.62% of the SCANS-IV Block abundance, and the corrected (11,966 individuals) is 39.5%.

15. Applying a similar comparison to the common dolphin management unit (MU) abundance estimate (102,656 individuals (95% CI 58,932–178,882) (IAMMWG, 2022)), the proportion of the SCANS-IV Block CS-C abundance is 29.5% of the total MU. Extrapolating the site specific average corrected density estimate of 15.97 animals/km^2 over the SCANS Block CS-C area results in a proportion of the MU of 56 %, almost twice that of the SCANS-IV estimate.

Annex B Table 21C-1. Summary of common dolphin density estimates collected around the Array Area

Study or survey programme	Area		Uncorrected average relative density (n/km²)	Corrected average absolute density (n/km²)
	Name	Size (km²)		
Proposed Project, HiDef site-specific surveys	Llŷr marine megafauna survey area	640.92	1.06	15.97
Erebus Project, HiDef site-specific surveys (Darias-O'Hara *et al.,* 2021)	Erebus survey area (development area plus a 4 km buffer)	200.11	1.52	1.61
Cetacean and Seabirds of Wales (Evans and Waggitt, 2023)	Llŷr marine megafauna survey area	640.92	0.233	N/A
SCANS-III Survey (Hammond *et al.,* 2021)	Block D – Celtic and Irish Seas	48,590	N/A	0.374
SCANS-IV Survey (Gilles *et al.,* 2023)	Block CS-C	36,031	N/A	0.841
ObSERVE Survey (Rogan *et al.,* 2018)	Stratum 4 – Celtic Sea	N/A	N/A	0.637
JCP Phase III (Paxton *et al.,* 2016)	Atlantic Array	19,649	N/A	0.634

16. These comparisons assume a uniform density surface over the entire SCANS-IV Block and show that the use of the corrected DAS density estimate results in an unrealistically high proportion of individuals within the area. If used in the underwater noise assessment, it would result in a disproportionate number of animals impacted relative to the SCANS-IV Block CS-C and / or the MU reference population.

17. The predicted area within which common dolphin may be at risk of disturbance from impact piling is 42,153 km² based on the worst-case scenario (i.e. the use of the dose response isopleths) (see **Appendix 21B: Marine Mammal Underwater Noise Modelling**). Comparison to the Llŷr marine megafauna survey area of 640.92 km² highlights that this regional scale is most appropriately covered by the use of the SCANS-IV density estimates.

18. The impact assessment has therefore been based on the use of the SCANS-IV density estimates for the Block CS-C for common dolphin.

19. It is also worth noting that the MU reference population estimate (IAMMWG, 2022) is based on SCANS-III data. Although slightly different areas, we can compare SCANS-III and SCANS-IV Blocks relevant to the proposed project location. The SCANS-III density estimate for Block D was 0.374 animals/km², lower than the SCANS-IV (Block CS-C) estimate of 0.841 animals/km².

20. It is therefore possible that the assessment of impact to the MU population using the density estimate from SCANS-IV in relation to the MU reference population is over-precautionary.

21.1 Pre-Construction and Construction Noise Impact Results

21. Impacts to common dolphin have been assessed in this Annex using three density estimates for comparative purposes. SCANS-IV Block CS-C (0.841 animals/km²), DAS modelled average

absolute density estimate corrected for availability bias (15.97 animals/km^2) and the modelled uncorrected average relative density (1.06 animals/km^2) (**Annex B Table 21C-2**).

Annex B Table 21C-2. Summary of impact ranges for all assessed noisy activities using three density estimates for comparison purposes. Negligible = less than 0.02 % of reference population, bold highlighting worst case

Activity	Density (n/km^2)	Area (km^2)	Number	% reference population
Geophysical surveys	0.841	78.5	66	0.064
Disturbance	1.06		83	0.081
5km EDR	**15.97**		**1254**	**1.221**
Unexploded ordnance clearance	0.841	2.63	2.2	Negligible
High Order PTS SPLpk	1.06		2.8	Negligible
	15.97		42	Negligible
High order PTS SELss	0.841	0.00	0	0
	1.06		0	0
	15.97		0	0
Low order PTS SPLpk	0.841	0.05	<1	Negligible
	1.06		<1	Negligible
	15.97		<1	Negligible
Low order PTS SELss	0.841	0.00	0	0
	1.06		0	0
	15.97		0	0
High order TTS SPLpk	0.841	9.62	8	Negligible
	1.06		10	Negligible
	15.97		154	0.150
High order TTS SELss	0.841	0.08	<1	Negligible
	1.06		<1	Negligible
	15.97		2	Negligible
Low order TTS SPLpk	0.841	0.18	<1	Negligible
	1.06		<1	Negligible
	15.97		3	Negligible
Low order TTS SELss	0.841	0.00	0	0
	1.06		0	0
	15.97		0	0
Impact piling	0.841	0.00	0	0
PTS SPLpk	1.06		0	0
	15.97		0	0
PTS SELcum (static)	0.841	0.09	<1	Negligible
	1.06		<1	Negligible
	15.97		1	Negligible
PTS SELcum (fleeing)	0.841	0.03	<1	Negligible
	1.06		<1	Negligible
	15.97		<1	Negligible
Disturbance	0.841	270	227	0.221
160 dB fixed (worst-case)	1.06		286	0.279
	15.97		**4312**	**4.2**

Activity	Density (n/km²)	Area (km²)	Number	% reference population
Disturbance 160 dB fixed (best-case)	0.841	131	110	0.107
	1.06		139	0.135
	15.97		**2087**	**2.033**
Disturbance Dose Response curve (120 – 180 dB bins)	0.841	42153	7379	7.2
	1.06		9301	9.06
	15.97		**140130**	**136.5**
Disturbance Dose Response curve (140 – 180 dB bins)	0.841	5805	2380	2.32
	1.06		2999	2.92
	15.97		**45190**	**44.02**
Other construction activities Disturbance (worst case range) 120 dB fixed	0.841	1201	1010	0.984
	1.06		1275	1.242
	15.97		**19191**	**18.659**
Disturbance (best case range) 120 dB fixed	0.841	0.26	<1	Negligible
	1.06		<1	Negligible
	15.97		4	Negligible
Disturbance from vessels 120 dB fixed (Worst case range)	0.841	63.7	54	0.052
	1.06		68	0.066
	15.97		1017	0.991
120 dB fixed (best case range)	0.841	3.8	3	Negligible
	1.06		4	Negligible
	15.97		61	0.059

22. Operational noise was not reassessed in this comparative study, because impact ranges were found to be highly localised (see **Appendix 21C: Marine Mammal Underwater Noise Assessment**).

23. This assessment has shown that significance conclusions would remain the same as presented in **Volume 3, Chapter 21: Marine Mammals** regardless of the density estimate used for unexploded ordnance (UXO) clearance activities (injury and disturbance). Nor to the risk of injury from impact piling.

24. However, the use of the DAS site-specific density estimate resulted in a significant percentage of the reference population being disturbed from the worst-case in the 'other construction activities' category. Specifically, worst-case relates to the cable laying vessel activity and this assessment suggests a potential 18.7% of the reference population impacted.

25. Additionally, the use of the DAS site specific density estimate also results in a significant proportion of the reference population at risk of disturbance from impact piling.

26. The worst-case disturbance scenario from impact piling results from assessment using the dose response methodology. Applying the DAS site specific corrected density, results in a greater number of individuals at risk of disturbance than the number of individuals thought to exist in the reference population (i.e. 136.5% of the reference population).

21.2 Conclusions

27. This **Annex B** provides support for the view that it is disproportionate to use the DAS average absolute density estimate corrected for availability bias (15.97 animals/km^2) in the impact assessment.

28. It is not realistic to assume the estimated density within the Llŷr marine megafauna survey site is consistent throughout the wider regional area.

29. The methodology in the calculation of corrected density estimates for availability bias is uncertain, and in this case, an order of magnitude greater than any other estimate available in the Celtic Sea area.

30. The assessment in **Appendix 21C: Marine Mammal Underwater Noise Assessment** has therefore used the SCANS-IV density estimate for common dolphin, and this is considered to be precautionary when assessing against the management unit reference population.

21.3 References

Bilgmann, K., Parra, G.J. and Möller, L.M., 2018. Occurrence, distribution and abundance of cetaceans off the western Eyre Peninsula in the Great Australian Bight. Deep Sea Research Part II: Topical Studies in Oceanography, 157-158, pp.134-145.

Darias-O'Hara, A.K., Sinclair, R.R. and Stevens, A., 2021. Project Erebus Environmental Statement Technical Report – Marine Mammal and Turtle Baseline Characterisation. SMRU Consulting Report Code SMRUC-MSP-2021-006, provided to Marine Space.

Evans, P.G.H. and Waggitt, J.J., 2023. Modelled Distribution and Abundance of Cetaceans and Seabirds in Wales and Surrounding Waters. NRW Evidence Report, Report No: 646, 354 pp. Natural Resources Wales, Bangor.

Gilles, A., Authier, M., Ramirez-Martinez, N.C., Araújo, H., Blanchard, A., Carlström, J., Eira, C., Dorémus, G, Fernández-Maldonado, C., Geelhoed, S.C.V., Kyhn, L., Laran, S., Nachtsheim, D., Panigada, S, Pigeault, R, Sequeira, M., Sveegaard, S., Taylor, N.L., Owen, K., Saavedra, C., Vázquez-Bonales, J.A., Unger, B., Hammond, P.S., 2023. Estimates of cetacean abundance in European Atlantic waters in summer 2022 from the SCANS-IV aerial and shipboard surveys. Final report published 29 September 2023. 64 pp.

Hammond P.S., Lacey C., Gilles A., Viquerat S., Borjesson P., Herr H., Macleod K., Ridous V., Santos M.B., Scheidat M., Teilmann J., Vingada J., Oien N. 2021. Estimates of cetacean abundance in European Atlantic waters in Summer 2016 from the SCANS-III aerial and shipboard surveys.

IAMMWG, 2022. Updated abundance estimates for cetacean Management Units in UK waters (Revised 2022). JNCC Report No. 680, JNCC Peterborough, ISSN 0963-8091.

Laake, J.L., Calambokidis, J., Osmek, S.D. and Rugh, D.J., 1997. Probability of detecting harbor porpoise from aerial surveys: estimating g (0). The Journal of wildlife management, 63-75.

Paxton, C.G.M., Scott-Hayward, L., Mackenzie, M., Rexstad, E. and Thomas L., 2016. Revised Phase III Data Analysis of Joint Cetacean Protocol Data Resource. JNCC Report No.517, 207, JNCC, Peterborough.

Rogan, E., Breen, P., Mackey, M., Cañadas, A., Scheidat, M., Geelhoed, S. and Jessopp. M., 2018. Aerial surveys of cetaceans and seabirds in Irish waters: Occurrence, distribution and abundance in 2015-2017. Department of Communications, Climate Action & Environment and National Parks and Wildlife Service (NPWS), Department of Culture, Heritage and the Gaeltacht, Dublin, Ireland. 297.