



# White Cross Offshore Wind Farm: Outline Underwater Noise Monitoring Plan

WHX001-FLO-CON-ENV-PLN-0006



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## Glossary of Acronyms

<b>Acronym</b>	<b>Definition</b>
<b>ECT</b>	Environment and Consents Team
<b>GPS</b>	Global Positioning System
<b>KOW</b>	Kincardine Offshore Windfarm
<b>MMO</b>	Marine Management Organisation
<b>OUNMP</b>	Outline Underwater Noise Monitoring Plan
<b>SAMS</b>	Scottish Association for Marine Science
<b>SNCBs</b>	Statutory Nature Conservation Bodies
<b>UXO</b>	Unexploded Ordnance
<b>UNMP</b>	Underwater Noise Monitoring Plan
<b>WTG</b>	Wind Turbine Generator
<b>WWT</b>	Wildfowl and Wetlands Trust
<b>ZoI</b>	Zone of Influence
<b>ZTV</b>	Zone of Theoretical Visibility

## 1. Introduction

1. This document has been produced in response to a request made by the Marine Management Organisation (MMO) following the statutory consultation on Marine Licence application MLA/2023/00113 for White Cross Offshore Windfarm (the Project).
2. The MMO have advised that if MLA/2023/00113 is approved, there will be a condition attached to the subsequent Marine Licence that will formally outline the requirement for an Underwater Noise Monitoring Plan (UNMP) for the Project. **Appendix 1** will list the Marine Licence condition(s) that this document seeks to discharge.

### 1.1 Purpose and scope of the Outline Underwater Noise Monitoring Plan

3. The purpose of the Outline Underwater Noise Monitoring Plan (OUNMP) at this pre-consent stage is to outline the proposed approach to monitoring of underwater noise during the operation and maintenance phase of the Project. Underwater noise emitted during the construction phase will be managed by other mechanisms (i.e., UXO clearance plan). The purpose of the OUNMP will be further refined as definitive condition wording is provided by the MMO.
4. The requirements for consultation and updates to the OUNMP are also set out, as are the personnel requirements and proposed reporting details.

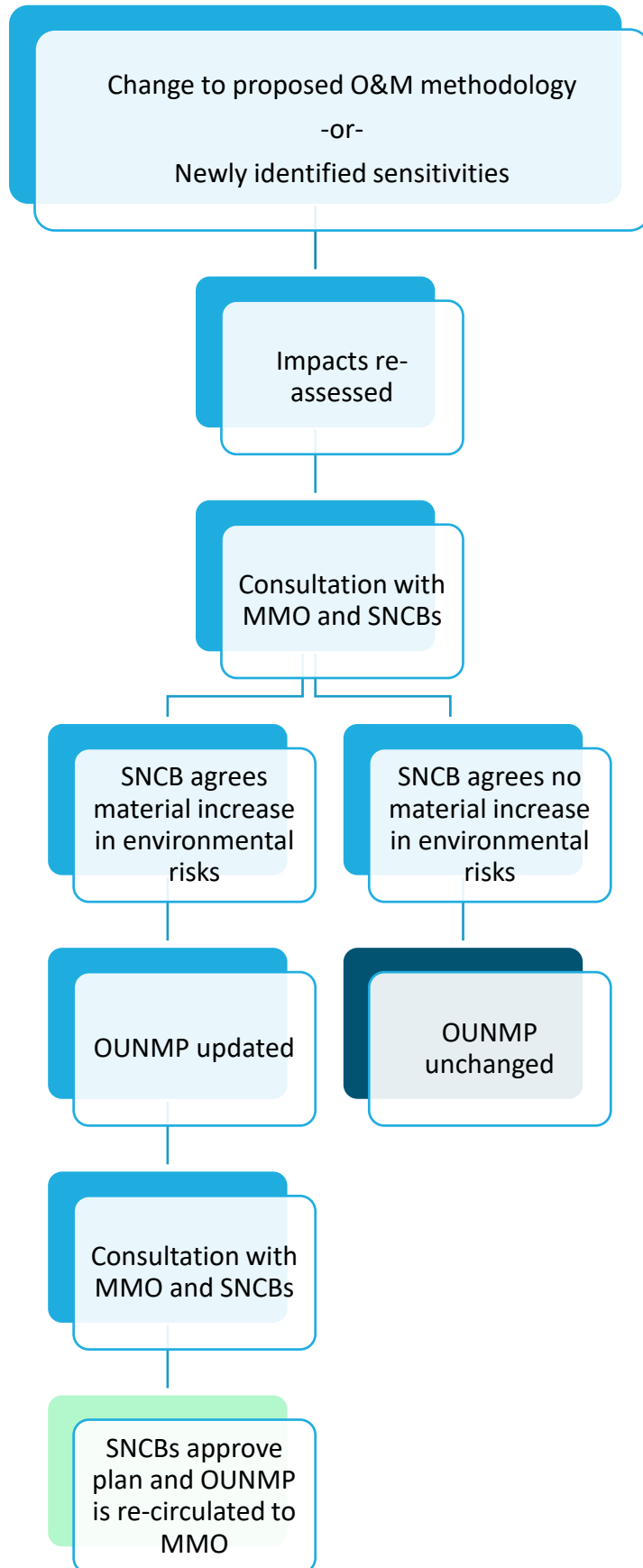
#### 1.1.1 Document structure

5. The proposed approach to updating the OUNMP and ensuring effective consultation is set out in **Section 2** and **Section 3**, respectively: however, it has not been consulted on at this 'outline' stage.
6. **Section 4** provides a brief background to the Project's operational underwater noise impacts. It also lists commitments made by the Project related to underwater noise monitoring, as presented in the **Project Mitigations Register** (WHX001-FLO-CON-ENV-REG-0001) which is provided as **Appendix P** of the **ES Addendum**.
7. The proposed approach to monitoring underwater noise is presented in **Sections 5** and **6**; with the proposed reporting details presented in **Section 7**.

## 2. Approach to updating the OUNMP

8. The OUNMP will be revised and updated as the project progresses to construction and operation, and as further information becomes available following decisions on final project design. For example, updates to the OUNMP may be required due to:

- emergence of novel data collection technologies (i.e., autonomous data collection).
  - identification of new environmental sensitivities.
  - emerging guidance.
  - new legislative requirements.
9. Updates are also likely to be required following review by the relevant statutory nature conservation bodies (SNCBs), in consultation with the MMO. Initially, these updates are expected to be required at regular intervals during the 'outline' plan phase (i.e., during the consenting, pre-construction and construction phases). Beyond this phase, the approach to updating the OUNMP will revert to the Change Management Process, as outlined in **Figure 1**.



*Figure 1 OUNMP Change Management Process*

### 3. Consultation

10. The off-site Project Environment and Consents Team (ECT) is responsible for:

- Managing consultation on the OUNMP with the relevant consultees.
- Maintaining and updating the OUNMP.
- Supporting the contractor tendering process to ensure monitoring requirements are efficiently communicated to suppliers.
- Ensuring that all environmental monitoring is undertaken at the appropriate intervals.
- Timely review and submission of monitoring reports.

11. Statutory consultation on the OUNMP took place in March 2024 when the first version was shared with the MMO. **Appendix 2** details the MMO's consultation comments and how WCOWL has addressed these.

12. This section will be further updated to summarise comments on this document as consultation progresses.

### 4. Project underwater noise impacts

13. The main sources of sound generated during the operation of wind turbines are aerodynamic and mechanical. The mechanical noise is from the nacelle at the top of the wind turbine tower. As the wind turbine blades rotate, vibrations are generated that travel down the turbine tower and radiate into the surrounding water column and seabed (Tougaard et al., 2009; 2020; Nedwell et al., 2003).

14. Mechanical noise is characterised by one or more tonal components that are typically at frequencies below 1kHz (Tougaard et al., 2009; Nedwell et al., 2003) and at least 10-20 dB lower than ship noise in the same frequency range (Tougaard et al., 2020). However, it is only detectable over underwater ambient noise at frequencies below 500Hz (Tougaard et al., 2009).

15. There is concern that the underwater noise generated could contribute a consistent, non-impulsive but long duration of sound to the marine environment. Even if the level of noise emitted is low and is not expected to cause physiological injury to marine mammals, it is thought possible that it could cause behavioural reactions if animals are in the immediate vicinity of the wind turbine (Tougaard et al., 2009; 2020).

16. There is also the potential for a noise that has been associated with 'cable snaps' to be present during the operation of the wind turbines. This is an impulsive noise that is thought to be related to tension release in mooring systems, although there is inconclusive evidence that the snapping noise is generated by either WTGs or subsea



infrastructure. Snapping noise has a potential noise level estimated to be 159 dB re 1  $\mu\text{Pa}^2\text{s}$  sound exposure level (SEL) for all WTGs proposed at the Project.

## 5. Approach to monitoring underwater noise

17. Monitoring of underwater noise during the operation of the Project will enable real-time collection of data, which will facilitate an understanding of the contribution of the noise emitted to the baseline underwater noise level.

18. The FORTUNE Project Final Report<sup>1</sup> recommends that future underwater noise monitoring for FLOW records detailed, directional measurements that separate and characterise noise emissions by each part of the turbine and moorings.

### 5.1 Aims and objectives

The aims of underwater noise monitoring are:

- To establish whether the presence of floating turbines significantly increase the underwater noise baseline in the marine environment in and around the array area.

19. This aim will be realised by committing to the following objectives:

- Establishing the pre-construction baseline underwater noise level/acoustic environment.
- Establishing the noise profile of operational floating turbines. This could include detailed, directional measurements that separate and characterise noise emissions by each part of the turbine and moorings.

## 6. Methodology

20. It is proposed, at this early stage, that a similar method of noise profiling is undertaken as that at Kincardine Offshore Windfarm (KOW).

### 6.1 Establishing the baseline acoustic environment

21. Noise profiling of the KOW pre-construction baseline underwater noise level/acoustic environment was undertaken by collecting acoustic data over eight continuous hours (during the same day) via a boat-based survey. For KOW, data was collected using the Scottish Association for Marine Science (SAMS) designed Drifting Ear whose

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<sup>1</sup>[Fortune Report Final 12\\_05\\_2023.pdf \(supergen-ore.net\)](#)

methodology was specifically designed for noise measurements in high flow tidal sites.

22. The basic principle of the Drifting Ear design was to keep a free-floating drogue mounted hydrophone fixed to a moving body of water rather than the seabed. Hydrophones were suspended within the drogues approximately six meters below the surface and connected near the recorder to reduce the introduction of cable-related noise. The devices were then connected to a surface float which contained an Iridium based satellite communication system for field-based tracking, as well as a global positioning system (GPS) unit to record precise location information. The recorded satellite and GPS data could then monitor the tracks and drift rate of each Drifting Ear unit for subsequent analysis.
23. The drifter mounted hydrophones (RESON TC4014-5) were broadband omnidirectional units characterized by low internal noise and high sensitivity ( $180 \text{ dB} \pm 3 \text{ dB re } 1 \text{V}/\mu \text{Pa}$ ) with a frequency response of  $25 \text{ Hz} - 250 \text{ kHz} \pm 3 \text{ dB}$ . Acoustic data was recorded using a compact digital underwater recorder (EA-SDA14), with resulting sound files stored internally on SD cards.
24. The recorders were set up to sample at 312.5 kHz with 32-bit resolution to cover a broad frequency band and allow interpretation of all likely noise sources without aliasing risks. It is not expected that the Drifting Ear method will require a marine licence as the equipment will not be deposited on the seabed (i.e., it will qualify as a marine licence exempted activity); however, WCOWL will seek advice from the MMO on the requirements for a marine licence for this activity.
25. Two Drifting Ears units (or similar) will be prepared for mobilisation to cover for the unlikely eventuality of equipment failure. Field scientists will carry out the deployment and retrieval of the field equipment with support of the vessel crew. Risk assessments and safe working procedures will be reviewed once the vessel is known and will be followed during operations. The weight of the unit means that it can be deployed and retrieved manually. The scientists will monitor the deployed unit throughout the survey period. If the unit drifts outside a pre-defined area, the vessel can intervene and recover the unit, and then redeploy it. A deployment time of 8 hours, regardless of whether this is as a single or multiple deployment will be attempted. During the deployment field scientists will collect and record auxiliary data such as environmental conditions (e.g., sea state, swell, current speed, current direction, etc.) during the noise monitoring event at frequent intervals.
26. Data collection will be repeated during different times of the year to ensure the data collected is as representative of year-round environmental conditions and wind

speeds in the area. Further details on the monitoring proposed will also be developed in consultation with the relevant SNCBs during the post-consent, pre-construction period.

## **6.2 Establishing the noise profile of operational floating turbines**

27. The purpose of noise profiling during the operational phase of the Project is to provide good quality, reliable measurements of the acoustic environment following the installation of turbines.
28. Post construction monitoring will collect data (during different times of the year) on noise emitted into the water column from a floating turbine, to determine the noise profile around the structure. It is proposed that the methodology for post construction monitoring will repeat (as closely as possible) the methodology undertaken to establish the baseline acoustic environment, and efforts will be made to distinguish the source of the noise emitted (i.e., whether it has been generated by the nacelle or by cable 'snapping'). However, the process for determining this will be developed in developed in consultation with the relevant SNCBs during the post-consent, pre-construction period.
29. Neither acoustic data collection methodologies (during the pre-construction or post-construction phase) have yet been determined; therefore, this section will be updated as more information becomes available.

## **7. Reporting**

30. Acoustic survey reports will be provided to the MMO and the relevant SNCBs within three months of receiving the finalised report from survey contractors, or equivalent.
31. All reporting will include provision of raw data.

## 8. References

Nedwell, J.R., Langworthy, J. and Howell, D. (2003). Assessment of subsea noise and vibration from offshore wind turbines and its impact on marine wildlife. Initial measurements of underwater noise during construction of offshore wind farms, and comparisons with background noise. Subacoustech Report No. 544R0423, published by COWRIE, May 2003.

Tougaard, J., Henriksen, O.D. and Miller, L.A. (2009). Underwater noise from three types of offshore wind turbines: estimation of impact zones for harbour porpoise and harbour seals. *Journal of the Acoustic Society of America* 125(6): 3766.

Tougaard, J., Hermannsen, L., and Madsen, P. T. (2020). How loud is the underwater noise from operating offshore wind turbines? *The Journal of the Acoustical Society of America* 148, 2885 (2020); doi: 10.1121/10.0002453

## **Appendix 1 Marine Licence condition associated with operational underwater noise monitoring**

## Appendix 2 Detailed consultation comments and WCOWL responses

Consultee	Date, Document, Forum	Comment	Response	Where addressed
Natural England	10 May 2024, Letter to the MMO	Natural England also welcomes the use of the SAMS designed Drifting Ears technology to replicate the study undertaken at Kincardine OWF in Scotland, however much more information is required with regards to survey design and methodology. For example, Natural England advise monitoring should be repeated during different times of the year to ensure the data collected is as representative of year-round environmental conditions and wind speeds in the area as possible.	Updated proposed methodology to include data collection across different times of the year.	Section 6.1.
Natural England	10 May 2024, Letter to the MMO	There is also no mention of noise generated by mooring cable 'snapping' or the deployment of additional equipment such as F-PODS to monitor marine mammal species in the area and their reactions to operational noise levels at White Cross. Natural England advise that these are added in the addendum submission.	Updated proposed methodology to include commitment to develop process to distinguish source of noise omitted.	Sections 4 and 6.2
<b>Natural England</b>	10 May 2024, Letter to the MMO	Natural England notes the assertion that the use of Drifting Ears will mean a Marine Licence is not required as it will qualify as an exempted activity and strongly recommends White Cross seeks advice from MMO as the licensing authority in this regard. It should be noted that Marine Licence exemptions do not remove the requirement for other licences or consents and again, advice should be sought from the MMO in this regard.	Updated text to acknowledge need to consult MMO on requirement for a marine licence to deploy Drifting Ears.	Section 6.1.