Partners in UK offshore wind

MONA OFFSHORE WIND PROJECT

Appendix to ExQ1 Q1.5.3 Fish and Shellfish Ecology

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Image of an offshore wind farm

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Contents

Glossary

Term	Meaning
Applicant	Mona Offshore Wind Limited.
Development Consent Order (DCO)	An order made under the Planning Act 2008 granting development consent for one or more Nationally Significant Infrastructure Project (NSIP).
Mona Offshore Wind Project	The Mona Offshore Wind Project is comprised of both the generation assets, offshore and onshore transmission assets, and associated activities.
Recoverable Injury	Relating to injuries, such as hair cell damage or minor internal or external hematoma which are unlikely to result in death (Popper *et al.*, 2014).
The Planning Inspectorate	The agency responsible for operating the planning process for Nationally Significant Infrastructure Projects.
Temporary Threshold Shift	A temporary physiological reduction in hearing sensitivity caused by exposure to intense sound which does not result in an injury.

Acronyms

Acronym	Description
EPP	Evidence Plan Process
ES	Environmental Statement
EWG	Expert Working Group
ExA	Examining Authority
JNCC	Joint Nature Conservation Committee
MMO	Marine Management Organisation
NRW (A)	Natural Resources Wales (Advisory)
NWWT	North Wales Wildlife Trust
OWF	Offshore Wind Farm
SoCG	Statement of Common Ground
TTS	Temporary Threshold Shift

Units

Unit	Description
m	Metre

1 Appendix to ExQ1 Q1.5.3 Fish and Shellfish Ecology

1.1 Introduction

1.1.1.1 This document has been prepared in response to Question 1.5.3 of the Examining Authority's first round of Written Questions addressed to the Applicant, Natural Resource Wales (Advisory), Joint Nature Conservation Committee (JNCC) and North Wales Wildlife Trust (NWWT). The question is as follows:

- ES Chapter 3 (Vol 2) Fish and Shellfish Ecology [APP-055]
  - There does not appear to be any information on wind turbine sound emissions nor vessels sound emissions during operation in section 3.9.3. Table 3.6 states that it has been scoped out based on site specific sound information, including modelling of sound emissions from the proposed wind turbines and vessels and effects on fish and shellfish receptors as detailed in section 3.9.3.
  - The Planning Inspectorate did not agree that operational noise of the OWF can be scoped out of the Environmental Statement.
  - Can the Applicant provide the information stated in Table 3.6 on wind turbine sound emissions and vessels; and
  - Can respective parties advise if they have any concerns regarding potential underwater sound during the operational phase impacting fish and shellfish receptors.

1.2 Response

1.2.1.1 The Applicant confirms that operational wind turbine sound emissions in the operation and maintenance phase and vessel sound emissions in all phases have been scoped out of the assessment undertaken for fish and shellfish ecology receptors presented within Volume 2, Chapter 3: Fish and shellfish ecology (APP-055).

1.2.1.2 NRW (A) has confirmed their agreement with the scoping of impacts for the Environmental Impact Assessment undertaken for fish and shellfish ecology (Volume 2, Chapter 3: Fish and shellfish ecology; APP-055), as outlined within the Statement of Common Ground (SoCG) between Mona Offshore Wind Project and NRW (A) submitted at Deadline 1 (see Initial SoCG between Mona Offshore Wind Project and NRW (A) - Offshore (REP1-025), item NRW.FSF.5).

1.2.1.3 Scoping of impacts was also agreed during the Evidence Plan Process (EPP), through the benthic ecology, fish and shellfish ecology and physical processes Expert Working Group (EWG) meetings (please refer to E3 Consultation Report; APP-037).

1.2.1.4 The Applicant wishes to highlight that fish and shellfish ecology is considered outside of the remit of the JNCC, as confirmed by the JNCC following benthic ecology, fish and shellfish ecology and physical processes EWG Meeting 1, on 17 February 2022 (refer to E3 Consultation Report; APP-037), therefore no SoCG for fish and shellfish ecology has been developed with this stakeholder.

1.2.2 Information from Table 3.6 of Volume 2, Chapter 3: Fish and shellfish ecology (APP-055)

1.2.2.1 The underwater sound modelling information referenced within Table 3.6 of Volume 2, Chapter 3: Fish and shellfish ecology (APP-055) in response to the Planning Inspectorate feedback at Scoping is provided within Table 1.55 (sound generated by

operational wind turbines) and Table 1.57 (sound generated by vessels) of Volume 5, Annex 3.1: Underwater sound technical report (APP-079). Information to justify the scoping out of these impacts is also provided in Table 3.8 of Volume 2, Chapter 3: Fish and shellfish ecology (APP-055).

1.2.3 Sound generated by operational wind turbines (operation and maintenance phase)

1.2.3.1 As outlined in section 1.2 above, justification for the scoping out of underwater sound associated with operational wind turbines is provided within Table 3.8 of Volume 2, Chapter 3: Fish and shellfish ecology (APP-055), and states:

- Sound generated by operational wind turbines is of a very low frequency and low sound pressure level (Andersson, 2011).
- Sound levels are only high enough to possibly cause a behavioural reaction within metres from a wind turbine (Wahlberg and Westerberg, 2005; Sigray and Andersson, 2011; Vandendriessche *et al*., 2015) and therefore such levels are not considered to have potentially significant effects on fish and shellfish receptors.
- Increases in fish abundance observed surrounding operational wind turbines, supporting the suggestion that behavioural effects are apparent only at very close range (Van Hal *et al*., 2017).
- The Marine Management Organisation (MMO) review of post-consent monitoring at offshore wind farms found that available data on the operational wind turbine sound in general showed that sound levels from operational wind turbines are low and the spatial extent of the potential impact is low (MMO, 2014).
- Project specific modelling indicated that effects on fish (e.g. injury or behavioural effects) are unlikely to occur for the modelled operational wind turbines. See Volume 5, Annex 3.1: Underwater sound technical report (APP-079) for further detail.
- This approach was agreed in the scoping phase and reaffirmed during consultation during EWGs as part of the EPP (see E3 Consultation Report; APP-037).

1.2.3.2 More recent studies with regards to the sound generated by operational wind turbines, such as by Siddagangaiah *et al.* (2024), which studied the potential impacts of operational wind turbine sound on fish chorusing behaviour in Taiwan, support this position. This study recorded operational wind turbine noise and fish chorusing over a two-year period within 10 m of a wind turbine foundation and indicated that underwater sound generated by a single wind turbine did not impact seasonal fish vocalisation trends.

1.2.3.3 Further, a review paper by Popper and Hawkins (2019) indicated that the effects of operational wind turbines are likely restricted to the masking of animal communications as opposed to causing permanent avoidance reactions or physiological damage.

1.2.3.4 As described above in reference to Table 3.8 of Volume 2, Chapter 3: Fish and shellfish ecology (APP-055), these studies are supported by the underwater sound modelling for impacts to fish by operational wind turbines undertaken for the Mona Offshore Wind Project, presented in Table 1.55 of Volume 5, Annex 3.1: Underwater sound technical report (APP-079), which indicates potential impact ranges for Temporary Threshold Shift (TTS) to Group 3 and 4 fish (i.e. those considered of

highest sensitivity to underwater sound; Popper *et al.,* 2014) of up to 5 m from the source, based on a continuous exposure time of 12 hours.

1.2.3.5 The recoverable injury range (based upon Popper *et al*., (2014) criteria) for fish of the same Groups was not exceeded, based upon a continuous exposure period of 48 hours to operational wind turbines.

1.2.3.6 As such, the potential for significant impacts to occur from underwater sound generated by operational wind turbines is considered negligible, and the Applicant is confident in the evidence base applied for scoping this impact out of further assessment for fish and shellfish ecology receptors within Volume 2, Chapter 3: Fish and shellfish ecology (APP-055).

1.2.4 Sound generated by vessels (all phases)

1.2.4.1 As outlined in section 1.2 above, justification for the scoping out of underwater sound generated by vessels during all project phases is provided within Table 3.8 of Volume 2, Chapter 3: Fish and shellfish ecology (APP-055), and states:

- Operational underwater sound generated from vessels, including dredging sound, is likely to be low and effects would only occur if fish species remained within the immediate vicinity of the vessel (i.e. within a range of metres).
- Project specific modelling indicated that for injuries to fish to occur, individuals would need to be in close proximity (i.e. tens of metres) to vessels for extended periods (i.e. recoverable injury for 48 hours of continuous exposure and TTS would require 12 hours of continuous exposure). See Volume 5, Annex 3.1: Underwater sound technical report (APP-079) for further detail.
- This approach was agreed during the scoping phase with stakeholders through EWGs under the EPP process and the Scoping Opinion (see E3 Consultation Report; APP-037).

1.2.4.2 Whilst underwater sound from vessels can impact activities such as communication (Putland *et al*., 2017) and predator recognition (McCormick *et al*., 2019), a synthesis of studies developed by Pieniazek *et al.* (2023) demonstrates the uncertainties associated with laboratory-based studies which largely inform this area of research, and the variability in methods and results associated with field studies (including the vessel types investigated, sound generation and observational methods). Furthermore, as outlined within Table 1.57 of Volume 5, Annex 3.1: Underwater sound technical report (APP-079), fish would need to remain within very small potential impact ranges for a continuous period of 48 hours for recoverable injury to occur and 12 hours continuously for TTS to occur in response to underwater sound from vessels during all project phases.

1.2.4.3 Impact ranges for recoverable injury to Group 3 and 4 fish (based on Popper *et al.,* 2014 criteria) due to underwater sound from vessels in all phases of the Mona Offshore Wind Project (including operation and maintenance) were modelled and found to extend <10 m from the source, and for TTS to a maximum of 41 m from the source (Volume 5, Annex 3.1: Underwater sound technical report; APP-079). Impact ranges for Group 1 or 2 fish are expected to be lower, with equal exposure durations of 12 to 48 hours. As highly mobile receptors, fish are considered highly unlikely to remain within a range of metres from the sound source for a period of 12 or 48 hours continuously (regardless of whether vessels remain stationary for this period of time), and therefore, the potential for significant impacts to occur is considered negligible.

1.2.5 Shellfish

1.2.5.1 Shellfish receptors are generally considered of higher resilience to underwater sound due to a lack of gas-filled chambers, which play a role in sound detection in some fish species, as outlined within Volume 2, Chapter 3: Fish and shellfish ecology (APP-055), therefore impacts to shellfish from underwater sound from operational wind turbines or vessels are unlikely to occur.

1.2.6 Summary

1.2.6.1 Based on the information outlined above within section 1.2 and in Volume 2, Chapter 3: Fish and shellfish ecology (APP-055), potentially significant effects to fish and shellfish receptors are not expected to occur due to underwater sound generated by operational wind turbines (operation and maintenance phase) or vessels (all phases, including operation and maintenance), and the Applicant is confident in the evidence base applied for scoping this impact out of further assessment and the agreement to do so obtained during the EPP and SoCG with NRW (A).

1.2.7 References

McCormick, M.I., Fakan, E.P., Nedelec, S.L. and Allan, B.J.M. (2019) Effects of boat noise on fish fast-start escape response depend on engine type. Scientific Reports. 9: 6554.

Pieniazek, R.H., Beach, R.K., Dycha, G.M., Mickle, M.F. and Higgs, D.M. (2023) Navigating noisy waters: A review of field studies examining anthropogenic noise effects on wild fish. Journal of the Acoustical Society of America. 154: 2828 – 2842.

Putland, R.L., Merchant, N.D., Farcas, A., and Radford, C.A. (2017) Vessel noise cuts down communication space for vocalizing fish and marine mammals. Global Change Biology. 2017: 1 - 14.

Siddagangaiah, S., Chen, C-F., Hu, W-C, Akamatsu, T. and Pieretti, N. (2024) Assessing the influence of offshore wind turbine noise on seasonal fish chorusing. ICES Journal of Marine Science. 0: 1-10.