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Five Estuaries Offshore Wind Farm Case Team
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(Email only)

MMO Reference: DCO/2019/00008
Planning Inspectorate Reference: EN010115
Identification Number: 20049306

21 June 2024

Dear Sir or Madam,

## Planning Act 2008, Five Estuaries Offshore Wind Farm Ltd, Proposed Five Estuaries Offshore Wind Farm Order

This document comprises the Marine Management Organisation's ("MMO") initial comments in respect of the above Development Consent Order application ("DCO Application") in the form of a relevant representation.

This is without prejudice to any future representation the MMO may make about the DCO Application throughout the examination process. This is also without prejudice to any decision the MMO may make on any associated application for consent, permission, approval or any other type of authorisation submitted to the MMO either for the works in the marine area or for any other authorisation relevant to the proposed development.

## The MMO's role in Nationally Significant Infrastructure Projects (NSIPs)

The MMO was established by the Marine and Coastal Access Act 2009 (the "2009 Act") to make a contribution to sustainable development in the marine area and to promote clean, healthy, safe, productive and biologically diverse oceans and seas.

The responsibilities of the MMO include the licensing of construction works, deposits and removals in English inshore and offshore waters and for Northern Ireland offshore waters by way of a marine licence. Inshore waters include any area which is submerged at mean high water spring ("MHWS") tide. They also include the waters of every estuary, river or channel where the tide flows at MHWS tide. Waters in areas which are closed permanently or intermittently by a lock or other artificial means against the regular action of the tide are included, where seawater flows into or out from the area.

In the case of NSIPs, the Planning Act 2008 (the "2008 Act") enables DCO's for projects which affect the marine environment to include provisions which deem marine licences.

As a prescribed consultee under the 2008 Act, the MMO advises developers during pre-application on those aspects of a project that may have an impact on the marine area or those who use it. In addition to considering the impacts of any construction, deposit or removal within the marine area, this also includes assessing any risks to human health, other legitimate uses of the sea and any potential impacts on the marine environment from terrestrial works.

Where a marine licence is deemed within a DCO, the MMO is the delivery body responsible for post-consent monitoring, variation, enforcement and revocation of provisions relating to the marine environment. As such, the MMO has a keen interest in ensuring that provisions drafted in a deemed marine licence ("DML") enable the MMO to fulfil these obligations.

Further information on licensable activities can be found on the MMO's website here. Further information on the interaction between the Planning Inspectorate and the MMO can be found in our joint advice note 11 Annex B here.

## Relevant Representation

On the 23 April 2024, the MMO received notice under Section 56 of the Planning Act 2008 (the "PA 2008") that the Planning Inspectorate ("PINS") had accepted an application made by Five Estuaries Offshore Wind Farm Ltd (the "Applicant") for a DCO Application (MMO ref: DCO/2019/00008; PINS ref: EN010115).

The DCO Application includes a draft development consent order (the "DCO") and an Environmental Statement (the "ES"). The draft DCO includes, at Schedule 10 and 11, a draft Deemed Consent under Part 4 (Marine Licensing) of the Marine and Coastal Access Act 2009 (the "Deemed Marine Licence")(DML).

The DCO Application seeks authorisation for the construction, operation and maintenance of Five Estuaries Offshore Wind Farm ("VE"), comprising of up to 79 wind turbine generators together with associated onshore and offshore infrastructure and all associated development ("the "Project").

Please find the MMO comments below.

Yours faithfully/sincerely

[redacted]

Emma Chalk
Marine Licensing Case Officer

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# Contents

## 1. The Proposed Development

1.1.1 The Five Estuaries Offshore Wind Farm Project is a proposed extension to the east of the existing 353 megawatt (MW) Galloper Wind Farm, located approximately 37 kilometres (km) off the coast of Suffolk, England (see Annex 1 Figure 1).

1.1.2 The proposal includes provision for the construction, operation, maintenance and decommissioning of a wind farm with a generating capacity of over 100MW. Comprising of up to 79 wind turbine generators with associated foundations and a maximum tip height of 399 meters(m) above sea level. It proposes up to 2 offshore substation platforms, up to 200km of inter-array cables and up to 196km offshore export cables. All onshore infrastructure would be located in Tendring District, Essex.

## 2. General comments on the application

### 2.1 General Comments

2.1.1 The MMO were given the opportunity to view and provide comments on the draft DCO and DML on the 18 December 2023 and 30 January 2024, prior to the submission to PINS. The MMO provided comments on the draft DCO and DML on the Applicant on 4 April 2024, after the Applicant had submitted its application for a DCO to the Secretary of State.

2.1.2 Unless otherwise stated, comments are relevant to both schedules 10 and 11 of the Deemed Marine Licence (DML).

2.1.3 The MMO are aware that the draft Development Consent Order (DCO) and DML are still in early stages, and as such the MMO have not commented on any formatting errors or missing text, as it is presumed that these will be refined in future versions.

### 2.2 Major Comments

2.2.1 Marine Plans

The Applicant should demonstrate that they have considered whether the project adheres to all the relevant marine plans and policies in the area. The MMO recommends that this is presented in a single, coherent document instead of a number of separate references throughout the submission. The relevant marine plan policies that should be met can be identified using the Explore Marine Plans tool and policy information on the following website:

https://www.gov.uk/guidance/explore-marine-plans

2.2.2 MMO requires the Applicant to detail how the proposed project is compliant with the relevant marine plans by producing a marine plan policy assessment in one document. Once a comprehensive marine plan assessment has been provided, the MMO will provide comment on this.

## 3. Development Consent Order (DCO) and Deemed Marine Licences (DMLs)

### 3.1 DCO Major Comments

3.1.1 Benefit of the Order
In the MMO's initial comments on the draft DCO/DML, provided to the Applicant on the 4 April 2024, the MMO raised concerns with the inclusion of this provision. The MMO still have significant concerns with Part 2 Article 7 of the DCO and Paragraph 7 of the DMLs. For the benefit of the Secretary of State, the MMO would like to reiterate our position on this below:

3.1.2 It is the MMO's stated position that the DML granted under a DCO's should be regulated by the provisions of the Marine and Coastal Access Act 2009 (MCAA 2009), and in respect of this DCO application, specifically by all provisions of section 72 MCAA 2009.

3.1.3 PINS Guidance
As set out in Advice Note Eleven, Annex B – Marine Management Organisation | National Infrastructure Planning (planninginspectorate.gov.uk) where a developer chooses to have a marine licence deemed by a DCO, we, the MMO, "will seek to ensure wherever possible that any deemed licence is generally consistent with those issued independently by the MMO."

3.1.4 Developers can seek consent for a marine licence directly with the MMO, reinforcing that in respect of marine licences, the Development Consent Order (DCO) process is nothing more than a mechanism for granting a marine licence – it is not a vehicle to amend established process and procedures, such as those for the transfer of a marine licence.

3.1.5 As the guidance further sets out, we, the MMO are responsible for enforcing marine licences regardless of whether these are 'deemed' by a DCO or consented independently, and it is therefore fundamental that all marine licences are clear and enforceable, and consistency is a key element in achieving this.

3.1.6 Section 72(7)(a) MCAA 2009 permits a licence holder to make an application for a marine licence to be transferred, and where such an application is approved for the MMO to then vary the marine licence accordingly (section 72(7)(b)).

3.1.7 Application to transfer or lease

In considering the proposed provisions of Article 7 DCO, Article 7(2), being read with Article 7(4) introduces a process involving the Secretary of State providing consent to the transfer in certain circumstances, rather than the MMO as the regulatory authority for marine licences considering the merits of any application for a transfer. The MMO note the proposed ability for the undertaker to lease the deemed marine licence for an agreed period of time – This specific power has been addressed separately below.

3.1.8 As the process proposed by the applicant is a significant departure from the current statutory framework in relation to marine licences, it has not been tested, it may therefore be the case that the applicant/undertaker will face unnecessary delays following its application as it is not clear that the Secretary of State will have a process in place to deal with requests of this nature and it is not clear what any consultation period with the MMO would be.

3.1.9 Duty to consult MMO

It is noted that the Secretary of State "must consult" the MMO (Article 7(6)) – however the obligation goes no further than this, the Secretary of State is not obligated to take into account the views of the MMO in providing its consent and there is no obligation for the MMO to be informed of the decision of the Secretary of State nor the undertaker.

3.1.10 In the regulatory sphere it strikes the MMO as highly unusual that a decision to transfer a marine licence or to lease is not the decision of the regulatory authority regulating in that area.

3.1.11 Power to vary the marine licence following a transfer

Despite the proposed changes to the process of transferring a marine licence it remains that neither the licence holder/undertaker nor the Secretary of State has any power to actually vary any terms of a marine licence and it will still therefore be necessary for the MMO to take steps to vary a marine licence to reflect that it has been transferred to another entity. To our mind the proposed mechanism for transfer of a marine licence does not actually work and in fact does little more than complicate the process.

3.1.12 There are also very real practical concerns as to how the proposed process would work in practice. The transfer of the licence would happen first, and then the marine licence would need to be varied. After the transfer of the licence, the new license holder/undertaker would have a marine licence which would still be in the name of the license holder/undertaker who had transferred the licence. The new license holder/undertaker would have no authorisation to carry out any acts until the variation had taken place and until the variation had been affected the original licence holder/ original undertaker would remain liable for any actions undertaken. The procedure under section 72 MCAA avoids this issue entirely.


3.1.13 Transfer of "any or all of the benefit"
Article 7(2)(a) specifies the transfer of "any or all of the benefit of the provisions of this Order (including the deemed marine licence". Article 72(7)(a) MCAA 2009 specifies:
"On an application made by the licensee, the licensing authority which granted the licence –
(a) may transfer the licence from the licensee to another person…"

3.1.14 As can be seen above there is no concept within the regulatory framework of MCAA 2009 for a marine licence to be transferred (or indeed leased) 'in part'. This proposal by the applicant creates a new power and an additional level of complexity. The MMO would be grateful if the Applicant could indicate why it considers the ability to either transfer or lease 'in part' necessary.

3.1.15 The ability to transfer 'part' of a marine licence is a wholly new concept and would lack consistency with marine licences granted independently by the MMO – which would make a significant departure from the PINS guidance to applicants as set out above.

3.1.16 The MMO objects to the provisions relating to the process of transferring and/or granting the deemed marine licences set out in the draft DCO at Part 2, Article 7 insofar as these are intended to apply to the MMO and requests paragraphs 7(6) and 7(9) be removed in their entirety, with a clarification added to specifically exclude these provisions from applying to the MMO (with corresponding wording amended in the Deemed Marine Licences).

3.1.17 Grant to a lesse of a deemed marine licence
Article 7(2)(b) specifies a grant to a lessee for an agreed period of "any or all of the benefit of the provisions of the Order (including the deemed marine licences)".

3.1.18 'Leasing'
There is however no mechanism either in the DCO or indeed in MCAA 2009 for a marine licence to be 'leased', specifically there is no provision for the licence 'reverting' to the licence holder after the agreed lease period – in practical terms it would be necessary to vary the marine licence to change the details of the licence holder at the beginning of the agreed period and then again at the end of the agreed period. It is not clear why the applicant considers it necessary to introduce the ability to 'lease' the whole or part of a deemed marine licence and we should be grateful for any clarity on this issue.

3.1.19 There are significant practical implications should the power to lease be created in this DCO as there is no procedure in place to affect such a lease. Any such lease would require a transfer or variation to allow lessee to claim the benefit of the licence, and then at the end of the lease period the marine licence would need to be varied to transfer it back to the lessor. Further information is required from the applicant as to the detail of this process, for example is it anticipated that the return of the licence to the lessor to be automatic and what would the process be if the lessee refused to transfer the marine licence back.

3.1.20 Article 7(2)(b) use of the term 'grant'

The MMO would be grateful for clarification on the use of the term 'grant' in Articles 7, specifically 7(2)(b) in respect of granting the benefit of the marine licence to a lessee. Article 7(2)(a) refers to the transfer of the marine licence -as is the language of Article 72 MCAA 2009. As the granting of marine licences fall under section 69 MCAA and not section 72, can the applicant provide further explanation of it intention in this regard and its use of the term?

3.1.21 Enforcement

It is essential as the regulatory authority in the marine environment that the MMO is always fully aware who has the benefit of marine licence in order that it can carry out its regulatory function and where necessary take enforcement action. The mechanism the applicant is currently proposing for the transfer of a marine licence departs from this established process without clear justification as to why such a departure is necessary or appropriate in the circumstances.

3.1.22 Conclusion

It is firmly the MMOs position that the current regulatory framework should prevail, specifically that only a transfer of the whole of a marine licence should be permitted and not part of it and the transfer should be left entirely to the MMO to process outside of the Nationally Significant Infrastructure Project process. The provisions currently proposed by the applicant raise several significant issues and complicates a what is a straightforward and well-established statutory process and the MMO can see little or no benefit to this.

3.1.23 The MMO is concerned that the procedure proposed represents an unnecessary duplication of the existing statutory regime set out in s72 of the Marine and Coastal Access Act 2009 and that it will give rise to significant enforcement difficulties for the MMO. The MMO also considers that it has the potential to prejudice the operation of the system of marine regulatory control in relation to the proposed development. The MMO also regards the proposed procedure as cumbersome, more administratively burdensome, slower and less reliable than the existing statutory regime set out in s72 of the 2009 Act.

3.1.24 The MMO considers that little advantage is gained for the Applicant by these provisions and the tangible risks and disadvantages that it poses can be avoided by retaining the existing statutory regime in full.

**3.2 Materiality**

3.2.1 The MMO has concerns on the use of materiality within the DCO's, the MMO's position is summarised below:

3.2.2 The MMO strongly considers that the activities authorised under the DCO and DML should be limited to those that are assessed within the Environmental Impact Assessment ("EIA"), and so the statement within the DML "Such agreement may only be given where it has been demonstrated to the satisfaction of the MMO that it is unlikely to give rise to any materially new or materially different environmental effects from those assessed in the environmental statement" should be updated to clarify this.

3.2.3 The intention behind EIA is to protect the environment by ensuring that in deciding whether to grant a development consent for a project, and in deciding what conditions to attach to that consent, the decision has full knowledge of what the likely significant environmental effects of the project/development will be. That knowledge then guides the consent process and what conditions, if any, to attach to the consent. Additionally, there is considerable public consultation under the EIA process because the process recognises the importance of local knowledge in environmental decision making.

3.2.4 The EIA legislation was designed to apply to those plans/projects which could be sufficiently detailed and particularised at the application stage, to allow the consenting decision to be taken in the full knowledge of what the likely significant effects of that plan or project would be. In such circumstances, it would be unnecessary to create a legal obligation under the order which requires the activities to remain within what was assessed under the EIA, because the consent authorises the detailed and well particularised project, assessed in the EIA to be carried out, and therefore, providing the development is constructed as per the consent, those works would, by default, remain within the parameters of the EIA.

3.2.5 If the Applicant is wanting to retain some flexibility and is proposing that the works that can be carried out should be restricted to those which "do not give rise to materially new or materially different environmental effects" to those assessed in the EIA. The concern with this is that the inclusion of the word "materially" here would allow the undertaker to carry out works whose effects are outside of the likely significant effects assessed in the EIA, providing they do not do so materially, i.e. in any significant way, greatly, or considerably. This is not what the purpose of the EIA process is, and it runs contrary to the purpose of EIA. The other issue with this is that whilst the undertaker is responsible for producing the environmental information and statement on which the EIA decision is based, the appropriate authority is responsible for the EIA consent decision, the inclusion of the word materially essentially means that the undertaker makes the decision as to what is and what is not material. Under EIA it is for the appropriate authority to determine what the likely significant effects will be and how those should be mitigated.

3.2.6 On this basis, the MMO does not consider that it is appropriate to use the word "material" in these circumstances.

### 3.3 Site Integrity Plan

3.3.1 The MMO note the works are taking place within the Southern North Sea Special Area of Conservation (SNS SAC), designated for harbour porpoise, which are an Annex II Species particularly sensitive to noise.

3.3.2 Due to this sensitivity, the Joint Nature Conservation Committee (JNCC) issued guidance in June 2020 regarding the impacts of noise within the SAC. This guidance can be found at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/889842/SACNoiseGuidanceJune2020.pdf

3.3.3 In order to avoid an Adverse Effect on Site Integrity (AEOI) JNCC have outlined that noise disturbance that impacts or is within an SAC from a plan/project, individually or in combination with other plans and projects, is considered to be significant if it excludes harbour porpoises from more than:

- 20% of the relevant area of the site in any given day,

or

- an average of 10% of the relevant area of the site over a season

These are known as daily and seasonal thresholds respectively.

3.3.4 In order to manage noise, and therefore impact, to the SNS SAC, it was agreed that any DCO's for offshore wind are required to include a condition within the DML which requires submission of a 'Site Integrity Plan' (SIP) to be submitted to the MMO and agreed in writing prior to the commencement of any noisy activity.

3.3.5 Therefore the MMO request the following to be included within the DML:
Interpretation to include:
*"JNCC Guidance" means the statutory nature conservation body 'Guidance for assessing the significance of noise disturbance against Conservation Objectives of harbour porpoise SACs' Joint Nature Conservation Committee Report No.654, May 2020 published in June 2020 as amended, updated or superseded from time to time;"*

SNS SAC SIP Condition:
(1) *No piling activities can take place until a Site Integrity Plan (SIP), which accords with the principles set out in the in principle XX Project Southern North Sea SAC Site Integrity Plan, has been submitted to, and approved in writing, by the MMO in consultation with the relevant statutory nature conservation body.*

*(2) The SIP submitted for approval must contain a description of the conservation objectives for the Southern North Sea Special Area of Conservation (SNS SAC) as well as any relevant management measures and it must set out the key statutory*

*nature conservation body advice on activities within the SNS SAC relating to piling as set out within the JNCC Guidance and how this has been considered in the context of the authorised scheme.*

*(3) The SIP must be submitted to the MMO no later than six months prior to the commencement of the piling activities.*

*(4) In approving the SIP the MMO must be satisfied that the authorised scheme at the preconstruction stage, in-combination with other plans and projects, is in line with the JNCC Guidance.*

*(5) The approved SIP may be amended with the prior written approval of the MMO, in consultation with the relevant statutory nature conservation body, where the MMO remains satisfied that the Project, in-combination with other plans or projects at the pre-construction stage, is in line with the JNCC Guidance."*

3.3.6 As a minimum the SIP should include the following sections:

*Introduction*

- *Purpose of this document*
- *Project Background*
- *The Southern North Sea SAC*
- *Requirements for this Document*

*Consultation*

- *Schedule for Agreement*
- *Southern North Sea SAC for Harbour Porpoise*
- *Conservation Objectives*
- *Management Measures*
- *Advice on Activities*

*Project Description*

- *Project Commitments*

*Potential Effects*

- *Summary of Potential Effects of the proposed Project Alone*
- *Summary of Potential In-Combination Effects*

*In Principle Management and Mitigation Measures*

- *Measure 1: Alternate Foundation Methodologies*
- *Measure 2: Noise Mitigation Systems*
- *Measure 3: Scheduling of Pile Driving and UXO Clearance*
- *Measure 4: Clustering of UXO Devices*
- *Other Potential Measures*
- *Measures Not Applicable*
- *Assessment of Efficacy of Measures and Implementation*
- *Other Mitigation Measures outside the Scope of the SIP*
- *EPS Licence*
- *Additional Marine Licence*
- *Summary*
- *References*

### 3.4 DML Schedules 10 - 11 Interpretations

3.4.1 As the MMO provided comments to the Applicant on the Draft DCO and DML prior to the Applicants submission to the Planning Inspectorate, the MMO are aware that the below comments will not have been included in the version of the DCO submitted with the application. However, a copy of these comments were provided to the Applicant on the 4 April 2024. The MMO would like to reiterate the comments here, to ensure they are included in the next version of the draft DCO and DML.

3.4.2 The MMO would like to note that any reference to a condition applies to all schedules where similar conditions exist.

3.4.3 Part 1 (2): Under Buoys "LiDAR" should be spelt with a lowercase "l"

3.4.4 Part 1 (2): Definition for cables should be included or a justification as to why they are not included should be provided. The MMO recommend the following wording: *"cable" includes cables for the transmission of electricity and fibre-optic cables;*

3.4.5 Part 1 (2): Under "cable crossings" it is not clear what other existing infrastructure could be". Please can further information be provided on this and clarification provided in the definition.

3.4.6 Part 1 (2): Under "commence". Is there any proposed monitoring to be carried out prior to the commencement of licensed activities?

3.4.7 Part 1 (2): Defence Infrastructure Organisation Safeguarding – Would be best to have addresses under Part 1 (4) of Schedule 10, for continuity purposes.

3.4.8 Part 1 (2): Definition for Defra. The MMO note that this does not appear within DML or DCO so suggest it is removed from the interpretations.

3.4.9 Part 1 (2): The MMO do not agree with the definition of "maintain".

3.4.10 Part 1: Definition's should align within the document. Definition for MMO Is different in the DCO and DML:

*DCO Part 1 (2) Interpretations: "Marine Management Organisation" or "MMO" means the Marine Management Organisation being the body created under the 2009 Act and who is responsible for the monitoring and enforcement of the deemed marine licences;*

*DML Part 1 (2): "Marine Management Organisation" or "MMO" means the Marine Management Organisation, Lancaster House, Hampshire Court, Newcastle upon Tyne, NE4 7YH who is the body created under the 2009 Act and who is responsible for the monitoring and enforcement of this licence"*

The MMO recommend that the address is removed from schedule 10 & 11, as this is noted in Part 1 (4) of the DML's.

3.4.11 Part 1 (2): The MMO recommend a definition should be included for the MMO's Marine Case Management System (MCMS), and reference should be made to MCMS for submissions of post-consent documentation or notification.

3.4.12 Part 1(3) For scour protection the MMO highlights that scour protection has been used to stabilise the use of jack-up barges in similar offshore wind farm locations and the MMO would like further clarification if the Applicant will be intending to do similar within the Project.

3.4.13 Part 1(4) In addition to this the MMO would like clarity on where the disposal volumes for drill arisings in connection with any foundation drilling are within the draft DCO (dDCO)/DML. The MMO believes that drill arising should be explicitly stated within the dDCO/DML and the following section should be included in the above Article:

*disposal of drill arisings in connection with any foundation drilling up to a total of XX cubic metres.*

3.4.14 Part 2(d): The MMO note that the removal of sediment samples is set out briefly, however, the MMO consider more detail on how this process should operate is required.

**3.5 DML Schedules 10 - 11 Conditions**

3.5.1 Part 2 (1)(2)(c): Should this be MHWS's rather than MHW. This should be amended for consistency.

3.5.2 Part 2(1)(7): Where it *notes "The total volume of scour protection material for wind turbine generator foundations must not exceed 1,582,040 cubic metres".*

Can the maximum volume of scour protection per turbine and per each structure be included as well as the total combined volume?

3.5.3 Part 2 (8): Can "of Seafish" be included after "Kingfisher Information Service" and the email address: kingfisher@seafish.co.uk. "of Seafish" should be included elsewhere in the DML's where the Kingfisher Information Service has been referenced.

3.5.4 Part 2 (8)(a): Should be "Kingfisher Fortnightly Bulletin"

3.5.5 Part 2 (7): The MMO request the inclusion of a provision within the DML that notification to the MMO of incorrect notification is required. The MMO suggest the following wording is included:

*Should the undertaker become aware that any of the information on which the granting of this licence was based was materially false or misleading, the undertaker must notify the MMO of this fact in writing as soon as is reasonably practicable. The undertaker must explain in writing what information was material*

*false or misleading and must provide to the MMO the correct information.*

3.5.6 With respect to any condition which requires the licensed activities to be carried out in accordance with the plans, protocols or statements approved under this licence, the approved details, plan or scheme are taken to include any amendments that may subsequently be approved in writing by the MMO. Subsequent to the first approval of those plans, protocols or statements provided it has been demonstrated to the satisfaction of the MMO that the subject matter of the relevant amendments does not give rise to any materially new or materially different environmental effects to those assessed in the environmental information.

3.5.7 Part 2: The undertaker must ensure that the MMO, the MMO Local Office, l fishermen's organisations and the Source Data Receipt Team at the UKHO Taunton, Somerset, TA1 2DN (sdr@ukho.gov.uk) are notified within five days of each instance of cable repair, replacement or protection replenishment activity.

3.5.8 Part 2: The following condition should be included:

*Any jack up barges or vessels utilised during the licensed activities, when jacked up, must exhibit signals in accordance with the UK Standard Marking Schedule for Offshore Installations.*

3.5.9 Part 2 (10)(2): This should also include reference to the "Environment Agency Pollution Prevention Control Guidelines".

3.5.10 Part 2 (10)(4): The MMO Consider that it would be unrealistic to expect submissions to be submitted to the MMO on the last day of the reporting period. As such the 15th of the following month is reasonable and in-line with other DCO's (e.g. 15 February and 15 August respectively).

3.5.11 Part 2 (10)(10): There is currently no timeframe in which to report to the MMO – The standard timeframe recommended is 24 hours and is in line with other DCO's.

3.5.12 Part 2 (11)(1): Force Majeure. The MMO do not consider that this provision is necessary as section 86 of MCAA provides a defence for action taken in an emergency in breach of any licence conditions. The MMO require justification or rationale as why this provision is considered necessary.

3.5.13 Part 2 (15)(2): No timeframe in which to report to the MMO – recommend 24 hours is appropriate ("at least 24 hours before...")

3.5.14 Part 2 (16)(5): Please include a timeframe e.g. 6 months

3.5.15 Part 2 (17): Construction monitoring. Can the following provision be included:

*The results of the initial noise measurements monitored in accordance with sub-paragraph 17(2)(b) must be provided in writing to the MMO within six weeks of the installation (unless otherwise agreed) of the first four piled foundations of each piled foundation type. The assessment of this report by the MMO will determine whether any further noise monitoring is required. If, in the opinion of the MMO in consultation with the statutory nature conservation body, the assessment shows impacts significantly in excess to those assessed in the environmental statement and there has been a failure of the mitigations set out in the marine mammal mitigation protocol, all piling activity must cease until an update to the marine mammal mitigation protocol and further monitoring requirements have been agreed.*

3.5.16 Part 2(18)(2)(b): Please include a timeframe, the MMO recommend 12 months for this survey to be undertaken.

3.5.17 Part 2(18): Please include the following provision:

*In the event that the reports provided to the MMO under sub-paragraph (4) identify a need for additional monitoring, the requirement for any additional monitoring will be agreed with the MMO in writing and implemented as agreed.*

3.5.18 Part 2: Completion of construction. Please can the following provision be included:

Reporting of scour and cable protection;
*(1) Not more than four months following completion of the construction of the authorised project, the undertaker must provide the MMO and the relevant statutory nature conservation bodies with a report setting out details of the cable protection and scour protection used for the authorised project.*

*(2) The report must include the following information—*
*(a) the location of cable protection and scour protection;*
*(b) the volume of cable protection and scour protection; and*
*(c) any other information relating to the cable protection and scour protection as agreed between the MMO and the undertaker*.

## 4. Environmental Statement (ES)

### 4.1 Dredge and Disposal

In providing this response the MMO has reviewed the following documents:

a. ES Volume 6.1.1, Chapter 1 - Introduction
b. ES Volume 6.1.3.1, Annex 3.1 – Cumulative Effects Assessment
c. ES Volume 6.1.4, Chapter 4 – Site Selection and Alternatives
d. ES Volume 6.2.1, Chapter 1 – Offshore Project Description
e. ES Volume 6.2.1.1, Annex 1.1 – Detail Offshore Project Design Envelope
f. ES Volume 6.2.2, Chapter 2 - Marine Geology, Oceanography and Physical Processes
g. ES Volume 6.2.3, Chapter 7 - Marine Water Sediment Quality
h. ES Volume 6.5.2.4, Annex 2.4 - Main Array and Export Cable Route - Environmental Features Report

4.1.1 The MMO have identified a number of information gaps which have been detailed below. The MMO, therefore, defers comment on conclusions relating to likely significant effects until information gaps concerning the sediment data are resolved (see paragraphs 4.1.2-4.1.11).

4.1.2 MMO raised previous concerns regarding the Preliminary Environmental Information Report (PEIR), which mostly related to the collection of sediment samples to support the ES, and the minor comments requiring attention or recommending action are quoted as follows:

i. *"The locations of contaminant sample stations appear to be tangentially representative of the North and South Arrays. It appears that only those stations which contained "fines" have been tested, which the MMO presumes to be sediment with ≤63µm diameter. However, the MMO note that both sites FE1_02 and FE2_06 – which were not tested for contaminants, also contain similar levels of fine material to site FE2_01 (which was tested for contaminants). The MMO do not see the rationale of not testing for contaminants at these sites and request further clarification from the Applicant.*

ii. *Whilst the contaminant results presented indicate very low levels, the number of samples is less than adequate.*

iii. *As with the Arrays and Interconnector, the MMO do not see the rationale of only testing eight sample stations for contaminants when more than eight samples along the export cable corridor (ECC) have a notable proportion of fine material. For example, sample stations prefixed "FE5" comprise ten sample stations, of which only one was tested for contaminants, but all of which contain a not insignificant level of fine material.*

iv. *The MMO cannot find any justification as to the apparent exclusion of polybrominated diphenyl ethers from the applicant's sampling regime. Whilst it may be the case that this contaminant group is unlikely to exhibit elevated levels in offshore sediments, the MMO would at least have expected some kind of scoping to justify its exclusion. As this is only the PEIR, the MMO do not consider this to be essential to resolve the PEIR consultation, but we would expect some detail in the Environmental Statement."*

4.1.3 Comments 4.1.2 i and iii do not appear to have been actioned. The Array area contains two samples which contain fine material (FE1_02 and FE2_05) which were not analysed for contaminants (compared to three samples which were). The MMO cannot locate any justification as to why these samples were not tested for contaminants, and based on the contaminant sampling undertaken, the southern array area ("FE2") is not characterised for contaminants in any capacity. The cable corridor area contains 35 samples which contain fine material, of which only eight were tested for contaminants, and 27 which were not.

4.1.4 For comment 4.1.2 ii, the number of samples does not appear to have changed since the Section 42 response. The number of samples tested for remains low.

4.1.5 As these comments appear to have been unactioned, the MMO considers the cable corridor is inconsistently and insufficiently characterised. Therefore, we ask for justification on comments 4.1.2 i-iii.

4.1.6 The MMO notes that comment 4.1.2 iv appears to have been actioned as Polybrominated Diphenyl Ethers (PBDE) data are available for both sediment datasets (array and cable corridor).

4.1.7 Section 3.6.33 onwards (pp 51) of ES Volume 6.2.3, Chapter 7 Marine Water Sediment Quality, describes intertidal sediment sampling with samples taken at 23 locations, and then details the contaminant results which comprise a subset of three intertidal samples.

4.1.8 The report does not detail the locations of these samples within the intertidal area, in the way that it does with the array and cable corridor. A lack of spatial information for these samples critically limits the utility of the data. Therefore, the MMO asks for further detail on these locations.

4.1.9 It would also be useful if the Applicant would confirm why only three samples were tested for contaminants. The MMO presumes it was due to an absence of fine material from the Particle Size Analysis (PSA) data, however, we would like confirmation on this.

4.1.10 Furthermore, the MMO would like confirmation from the applicant on the laboratories contracted for all analyses.

4.1.11 The MMO also notes that raw data for sediment quality should be provided as an annex to the Marine Water Sediment Quality chapter. Otherwise, our assessment for contaminants other than trace metals, Polycyclic Aromatic Hydrocarbons (PAHs) and PBDEs will be based on a qualitative description of the results only.

4.1.12 Given the information gaps highlighted above in the MMO's response. The MMO defers comment on necessary mitigation until the information gaps have been adequately addressed.

### 4.2 Benthic Ecology

In providing this response the MMO has reviewed the following documents:

a. ES Volume 6.1.1, Chapter 1 – Introduction
b. ES Volume 6.1.3, Chapter 3 - EIA Methodology
c. ES Volume 6.1.3.1, Annex 3.1 - Cumulative Effects Assessment
d. ES Volume 6.1.4, Chapter 4 - Site Selection and Alternatives
e. ES Volume 6.2.1, Chapter 1 - Offshore Project Description
f. ES Volume 6.2.1.1, Annex 1.1 - Detailed Offshore Project Design Envelope
g. ES Volume 6.2.5, Chapter 5 – Benthic and Intertidal Ecology
h. ES Volume 6.5.2.4, Annex 2.4 - Main Array and Export Cable Route - Environmental Features Report
i. ES Volume 6.5.5.1, Annex 5.1 – Main Array - Benthic Ecology Monitoring Report
j. ES Volume 6.5.5.2, Annex 5.2 – Export Cable Route and Intertidal Benthic Ecology Monitoring Report

4.2.1 The MMO notes that Volume 6, Part 2, Chapter 1: Offshore Project Description states "At this stage in the VE development process, decisions on exact locations of infrastructure and the precise technologies and construction methods employed cannot be made. Therefore, the project description at this stage is indicative and the design envelope approach (often referred to as the 'Rochdale Envelope') has been used to provide certainty that the final project as built will not exceed these parameters, whilst providing the necessary flexibility to accommodate further project refinement during the detailed design phase post-consent".

4.2.2 The project description is as clearly presented as could be reasonably expected at this stage. However, considering the proximity of the VE project to the Galloper OWF (and the Applicant stated benefit of using existing datasets when extending operational OWFs), the MMO queries the inclusion of gravity base jacket foundations as the engineering solution in the assessment (as worst-case scenario) rather than the pile foundations achieved at Galloper (and presented in Figure 1.3 of Volume 6, Part 2, Chapter 1 of the ES – also see Annex 1, Figure 2 below).

4.2.3 VE states that it is impossible to quantify the quantum of paint flakes released from Wind Turbine Generator (WTG) corrosion protection measures and that all paint will be confirmed as suitable for use in the marine environment. The Applicant also states, "the scale of material released will be extremely small in the context of such material that comes from general vessel traffic in the North Sea".

4.2.4 Recent research has shown that antifouling paint particles typically used in the marine environment fundamentally alter sediment microbial communities (Tagg et al. 2024) and the input of paint flakes from WTG is likely to be localised and persistent over the lifetime of the Project. Therefore, the MMO still advocates for the monitoring of a subset of WTGs to assess the prevalence/abundance of paint flakes in surrounding sediments. Although we agree that it is impossible to quantify the exact quantum of paint flakes released from any single WTG, we suggest that an assessment of surficial sediment bound paint flakes should be considered in pre- and post-construction monitoring (even if this solely involves the collection and storage/provision of samples to collaborators for this purpose) so that a robust assessment can be made of the sediment bound paint flakes before and after construction.

4.2.5 While the MMO believes the appropriate evidence base has been proposed for use in the assessment, we defer to the relevant Statutory Nature Conservation Body (SNCB) regarding the use of the Marine Life Information Network (MarLIN) MarESA in the sensitivity assessment and the classification of samples into EUNIS biotopes as they are best placed to comment with reference to these topics.

4.2.6 The appropriate data sources have been identified. Data from a site specific benthic subtidal survey campaign in November 2021 and historical data (e.g., from Galloper OWF pre- and post- construction surveys) have been used to characterise the area.

4.2.7 The MMO note that the Cefas OneBenthic dataset has also been used to demonstrate the macrofaunal assemblages across the VE array and offshore export cable corridor (ECC) in Section 5.7 of the Benthic and Intertidal Ecology Chapter of the ES.

4.2.8 Volume 6, Part 1, Chapter 3 of the ES includes the methodology used in the Environmental Impact Assessment and details the approach to cumulative effects. We note that the North Falls Development Consent Order (DCO) application is being applied for following the VE DCO application and that a coordinated approach to construction is being pursued in as far as is practicable.

4.2.9 The cumulative impact assessment for benthic ecology receptors includes a long list of projects to be considered, alongside the status (at the time of reporting) of each development, and an appropriate study area has been used in the assessment as shown in Figure 5.8 of the Benthic and Intertidal Ecology chapter (also see Annex 1, Figure 3 below).

4.2.10 While the exact location of the Project infrastructure is not yet known, *Sabellaria spinulosa* was not recorded in reef form within the offshore ECC or the WTG array area during the characterisation survey in 2021 and the Applicant has committed to micrositing to avoid adverse effects on sensitive/protected habitats, biogenic reefs, or protected species should they be encountered following analysis of the pre-construction survey data. The Applicant has confirmed that "Pre-construction surveys will be undertaken to determine the location, extent and composition of any habitats of principal importance and/or Annex I and impacts to the features will be avoided as far as reasonably practicable".

4.2.11 The MMO agrees with the embedded mitigation of micro-siting infrastructure to avoid habitats of principle importance.

4.2.12 The Offshore Project Description chapter of the ES states that trial trenching may be undertaken up to two years prior to the commencement of the offshore construction phase. While the maximum burial depth is stated within the design envelop (3.5 m), the MMO seeks clarification from the Applicant what the minimum acceptable cable burial depth would be and if the cable will be removed should the minimum burial depth not be achieved.

4.2.13 As stated in paragraph 4.2.5, the MMO defers to the relevant SNCB, regarding the cable burial hierarchy, mitigation strategy and potential use of cable protection within the Margate and Long Sands Special Area of Conservation (M & LS SAC) and any potential impacts on the protected features and conservation measures at this site.

### 4.3 Fish Ecology

In providing this response the MMO has reviewed the following documents:

a. ES Volume 6.2.1, Chapter 1 - Offshore Project Description
b. ES Volume 6.2.1.1, Annex 1.1 - Detailed Offshore Project Design Envelope
a. ES Volume 6.2.6, Chapter 6 – Fish and Shellfish Ecology
b. ES Volume 6.2.8, Chapter 8 – Commercial fisheries
c. ES Volume 6.5.6.1, Annex 6.1 – Fish and Shellfish Ecology Technical Baseline Report
d. ES Volume 6.5.6.2, Annex 6.2 - Underwater Noise Technical Report
e. ES Volume 6.5.6.2.1, Annex 6.2.1 – Landfall Impact Piling Modelling
f. ES Volume 6.5.6.3 Spawning Herring Heatmaps - International Herring Larval Survey Data
g. ES Volume 6.5.6.4, Annex 6.4 – Herring Seasonal Restriction Note
h. ES Volume 6.5.8.1, Annex 8.1 – Commercial Fisheries Technical Baseline Report

4.3.1 The MMO notes site-specific data collected from fisheries surveys undertaken for earlier OWF developments (e.g. Galloper, Greater Gabbard and Gunfleet Sands) have been used to provide the site characterisation. The survey data were collected between 2007 – 2014 and in our opinion are appropriate to identify the general fish assemblages typically found in the vicinity of VE. Other sources of publicly available information used to inform the assessment include MMO fisheries reports, spawning and nursery ground data (Coull et al. 1998 and Ellis et al. 2012), International Herring Larval Survey (IHLS) data, ICES beam trawl and bottom trawl data, and seabed sediment data from the British Geological Survey (BGS) and EUSea Map. Collectively, the MMO considers that the evidence used to inform the fisheries and fish ecology assessment is appropriate.

4.3.2 We, however, believe there may be some inaccuracies with the IHLS data used to inform the assessment as there appear to be some data missing. Please see paragraphs 4.3.19, 4.3.20, 4.3.22 and 4.3.23 for further details.

4.3.3 The potential impacts arising from the construction and operation of VE have been identified in Table 6.10 of the Fish and Shellfish Ecology ES Chapter. The impacts and effects identified are appropriate and that the evidence used to inform the ES is generally consistent with that submitted for operations of a similar nature.

4.3.4 The MMO still have some concerns related to the appropriateness of the mitigation measures presented by the Applicant (see paragraphs 4.3.15 – 4.3.16 and 4.3.26). This includes the methodology used to calculate 'peak' spawning, and thus the duration of the temporal restriction (see paragraphs 4.3.19 – 4.3.23).

4.3.5 VE has now carried out habitat suitability assessments following the MarineSpace et al. (2013a and 2013b) methods for herring and sandeel respectively. These are presented as Figure 3.9 for herring and Figure 3.15 for sandeel in the Fish and Shellfish Ecology Technical Baseline Report. The Applicant acknowledges that the array overlaps areas of 'high' potential herring spawning habitat and 'high' sandeel habitat suitability, as shown in the heatmaps presented. This is especially true for the southern array for herring, with the northern array and much of the cable corridor overlapping less suitable herring spawning habitat. For sandeel, both the northern and southern array overlap 'high' suitability habitat, along with some of the cable corridor.

4.3.6 The Applicant does highlight that there is poor correlation between site-specific Particle Size Analysis (PSA) data and the British Geological Survey (BGS) data in some areas. In addition to the large areas of suitable sandeel habitat in the vicinity of the array area (AA) and export cable corridor (ECC) which could call in to question the importance of this habitat to sandeel at a regional scale. It should be noted that although there may be suitable habitat in the broader area, it may not be evenly distributed due to a number of biological and environmental factors, and therefore the EEC and AA may still represent an area of importance for sandeel. The Applicant should also note that the MarineSpace et al. (2013a and 2013b) methods have recently been revised to improve the seabed sediment data coverage used in the methods, see Kyle-Henney et al., 2023 (for herring) and Reach et al., 2023 (for sandeel). These represent the best available methods for assessing habitat suitability for herring and sandeel, however we recognise that these would not have been available at the time the VE ES was written.

4.3.7 The MMO notes that the underwater noise assessment carried out by the Applicant now includes a section assessing the impacts of underwater noise (UWN) generated by the detonation of UXO. In addition, the Applicant has now included the requested UWN modelling using the 135 dB SELss threshold (as per Hawkins et al. 2014) to predict the impact range for behavioural effects in herring (see Figures 6.22 and 6.23 in the chapter Fish and Shellfish Ecology). The Applicant's use of this threshold is an appropriate approach however please see paragraph 4.3.9. The plume modelling provided also seems broadly appropriate and shows that the impacts of elevated Suspended Sediment Concentration (SSC) and the potential smothering effects will likely extend up to a maximum of 500m. The SSC will decrease with distance from the source and will last for the duration of the disturbance plus a maximum of one tidal cycle. VE is now in agreement that the impacts of UWN due to piling and elevated SSC due to cable installation works and bed preparation have the potential to impact spawning herring due to the proximity of suitable herring spawning habitat (see paragraphs 4.3.15-4.3.16). These impacts have been assessed as not significant with the appropriate mitigation; and whilst the MMO agrees with this statement, we do not have sufficient confidence in the mitigation measures that the Applicant has presented at this stage (see paragraphs 4.3.19-4.3.23 and 4.3.26 for further comments).

4.3.8 It would have aided the assessment if the Applicant had overlaid the UWN modelled noise contours over the herring potential spawning habitat heatmap provided in Figure 3.9 of the Fish and Shellfish Ecology Technical Baseline Report, rather than overlay the noise contours over IHLS data and Coull et al. (1998) data. This would have provided a more robust demonstration of where noise contours overlap areas of suitable spawning habitat, as opposed to just showing noise overlap with those areas where larvae are caught.

4.3.9 VE considers the 135 dB behavioural impact threshold for herring (based on Hawkins et al. (2014) to be too precautionary due to the environment in which the study was undertaken (a quiet lough). The Applicant suggests that the environment is not comparable to the study area where fish receptors are likely acclimated to higher background UWN. Whilst the MMO agrees with the Applicant that there are environmental differences between Hawkins et al. (2014) and the present study area, it should be noted that the use of the 135 dB threshold constitutes the best available evidence in lieu of an appropriate alternative. The use of the 135 dB threshold is considered best practice by Cefas and its use in UWN modelling is consistent with other projects of a similar nature. We note that the Applicant has presented the 135 dB threshold noise contour in Figures 6.22 and 6.23 of the ES chapter Fish and Shellfish Ecology, these figures would be much clearer if only the relevant noise contours were presented (186 dB, 203 dB, 207 dB, 210 dB (SELcum) as per Popper et al. 2014) and 135 dB SELss, as per Hawkins et al. 2014), rather than showing contours at 5dB intervals, most of which are not relevant to the assessment and results in overcrowded figures that are difficult to interpret.

4.3.10 The Applicant has presented a brief assessment of UXO clearance as part of the UWN assessment, it should be noted that UXO clearance will be consented under a separate Marine Licence (post-consent) and therefore not under the DCO. Please also note that two marine licences may be required: one for determining the number of UXOs and a second for the clearance of the UXOs found. Based on the information provided at this stage, it is anticipated that there will be up to 2000 UXO targets with up to 60 requiring clearance in the pre-construction phase. Clearances will occur either by high-order or low-order (deflagration) methods and will be limited to two in a 24-hour period. The maximum expected UXO weight is 698 kg a 0.5kg donor charge will be used of both low and high order clearance. The preliminary results show that mortality and potential mortal injury will likely occur up to 890 metres away from the source given the worst-case scenario. VE has identified potential suitable mitigation measures such as micro siting, preference for low order clearance and use of bubble-curtains as noise abatement measures. Given the proximity of suitable herring spawning habitat to the AA and ECC, the MMO note that suitable mitigation and/or noise abatement measures should be further explored.

4.3.11 The Applicant states that cables will be buried below the seabed wherever possible, with a target burial depth to be defined post-consent, using a Cable Burial Risk Assessment (CBRA) to take account of the ground conditions and other factors. In line the with the National Policy Statement EN3 (Department of Energy & Climate Change, 2011), the MMO recommends that, where possible, cables are buried to a minimum depth of 1.5m (subject to local geology or seabed obstructions). Burying cables to the minimum depth will reduce the risk of snagging and damage to cables by other marine vessels e.g. anchors, bottom-towed gear. It will also increase the distance between electro-sensitive fish receptors and electro-magnetic fields (EMF).

4.3.12 The MMO raised concerns in our Section 42 response regarding quantifying the impacts to spawning grounds and habitat as a percentage of area affected. For ease this information has been provided again below:

*The MMO do not support the calculation of total spawning habitat, as this approach can over- or underrepresent spawning grounds and is solely based on substrate suitability. The MMO have provided a summary of the reasons below why we do not support the calculation of total spawning habitat:*

*(i) Spawning areas can change over time or become recolonised.*
*(ii) Whilst spawning and nursery ground maps are used to provide the most recent and appropriate information to identify spawning areas, they do not fully define/consider/identify the following:*

- *All potential areas of spawning,*
- *Any habituation that may occur i.e., identify areas where higher densities of spawning are present,*
- *Specific substrate requirements e.g., substrates which are most suitable within the wider broadscale sediments,*
- *More suitable topography e.g., ridges/edges of sandbanks where sandeel may spawn or furrows where herring may spawn,*
- *Environmental factors that may influence spawning intensity such as temperature, oxygenation, natural disturbance, anthropogenic disturbance etc.,*
- *Calculations of specific spawning areas are based on peak spawning times i.e., the number of days of a spawning period rather than considering the entire spawning season.*

4.3.13 The MMO notes that VE has attempted to justify the use of percentages to quantify the amount of habitat and the amount (duration) of the spawning season impacted. These have been used throughout the ES chapter Fish and Shellfish Ecology despite concerns raised in the Section 42 response. The Applicant argues "that the spawning grounds and the duration of spawning periods are considered highly precautionary; this is on the basis that Coull et al., (1998) specifically states that the spawning and nursery grounds should be seen as representing the widest known distribution given current knowledge and should not be seen as rigid. This is also the case with the duration of spawning seasons, with the seasons tabulated in Coull et al., (1998) described as the generally accepted maximum duration of spawning." The MMO disagrees with these statements, and for the reasons stated in the paragraph 4.3.12. The high uncertainty associated with exact quantification of these areas/periods as a percentage is not an appropriate approach. We recommend the Applicant presents these as raw figures in appropriate units such as $m^2$ or $days^{-1}$.

4.3.14 The MMO notes that the Applicant has cited Geffen (1986) in the Herring Seasonal Restriction Note, but this study is not included in the reference list.

4.3.15 The Applicant has proposed the following mitigation measures in addition to those presented at the PEIR stage:

i. To avoid population impacts to Downs herring from UWN during their spawning season, no piling will be undertaken within the array areas during the 'peak' Downs herring spawning period, defined by the Applicant as 6th November until 1st January.
ii. To avoid population impacts to Downs herring spawning habitat and herring eggs and larvae from increased SSC due to cable installation and bed preparation works, dredged material from the northern array area will not be disposed of within the southern array area, to ensure sediment characteristics of the southern array area are maintained.

4.3.16 The MMO considers these mitigation measures (paragraphs 4.3.15 i and ii) are not appropriate in their current form, please see below for further details.

<u>Seasonal piling restriction</u>

4.3.17 To inform measure 4.3.15 i and identify a suitable temporal piling restriction, VE has carried out a back-calculation method to identify the 'peak' spawning period for the Downs herring stock. The data have been used to calculate the start and end of the 'peak' spawning period based on the earliest/latest survey start date, less the number of days from hatch length to catch length, less the yolk absorption and egg development periods. This involves the use of IHLS data for 2007-2022 and the following parameters:

i. IHLS survey timings and bottom sea temperature data.
ii. Larval length in survey sample data.
iii. Laval length at hatching.
iv. Egg development period.

v. Yolk absorption period.
vi. Growth rate.

4.3.18 The Applicant has used a larval length of 11 millimetres (mm) on which to base the calculation of a conservative estimate of the start and end of peak spawning as most of the larvae within the survey will have been spawned later than the calculated start date as 89.9% of all larvae recorded were ≤11 mm. The length at hatch has been estimated at 5 mm this is considered to be a conservative estimate however this size is occasionally reported for the Downs stock (0.5% of the recorded larvae). The justification for, and the choice of 11mm length at catch and 5mm length at hatch is appropriate.

4.3.19 The egg development period used in the calculation is based on Russell (1976). Data for the temperature at the maximum sampling depth for each trawl is recorded as part of the IHLS data (2007- 2022) and these temperature data have been used to determine the average temperature at the maximum sampling depth. This represents the average seafloor temperature for the egg development period. A temperature of 8.5°C has been used as a conservative temperature, which is the average temperature of the IHLS dataset covering the (coolest) northeastern extent of the English Channel. This is 1.4°C cooler than the average temperature for the entire English Channel. Based on this, a 14-day egg development duration has been used to inform the start date. The egg development duration calculation based on Russell (1976) is appropriate, however it is not clear at this stage whether 8.5°C is an appropriate temperature for the calculation. VE compares the temperature chosen with the average for the English Channel, stating that it is 1.4°C cooler. It should be noted that the project is not located in the English Channel but the Southern North Sea. Therefore, comparing temperatures with the English Channel is not appropriate. Furthermore, it is not clear if the temperature used by the Applicant to inform the back-calculation is appropriate. The Applicant has chosen the average temperature, however this cannot be considered a precautionary approach, as the temperature in the IHLS data ranged from 6.3°C to 10.1°C. The minimum temperature values should be used in the calculation to ensure that there is no scope for underestimating the time from peak spawning; and therefore, potentially allowing piling works to occur during this sensitive period.

4.3.20 The Applicant has presented data showing the average temperature at the maximum sampling depth for each IHLS sampling station for the years 2007 – 2022 in Figure 2.2 in the document Herring Seasonal Restriction Note. The temperatures at the maximum depth for each sampling station for each of these years has then been presented in Figures 6.1 - 6.14 (in Appendix B of the Herring Seasonal Restriction Note). However, the legend for Figures 6.1 - 6.14 states that the data show ‘Average Temperature (degrees)’, rather than the site and year specific bottom temperature for that particular year. The MMO asks for VE to clarify if these are average values or single values for each year.

4.3.21 The yolk absorption duration and the growth rate chosen for the back calculation are also not appropriate. Kiorboe et al., (1985) and Geffen (2002) have been used to inform the yolk absorption period and Oeberst et al. (2009) has been used to inform the growth rate. It should be noted that these studies use herring from the west coast of Scotland (the Clyde stock), Baltic and Limfjord, Denmark (the Dogger stock). None of these herring stocks exhibit the same spawning period as the Downs stock (November – January). A comparison of growth rates between stocks which have different spawning characteristics and are therefore physiologically different is not appropriate. VE should use the yolk absorption periods from Russell (1976) (see Table 2 below), and the growth rates from Heath (1993) which focus on the Downs stock and are therefore appropriate sources.

**Table 1 Egg development periods**

| Average temperature | Days |
|---|---|
| 12 - 13° C | 7-9 |
| 10 - 11° C | 10-12 |
| 7 - 8° C | 14-18 |
| 3 -4° C | 49 |

**Table 2 Yolk absorption periods**

| Average temperature | Days |
|---|---|
| 12.8° C | 3 & 9 |
| 12.0° C | 5 & 14 |
| 10.7° C | 7 & 16 |
| 10.3° C | 7 & 20 |

From Russell 1976.

4.3.22 The IHLS data used to inform the back-calculations also appears to be incomplete. VE states that IHLS data from 2007-2022 have been used to inform the calculations, some limitations in the data have been acknowledged such as the lack of any surveys of the Downs stock in 2018 and the lack of a December survey in 2014. However there appears to be some additional dates and even surveys missing from Table 2.1 of the Underwater Noise Report which shows the survey years and the start and end dates of the IHLS data for each year. A quick cross reference with the IHLS data from ICES data portal (see https://www.ices.dk/data/data-portals/Pages/Eggs-and-larvae.aspx) shows that the data presented in the table do not match. For example, from 2019 -2022 the table appears to show that no January surveys took place, however ICES reports that in 2021 there was a survey from January 6th- 9th and in 2022 there was a survey from January 8th - 11th. In addition, there appear to be inconsistencies between the start and end dates of surveys shown in Table 2.1 compared to the data on the ICES portal, for example for 2019, Table 2.1 states that the survey occurred from December 18th – 19th, when ICES reports the dates as December 16th – 20th. This is not an exhaustive list and a number of other similar inconsistencies were also identified, the Applicant should revisit the ICES portal and obtain the correct and complete IHLS data set for the Q12 and Q1 surveys. It should be noted that until 2018, the Southern North Sea and eastern English Channel (SNS) Downs IHLS surveys were conducted as three separate sampling events; one in the 3rd quarter of each year undertaken by the Netherlands between 16th - 31st December, and two in the 1st quarter of each year; between 1st - 15th January undertaken by Germany, and between 16th – 31st January undertaken by the Netherlands. From 2018 onwards, the latter survey (between 16th – 31st January) was discontinued, however, the spatial coverage for all surveys remains the same and it is only the temporal coverage which has changed.

4.3.23 In the MMO's response at the PEIR stage we mentioned that herring spawning typically occurs later in the season in the area of the Downs spawning ground where VE is located, compared to the areas of spawning ground in the English Channel. With this in mind, our suggestion that a 'peak' of spawning activity could potentially be established, was on the basis of breaking down the IHLS survey data by each of the three survey periods (two survey periods for 2018 onwards), this would allow for better interrogation of the data to identify when larval abundances were at their highest in the Southern North Sea spawning ground. This important step needs to be considered in order to better explore the refinement of the spawning restriction. The MMO are content to arrange a meeting between the Applicant, the MMO and our technical advisers Cefas to discuss this matter, prior to the Applicant carrying out further back calculations.

4.3.24 The MMO would like to highlight that once a peak spawning period has been agreed, a suitable buffer period should also be implemented to allow for settlement of seabed habitats and allow migration of herring to their spawning grounds. This buffer period has been set at eight days for other projects of a similar nature.

Sediment Disposal Restriction

4.3.25 As far as the MMO can tell, the mitigation measure proposed by the applicant, 4.3.15 ii, has been informed by the sediment suitability maps for herring (and sandeel) and is aimed at maintaining the sediment characteristics in each array and therefore their potential suitability to herring (and sandeel). Although we agree that sediment collected during cable installation and bed preparation works should be returned to broadly the same location from where it originated this mitigation measure is not sufficient in isolation to reduce other impacts to herring associated with increased SSC such as potential smothering of eggs and larvae.

4.3.26 The sediment disposal restriction does not provide adequate protection to spawning herring and resultant eggs and larvae. Herring are benthic spawners attaching their demersal eggs to coarse sediments such as gravel and sandy gravels. Cable burial and bed preparation is estimated to disturb approximately 42 million cubic metres ($m^3$) of sediment over the whole construction period. If these activities are to be carried out during the herring spawning season there is a potential for smothering of herring eggs due to the resulting sediment deposition. Given that the southern array overlaps areas of 'high' herring spawning potential (Figure 3.9 of chapter Fish and Shellfish Ecology Technical Baseline Report) and that the impacts of elevated SSC may extend up to 500m from the source, there may be potential for significant impacts to herring spawning success at a population level. Therefore, a temporal restriction on bed preparation and cable laying works in the southern array area will be necessary. It should be noted that the cable corridor and northern array overlap areas of lower herring spawning potential and therefore are of less concern. The MMO recommends that a temporal restriction is conditioned on the deemed marine licence (DML) to restrict dredging and disposal of material from the northern array area during the Downs herring spawning season in order to minimise the potential for impacts to herring eggs and larvae from activities likely to generate high SSC.

4.3.27 Whilst the MMO agrees with some of the results of the cumulative assessment, we do not support the Applicant's conclusions of no significant cumulative effects for the impacts of UWN and elevated SSC. The mitigation measures that the Applicant has currently presented to reduce impacts to herring from these two sources are not appropriate in their current form, please see paragraphs 4.3.15-4.3.16, 4.3.19-4.3.23 and 4.3.26 for details.

4.3.28 In the Fish and Shellfish Ecology Technical Baseline, VE states the following; 'until recently, fish were assumed to flee the noise stimulus at a rate of 1.5 m/s, however recent projects (RWE, 2022; Equinor, 2022; Ørsted, 2021; Vattenfall, 2019) have been advised to also consider stationary receptor modelling for some species groups'. Please note that the MMO's position on the use of a fleeing receptor has not changed and is as follows: The MMO do not support the use of a fleeing fish receptor when modelling the range of effect for UWN because there is no empirical evidence that fish will flee from a source of disturbance. The 'generic' fish swimming speed of 1.5m/s is based on Hirata K (1999). However, this does not comprise empirical evidence that fish will flee from the source of noise, and its use in this way may be considered speculative. It should also be recognised that swimming speeds are not the same as fleeing speeds. In studies which have sought to quantify swimming speed in fish, swimming performance is categorised into sustained, burst and prolonged swimming (Beamish, 1978; Cano-Barbacil et al., 2020), which are defined in the literature as follows:

i. Sustained swimming is aerobically generated and can be maintained for periods of time without muscular fatigue (excess of 200 minutes).

ii. Burst swimming is the maximum achievable swimming speed, this type of swimming is anaerobically generated and can only be sustained over short periods (20-30 seconds).

iii. Prolonged swimming is a transitional speed between burst and sustained swimming which can be maintained for intermediate lengths of time (1-200 minutes).

4.3.29 We know that fish will respond to loud noise and vibration, through observed reactions including schooling more closely; moving to the bottom of the water column; swimming away, and burying in substrate (Popper et al., 2014). However, this is not the same as fleeing, which would require a fish to flee directly away from the source over the distance shown in the modelling. We are not aware of scientific or empirical evidence to support the assumption that fish will flee in this manner. The assumption that a fish will flee from the source of noise is overly simplistic as it overlooks factors such as fish size and mobility, philopatric behaviours (foraging, reproductive or migratory) which may cause an animal to remain/return to the area of impact. Ultimately, the use of a fleeing fish model relies too heavily on an assumption, rather than being supported by an adequate evidentiary standard befitting of an Environmental Impact Assessment. If the Applicant is aware of new, empirical evidence characterising fish fleeing behaviour which may be of use, the MMO would be happy to review it.

4.3.30 The MMO emphasises that the authors of the Fish and Shellfish Ecology Technical Baseline have been made aware of the MMO's and Cefas' position on the use of a fleeing receptor in modelling and the lack of evidence to support a 'fleeing' speed of 1.5m/s on various occasions as part of other Offshore Wind Farm applications, and so we presume the inclusion of this within the report to be an error.

**4.4 Underwater Noise**

In providing this response the MMO has reviewed the following documents:

a. ES Volume 6.1.1, Chapter 1 – Introduction
b. ES Volume 6.2.1, Chapter 1 - Offshore Project Description
c. ES Volume 6.5.6.2, Annex 6.2 - Underwater Noise Technical Report
d. ES Volume 6.5.6.2.1, Annex 6.2.1 – Landfall Impact Piling Modelling

4.4.1 The MMO defers to Natural England for comments on whether all relevant marine mammal receptors have been scoped in for assessment. For marine mammals, the primary species considered in the assessment are grey seal, harbour seal, and harbour porpoise. We believe this was agreed through the Evidence Plan Process.

4.4.2 The MMO want to highlight that the following paragraphs are in relation to our Section 42 response comments, some of which are yet to be addressed.

<u>Previous Comments on Annex 6.2 Underwater Noise Technical Report:</u>

4.4.3 The MMO note that sections 1.3.9 to 1.3.10 of the report state that *"The current version of INSPIRE (version 5.1) is the product of re-analysing all the impact piling noise measurements in Subacoustech Environmental's measurement database and cross-referencing it with blow energy data from piling logs…. This analysis showed that, based on the most up-to-date measurement data for large piles at high blow energies, the previous iterations of INSPIRE tended to overestimate the predicted noise levels at these blow energies. With this in mind, the current version of INSPIRE attempts to calculate closer to the average fit of the measured noise levels at all ranges".* The MMO welcome this clarification, and acknowledge the drive for reducing unnecessary conservatism in modelling. Allegedly, the current version of INSPIRE should produce more realistic predictions. However, the MMO consider that in light of these, the various claims throughout the PEIR (especially in the Marine Mammal Ecology chapter) that the noise modelling and predictions are 'highly precautionary' seem unjustified."

The MMO note that this comment has not been addressed, although it is similar to paragraph 4.4.19 which has been responded to.

4.4.4 *"The MMO advise that more caution should be warranted given the lack of measured data for larger piles (in the region of 15 m diameter). The MMO note that previous source level estimates for lower hammer energies (i.e., 5,500 kJ for up to 16 m diameter piles proposed for Sheringham Shoal and Dudgeon Offshore Wind Farm Extension Projects) were 242.9 dB SPLpeak and 224.1 SELss, compared to 243.2 dB SPLpeak and 224.4 dB SELss for VE."*

The MMO want to highlight that whilst this point was an observation, it does not appear to be addressed.

4.4.5 The MMO can confirm that the caption of Figure 1.3 has been updated for the ES to include the hammer energies for the different piles. As expected, the largest hammer energy considered in the report is 1,600 kJ (for the 9.5 m pile in the North Sea) (which is much smaller than the proposed 7,000 kJ). A new figure – Figure 1.4 has also been added to the report showing a comparison between the unweighted SELss measured impact piling data and modelled data using INSPIRE (for the same piles presented in Figure 1.3).

4.4.6 The MMO have previously commented in our Section 42 response that: *"The purpose of the noise monitoring is to determine the actual underwater noise levels on site for comparison with the modelled levels presented in Annex 6.2 and used as the basis for the impacts predicted in the EIA, which are themselves intended to be worst-case. The MMO largely agree with sections 1.3.13 – 1.3.14 of Annex 6.2 that the measurements taken during installation will be constrained by the piling plan and site limitations and a direct (like-for-like) comparison with a modelled scenario is unlikely to be possible. Nevertheless, even if the piling locations and choice of transects would not be matched precisely, both modelling and monitoring should provide enough information to deduce some envelope of received level (RL) curves in each case. Thus, some sort of comparison/s in the form of 'level vs range' plots (for comparable hammer strike energies), with the associated envelopes of variability, should be possible and would be expected."*

4.4.7 Level vs range plots are mentioned in section 1.3.13 of the report but from what the MMO can see, the text in this section is the same as that provided at PEIR (no updates or further information provided). We have further addressed this point under comments 4.4.22-4.4.37. In summary, the Received Level curves would not only facilitate sense-checking analysis but could also provide more context for comparing with future monitoring measurements (we acknowledge though that the inclusion of predictions at 750 m is a valuable addition in this direction, although for the scope of checking the cumulative exposure impacts and other potentially longer range results, the model predictions in the further far-field regions also play a very important role).

4.4.8 <u>Piling predictions (single pile):</u>
The MMO have reviewed the predictions for piling (of single and consecutive monopiles). Maximum Permanent Threshold Shift (PTS) injury ranges in marine mammals of 7.3 km for very-high frequency (VHF) cetaceans (i.e., harbour porpoise) and < 100 m for phocid pinnipeds (i.e., seals) were predicted using the impulsive SELcum (cumulative sound exposure) criteria (Southall et al., 2019). TTS ranges of 30 km and 14 km were predicted for VHF cetaceans and phocids respectively. For fish, a maximum range of 36 km (stationary receptor) was predicted for TTS using the Popper et al. (2014) criteria, as well as potential mortal injury (7.1 km) and recoverable injury (11 km). The MMO consider that the predictions look plausible for VHF cetaceans (and low- and mid-frequency cetaceans) and fish, under the modelling assumptions provided in the report, more specifically the source levels, piling profiles and marine mammal fleeing speeds.

4.4.9 For phocids (seals) however, the PTS and TTS predictions look smaller than the MMO would expect. For example, under the modelling assumption that led to the predictions mentioned under paragraph 7.2.6 above, we would expect some modest PTS ranges for phocids (typically a few hundred meters, perhaps up to 1 km). The MMO request that the applicant confirms if the predictions for phocid pinnipeds are correct, or if some particular assumptions have been made regarding the fleeing behaviour and/or noise exposure of the phocids fleeing receptors?"

4.4.10 There are some changes to the predicted ranges presented in the ES (compared to PEIR). Please see Annex 2 of this response for a summary of the predictions.

4.4.11 The MMO notes that the ES report has been updated. In summary, in a 24-hour period there is the potential that up to four pin piles can be driven at a single WTG foundation location per piling vessel (4 piles would take 16 hours duration in total, see Table 1.12 in Annex 6.4). Further scenarios exploring piling at multiple locations have been considered, at the Southern Array – SW corner location and the Northern Array – N edge location to give a wide geographical spread as well as a worst case for water depths. Two different protocols have been investigated. Firstly, a sequential condition was run where pile installations are staggered as an experiment to avoid concurrent piling at multiple locations. Secondly, the concurrent condition had the piles at the north and south of the site installed simultaneously. See paragraphs 4.4.22-4.4.37 for further comments.

4.4.12 Continuous (non-piling sources):
In the MMO's Section 42 response we advised that *"Small effect ranges (largely < 100m) have been predicted for other sources of noise including the operational noise from wind turbines, and various construction activities (i.e., cable laying, suction dredging, trenching, rock placement and vessel noise). A fleeing animal receptor has been assumed for all marine mammals, and therefore the predicted effect ranges are minimal."*

4.4.13 This was more a general observation than a comment requiring action. From the MMO's review of Annex 6.2 presented in the ES, there has been no change to the continuous (non-piling sources) assessment since the PEIR.

4.4.14 Unexploded Ordnance (UXO) clearance:
*"The maximum equivalent charge weight for the potential UXO devices that could be present within the VE site boundary has been estimated as 698 kg; this has been modelled alongside a range of smaller devices: 25, 55, 120, 120, and 525 kg. In addition, low-order deflagration has been assessed, which assumes that the donor or shaped-charge (charge weight 0.5 kg) detonates fully but without the follow-up detonation of the UXO.*

*To estimate the potential impact from UXO detonation, an attenuation correction has been added to the Soloway and Dahl (2014) equations for the absorption over long ranges (i.e., of the order of thousands of metres), based on measurements of high intensity noise propagation taken in the North Sea and Irish Sea in similar depths to VE. This uses standard frequency-based absorption coefficients for the seawater conditions expected in the region. The MMO consider the predictions look reasonable. The assessment concludes that the maximum PTS range calculated for UXO is 13 km for the VHF cetacean category, based on the unweighted SPLpeak criteria and largest UXO device of 698 kg (we get a PTS prediction of 14.2 km for VHF cetaceans assuming the methodology from Soloway and Dahl and no attenuation correction).”*

4.4.15 This was more a general observation than a comment requiring action. From the MMO's review of Annex 6.2 presented in the ES, there has been no change to the UXO assessment since the PEIR.

Previous Comments on Chapter 7 Marine Mammal Ecology:

4.4.16 *“With regard to Table 7.2. (Summary of consultation relating to marine mammals). The MMO do not agree that it would be inappropriate to assess the significance of TTS, and believe an assessment of TTS should be included in underwater noise impact assessments, in addition to the assessment of the risk of PTS and disturbance. However, it was agreed that, as a minimum, the predicted TTS effect ranges along with the number of animals at risk should be present in the ES.”*

4.4.17 The Applicant has addressed this point within Table 7.2 of Chapter 7 Marine Mammals. The Applicant notes that the TTS impact ranges have been presented in Section 7.10, but there has been no assessment of magnitude, sensitivity or significance as previously agreed.

4.4.18 *“With regard to Section 7.5.18: A 5 km Effective Deterrence Range (EDR) for low-order detonations has been assumed, which was suggested by Sofia Offshore Wind Farm. The MMO requested further evidence to support this EDR, and it was noted that Sofia Offshore Wind Farm would be undertaking underwater noise monitoring for low order clearance to provide empirical data to evidence the 5 km EDR. The MMO are yet to see empirical evidence to support the 5 km EDR.”*

The Applicant has addressed the point for further evidence to support this Evidence Deterrence Range (EDR) within Table 7.2 of Chapter 7 Marine Mammals: “The Applicant recognises that the Sofia Offshore Wind Farm UXO clearance campaign (MLA/2020/00489) had unsuccessful low order clearance attempts and therefore there is no empirical data to support the 5 km EDR (SOWFL, 2023). However, the Applicant is also aware that Moray West Offshore Wind Fam UXO (MS- 00010483) were cleared using EODEX method with 100% success rate. Underwater noise monitoring was conducted for the first 30 detonations, the data has not been analysed as of the time of ES submission, but indications show that low order resulted in noise levels lower that what was modelled. Additionally, the JNCC (2023) Marine Noise Registry recognises the 5 km EDR for low order clearance. The Applicant therefore has presented the following assessment: a 26 km EDR for high order clearance, a 5 km EDR for low order clearance, and TTS as a proxy for both high and low order clearance. See Section 7.1 for methodology approach and Section 7.10 for UXO clearance impact assessment”. The MMO is aware that the JNCC MNR applies a 5 km EDR for low order clearance. Hopefully further monitoring data for UXO clearance, including low order, will become available in due course.

4.4.19 *“The MMO consider that the claims made throughout the report, particularly in section 7.7.11 of Chapter 7 (that the SELcum PTS predictions are ‘highly precautionary’ and ‘very unlikely to be realised’) are unsubstantiated. “As a result of these and the uncertainties on animal movement, model parameters, such as swim speed, are generally highly conservative and, when considered across multiple parameters, this precaution is compounded therefore the resulting predictions are very precautionary and very unlikely to be realised”. The MMO would argue how ‘uncertainties’ can be ‘highly conservative’. Although it is reasonable to assume that a marine mammal will swim away from the source, the actual concept of fleeing, specifically swimming away from the pile at a constant speed for a sustained period of time (over several hours), is not precautionary. The primary aim of the underwater noise modelling is to present the realistic worst-case scenario. While the MMO acknowledge that there may be conservative assumptions made (for instance, that pulsed sound does not lose its impulsive characteristics while propagating away from the source), these conservatisms may be offset by uncertainties surrounding the predicted source levels and fleeing speeds.”*

The Applicant has addressed this point within Table 7.2 of Chapter 7 Marine Mammals: “The Applicant maintains that the assessment of cumulative PTS (SELcum) is highly precautionary given the information presented in Section 7.6. The modelling does not account for recovery in threshold shift in between pulses or the loss of impulsive characteristics with distance. With regards to the fleeing model, the model uses typical swimming speeds rather than fleeing speeds which is considered to be conservative”.

This point is not agreed. While the Applicant is correct that the modelling does not account for recovery in threshold shift in between pulses or the loss of impulsive characteristics with distance, as we explained previously, these conservatisms may be offset by the assessment uncertainties, especially regarding the scaling of piling noise and assessment parameters. Furthermore, the Underwater Noise Report in Annex 6.4 specifically states that the current version of INSPIRE attempts to calculate closer to the average fit of the measured noise levels at all ranges (to reduce unnecessary conservatism in the modelling). This is therefore at odds with the (various) claims that the assessment is 'highly precautionary'.

4.4.20 The MMO would be happy to review any updated mitigation plans the Applicant submits (i.e., Marine Mammal Mitigation Plans).

4.4.21 Transboundary effects are considered in section 7.16 of Chapter 7 Marine Mammal Ecology. The report appropriately recognises that there may be behavioural disturbance or displacement of marine mammals from the VE site as a result of underwater noise. Behavioural disturbance resulting from underwater noise during construction could occur over large ranges (tens of kilometres) and therefore there is the potential for transboundary effects to occur where subsea noise arising from VE could extend into waters of other European Economic Area (EEA) states. VE OWF is located in close proximity to other states (e.g., French, German waters) and therefore there is the potential for transit of certain species between areas. The mobile nature of marine mammals also results in the potential for transboundary effects to occur.

<u>New Comments on Annex 6.2: Underwater Noise Report.</u>

4.4.22 Annex 6.2 Underwater Noise Report details the underwater noise modelling undertaken to support the ES. A summary of the approach to the noise modelling assessment and the results is provided in Annex 2 of this response for reference.

4.4.23 There is no change in the report (from the PEIR to ES) from section 1.5 (Other noise sources) onwards. Therefore, our comments are primarily in relation to the installation of monopiles and pin piles at VE.

4.4.24 We note the sizable scale of piling parameters considered for the foundation scenarios included in this assessment. In particular, the worst-case monopile scenario assumes the installation of a 15 m diameter pile, with a maximum hammer energy of 7,000 kJ. Furthermore, the maximum hammer energy is applied and sustained over a period of almost 7 hours, which is preceded by a relatively short and steep ramp-up (lasting only 35 minutes).

4.4.25 The local environmental conditions surrounding the construction site, namely water depths of 40-50 m and above, and seabed sediments made up of gravel and sand combinations, seem, in general, favourable for good sound propagation. Together with the above observations on piling parameters, the overall conditions seem conducive to generate high noise levels both in the near and in the far field.

*Comments on the source levels (page 32), predicted noise levels at 750 m (page 42), and the difference between monopile and pin pile level predictions:*

4.4.26 We appreciate the inclusion of the information about noise level predictions at the distance of 750 m from the source (Table 1.15 of the Underwater Noise Report), in addition to the source level values (Table 1.13). While the source levels are essentially a modelling concept and are in general best understood only within the particular context of the chosen propagation model and modelling setup, the predictions at 750 m have the particular advantage (as acknowledged in the report) of being comparable with other modelling predictions or, indeed, with measurements (either from similar environments or from future monitoring at the current site).

4.4.27 Having said the above, we observe that the predicted noise level values do not seem particularly high, especially when considering the piling parameters assumed for monopiles (namely, 7000 kJ blow energy and 15 m diameter pile) which are considerably larger than the corresponding pin pile parameters (4000 kJ and 3.5 m diameter pile). However, the SPLpeak and SELss values are only about 1.5–2 dB higher when comparing the monopile predictions with the corresponding pin pile predictions. The increase in blow energy alone could plausibly account for this relatively modest increase in predicted noise levels; however, this is at odds with the emerging evidence from literature, which suggests that the pile dimeter is also a very important factor in the scaling of the piling noise (von Pein et al., 2022). In particular, the increase of pile diameter by a factor of 4 (as in the present case) could add some additional 9–10 dB to the SELss values at 750 m (cf. Fig 10, eq. 10-12 from von Pein et al., 2022). In this context, we also note that the report acknowledges that the INSPIRE model is based on existing empirical data, which allegedly does not exist for the parameters relevant for the foundations assessed herein, and thus needed to be extrapolated, based on the existing trends, up to the scale of piling anticipated for the current application.

*Comments on the worst-case SPLpeak predicted levels at 750 m, compared to the worst-case PTS predictions for VHF cetaceans (202 dB peak pressure threshold)*

4.4.28 We note that when considering the maximum blow energy of 7000 kJ for monopiles, the worst case unweighted SPLpeak prediction at 750 m is 202.8 dB (Table 1.15) at all three modelling locations, which actually slightly exceeds the PTS threshold value of 202 dB SPLpeak for VHF cetaceans under the Southall et al. (2019) impulsive criteria. This indicates that the maximum PTS ranges for VHF cetaceans would be slightly larger than 750 m (approximately 800–820 m in our estimates). However, the summary results in Tables 1.16, 1.21 and 1.26 predict maximum ranges of only 730m, 730m and 740m at the three modelling locations, respectively for VHF cetaceans.

4.4.29 Notwithstanding the above observation, following our sense checking of modelling outputs presented throughout the report, we have been able to reasonably match the Subacoustech predictions for marine mammals and fish, based on the modelling parameters and assumptions as provided in the report, such as the source levels (note however the previous comment on source level and predicted levels at 750 m), piling profiles and marine mammal fleeing speeds. It should be noted that our internal sense checking process follows a streamlined approach (for example, using generic textbook-like values for parametrising the environmental properties, such as those of the seabed and of the water column, or the use of coarser numerical grids and bathymetric discretisation, and generic source spectra), and thus is not intended to match exactly the outputs of a fully-customised model (which could include, for example, validation/calibration of the transmission loss, refining of source spectra, etc.), but rather to explore the envelope of variability for the main modelling outputs and thus check the plausibility of the predictions presented in the report.

4.4.30 Some of the predictions (e.g., the predictions for fish species) compare favourably with our estimates, while others seem to sit closer to the lower end of the envelope of plausible outcomes (e.g., the PTS ranges for cumulative exposure for marine mammals). This could be explained by a number of factors, including the propagation loss and source spectra assumption, as mentioned above, although this remains somewhat speculative lacking explicit evidence that would facilitate a more in-depth comparison and analysis (e.g., curves of the received level (RL) versus range (unweighted and/or weighted), source spectra). As mentioned in our previous Section 42 response, the RL curves would not only facilitate such sense-checking analysis but could also provide more context for comparing with future monitoring measurements. We do acknowledge though that the inclusion of predictions at 750 m is a valuable addition in this direction, although for the scope of checking the cumulative exposure impacts and other potentially longer range results, the model predictions in the further far-field regions also play a very important role.

4.4.31 Given the assessment uncertainties as outlined above, the focus should be on ensuring that appropriate mitigation measures are secured to reduce the risk of potential impacts. The MMO would be happy to review any marine mammal mitigation plans.

<u>Comments on Annex 6.2.1: Landfall Impact Piling Modelling</u>

4.4.32 The MMO welcomes that additional noise modelling has been undertaken to assess impact piling for the construction of a sheet piled enclosure at the landfall location on the Essex coast between Holland-on-Sea and Frinton-on-Sea. Although it is expected that vibro-piling will be used for these activities, impact piling has been presented to represent a worst case with regards to noise as this has not been ruled out. The MMO considers this to be appropriate.

4.4.33 In summary, a single scenario has been modelled, considering the installation of 750 mm wide Larssen sheet piles, measuring 20 m in length using the assumed ramp up given in Table 1-1. It is possible that eight piles could be sequentially installed in a 24- hour period; this has been considered in the modelling.

4.4.34 The modelling results show that noise levels and ranges for potential impacts will be greater during high tide conditions. The report concludes that "all ranges at which PTS and TTS impacts could occur for marine mammals are expected to be less than 100 m. For fish, the maximum TTS range (186 dB SELcum threshold) is predicted to be 160 m for a single pile, increasing to 460 m when 8 sequentially installed piles are considered" (for a stationary receptor).

4.4.35 Nevertheless, the modelling report lacks information on the environment where piling will occur. Figure 1-1 for example, shows the landfall area as well as the representative modelling location used for this study. It would be helpful if this figure could also show the bathymetry of the domain. There is no indication of the water depths at the piling source. The report simply states: "as the furthest from land and therefore deepest location, this represents the location likely to lead to the largest potential impact ranges".

4.4.36 Furthermore, the report provides the unweighted SPLpeak and SELss source levels in Table 1-2 (below for reference). Both high and low tides have been considered for this modelling using tidal data from the Walton-on-the-Naze:

- Mean High Water Springs (MHWS): 4.6 m above lowest astronomical tide (LAT); and
- Mean Low Water Springs (MLWS): 0.1 m above LAT.

*Table 1-2 Summary of the unweighted source levels used for modelling.*

| Source levels | **Sheet pile (MHWS)** 750 mm wide, 300 kJ blow energy | **Sheet pile (MLWS)** 750 mm wide, 300 kJ blow energy |
|---|---|---|
| Unweighted $SPL_{peak}$ | 224.0 dB re 1 µPa @ 1 m | 216.7 dB re 1 µPa @ 1 m |
| Unweighted $SEL_{ss}$ | 194.2 dB re 1 $\mu Pa^2s$ @ 1 m | 171.0 dB re 1 $\mu Pa^2s$ @ 1 m |

4.4.37 We request further evidence to justify the source levels assumed in the modelling. We note for previous/other assessments, typical impact piling source levels for a similar hammer energy (i.e., 350 kJ) were higher than what is assumed here. The (low) source levels assumed in this assessment explains the modelled outputs (predicted impact ranges) presented.

4.4.38 Given the assessment uncertainties as outlined above, the focus should be on ensuring that appropriate mitigation measures are secured to reduce the risk of potential impacts. The MMO would be happy to review any marine mammal mitigation plans that the Applicant submits.

### 4.5 Commercial Fisheries

4.5.1 MMO defers to the National Federation of Fishermen's Organisations and Sussex Inshore Fisheries and Conservation Authorities, along with standalone representatives on matters of commercial fisheries. The MMO will continue to be part of the discussions relating to securing any mitigation, monitoring or other conditions required within the DMLs.

### 4.6 Shipping and Navigation

4.6.1 The MMO defers to the Maritime and Coastguard Agency and Trinity House on matters of shipping and navigation. The MMO will continue to be part of the discussions relating to securing any mitigation, monitoring or other conditions.

### 4.7 Civil and Military Aviation

4.7.1 The MMO defers to the Civil Aviation Authority, Ministry of Defence and Maritime and Coastguard Agency on matters of Civil and military aviation and supports any comments raised. The MMO will continue to be part of the discussions relating to securing any mitigation and monitoring or other conditions required within the DMLs.

### 4.8 Seascape, Landscape and Visual Resources

4.8.1 The MMO defers to Natural England as the SNCB on matters of Seascape, Landscape and Visual Resources. The MMO will continue to be part of the discussions relating to securing any mitigation and monitoring or development of any plans/conditions on this matter.

### 4.9 Marine Archaeology

4.9.1 The MMO defers to the Historic England on matters of shipping and navigation. The MMO will continue to be part of the discussions relating to securing any mitigation, monitoring or other conditions.

## 5. Summary

### 5.1 General Comments

5.1.1 The MMO has multiple concerns in relation to both the details within the ES and the conditions within the DMLs.

5.1.2 We strongly recommend that the Applicant engage with the MMO throughout the process in order to ensure the assessment is as smooth as possible and agreements can be reached through a Statement of Common Grounds (SoCG).

Yours faithfully

[redacted]

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# 7. Annexes

## 7.1 Annex 1: Project Site Overview

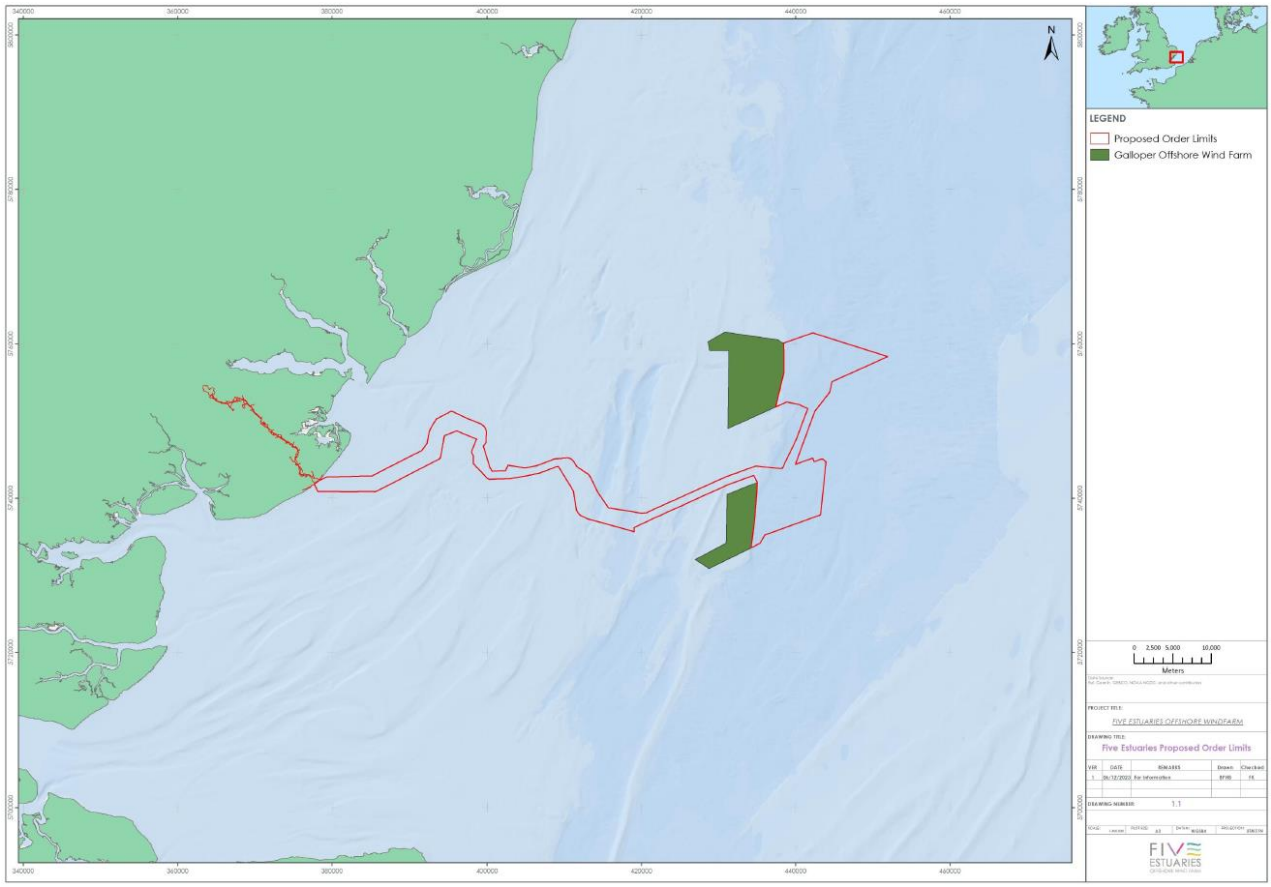


Figure 1. Location of the Five Estuaries Offshore Windfarm (Figure 1.1 of the Environmental Statement- Chapter 1 Introduction).

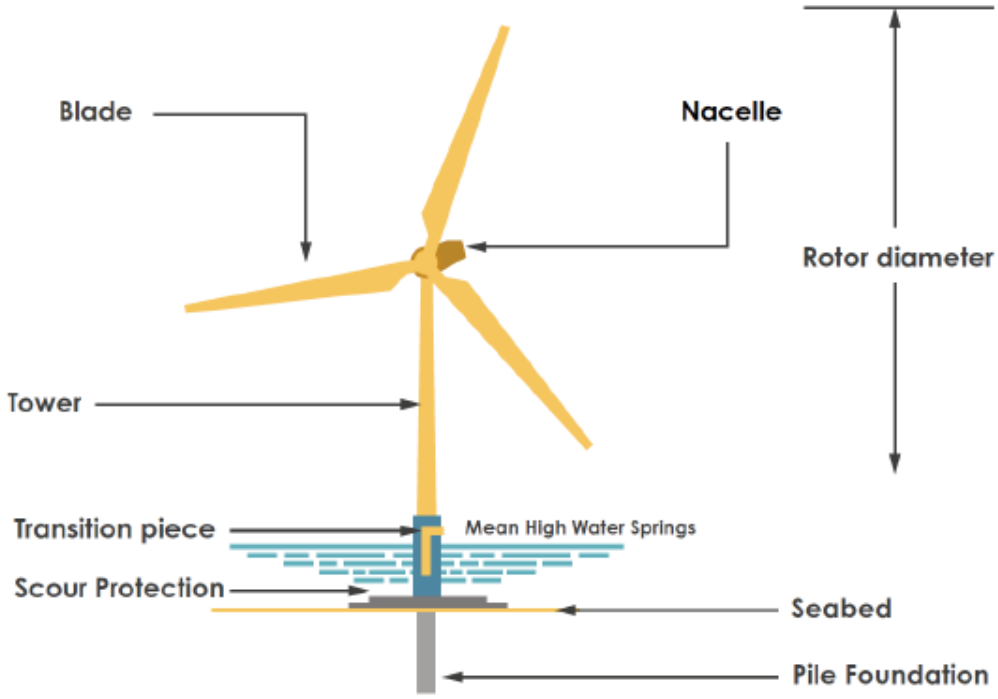


**Figure 1.3: Diagram of an offshore WTG**

Figure 2. Diagram of a piled foundation Wind Turbine Generator (Figure 1.3 of ES Part 2 Chapter 1 Offshore Project Description).

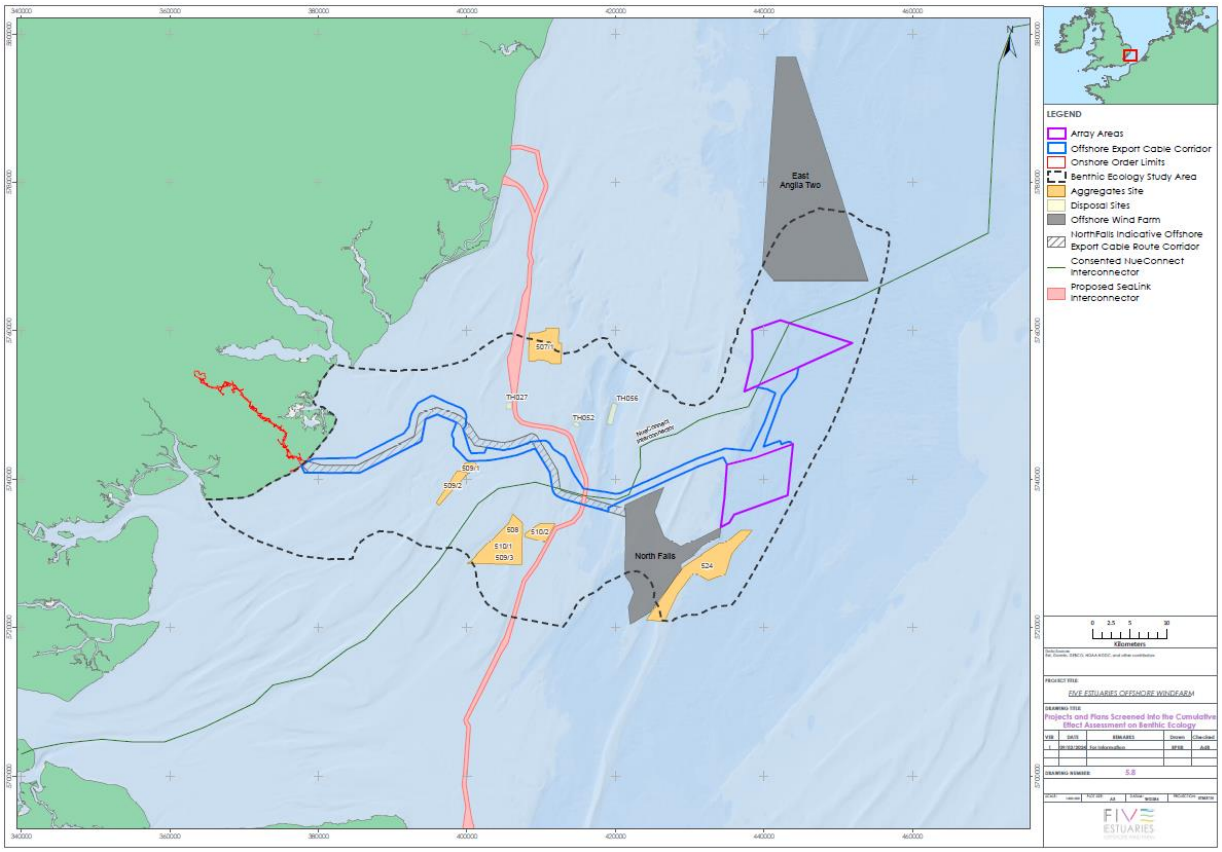


Figure 3. Location of Projects considered within the benthic and intertidal ecology cumulative effect assessment (Figure 5.8 in ES Part 2 Chapter 2 Marine Geology, Oceanography and Physical Processes).

## 7.2 Annex 2: Summary of the Modelled Predictions for the Noise Assessment

Approach to noise modelling:

Two foundation scenarios have been considered:

- A worst-case monopile scenario, installing a 15 m diameter pile with a maximum blow energy of 7,000 kJ; and
- A worst-case pin pile (jacket) scenario, installing 3.5 m diameter piles with a maximum energy of 3,000 kJ.

The source levels used in the modelling are provided in Table 1.13.

**Table 1.13: Summary of the unweighted source levels used for modelling.**

| Source levels | Location | Monopile worst-case (15 m diameter, 7,000 kJ) | Pin pile worst case (3.5 m diameter, 4,000 kJ) |
|---|---|---|---|
| $SPL_{peak}$ | South – SW corner | 243.2 dB re 1 µPa @ 1 m | 241.6 dB re 1 µPa @ 1 m |
| | North – NE corner | 243.2 dB re 1 µPa @ 1 m | 241.6 dB re 1 µPa @ 1 m |
| | North – N edge | 243.2 dB re 1 µPa @ 1 m | 241.6 dB re 1 µPa @ 1 m |
| $SEL_{ss}$ | South – SW corner | 224.4 dB re 1 $\mu Pa^2s$ @ 1 m | 222.4 dB re 1 $\mu Pa^2s$ @ 1 m |
| | North – NE corner | 224.4 dB re 1 $\mu Pa^2s$ @ 1 m | 222.4 dB re 1 $\mu Pa^2s$ @ 1 m |
| | North – N edge | 224.4 dB re 1 $\mu Pa^2s$ @ 1 m | 222.5 dB re 1 $\mu Pa^2s$ @ 1 m |

**Table 1.10: Summary of the underwater noise modelling locations used for this study.**

| Modelling locations | Southern Array – SW corner | Northern Array – NE corner | Northern Array – N edge |
|---|---|---|---|
| Latitude | 51.7488°N | 51.9736°N | 51.9875°N |
| Longitude | 002.0466°E | 002.2997°E | 002.2263°E |
| Water depth | 44.7 m | 48.2 m | 53.9 m |

In a 24-hour period there is the potential that up to four pin piles can be driven at a single WTG foundation location per piling vessel.
Further scenarios exploring piling at multiple locations have been considered, at the Southern Array – SW corner location and the Northern Array – N edge location to give a wide geographical spread as well as a worst case for water depths. Two different protocols have been investigated. Firstly, a sequential condition was run where pile installations are staggered as an experiment to avoid concurrent piling at multiple locations. Secondly, the concurrent condition had the piles at the north and south of the site installed simultaneously.

The following scenarios have been considered:

- Worst case single monopile scenario, 15 m diameter pile with 7,000 kJ hammer energy.
- Worst case pin pile scenario, 3.5 m diameter piles, 3,000 kJ hammer.
- Monopiles installed sequentially – alternate staggered installation at the Northern Array – N edge and Southern Array – SW corner, with two monopiles installed at each location (four total piles);
- Monopiles installed concurrently – simultaneous installation at the north and south, with two piles installed sequentially at each location (four total piles);
- Pin piles installed sequentially – installation of four piles (sequentially) at the Northern Array – N edge, followed on completion by the installation of four piles (sequentially) at the Southern Array – SW corner (eight total piles); and
- Pin piles installed concurrently – simultaneous installation at the north and south, with four piles installed sequentially at each location (eight total piles).

In addition, there is the potential for construction to take place with noise attenuation measures in place during the piling operations. The exact mitigation to be used has not yet been determined, but a flat, broadband, 10 dB reduction in source level has been used to reflect a noise attenuation. A 10 dB reduction gives a conservative estimate for most of the types of mitigation that could be considered, as derived from data presented in Verfuss et al. (2019). In this paper, data for the Big Bubble Curtain (BBC), a commonly deployed noise mitigation method, show that it provides a minimum of 10 dB attenuation in the frequency bands where marine mammals are most sensitive (i.e., 250 Hz and above). In a comprehensive review of pile driving with and without noise mitigation, Bellman et al. (2020) found that where it was deployed in depths of 30 m to 40 m, an attenuation in excess of 10 dB across the frequency spectrum could be achieved by a single BBC. This scenario has been considered for the worst-case multiple location scenario.

<u>Summary of results (selected):</u>

*Worst case monopile modelling scenario:*

The largest marine mammal impact ranges for monopiles are predicted at the Northern Array NE corner location; however, all three modelling locations show similar impact ranges. Maximum PTS ranges are predicted for LF cetaceans, with ranges of up to 15 km at the Northern Array NE corner. The largest VHF cetacean PTS impact ranges are predicted at the Northern Array N edge location with maximum PTS ranges of up to 8.6 km.

For fish, the largest recoverable injury ranges (203 dB SELcum threshold) for monopiles are predicted to be 12 km assuming a stationary receptor; if a fleeing receptor is assumed, the impact ranges are reduced to 1.6 km at the Northern Array N edge location. Maximum TTS ranges (186 dB SELcum threshold) are predicted up to 37 km for a stationary animal, reducing to 23 km for a fleeing receptor.

| **Worst case monopile modelling scenario – Marine Mammals (PTS)** | | | |
|---|---|---|---|
| **SPLpeak - Maximum range** | | | |
| | **SW corner of the Southern Array** | **NE corner of the Northern Array** | **N edge of the Northern Array** |
| LF cets | **50 m** | **50 m** | **50 m** |
| HF cets | < 50 m | < 50 m | < 50 m |
| VHF cets | **730 m** | 730 m | **740 m** |
| Phocids | **60 m** | **60 m** | **60 m** |
| **SELcum - Maximum range** | | | |
| LF cets | **15 km** | **15 km** | **15 km** |
| HF cets | < 100 m | < 100 m | < 100 m |
| VHF cets | 8.4 km | 8.5 km | **8.6 km** |
| Phocids | 300 m | 280 m | 330 m |

| **Worst case monopile modelling scenario – Marine Mammals (TTS)** | | | |
|---|---|---|---|
| **SPLpeak - Maximum range** | | | |
| | **SW corner of the Southern Array** | **NE corner of the Northern Array** | **N edge of the Northern Array** |
| LF cets | 130 m | 130 m | 160 m |
| HF cets | < 50 m | < 50 m | < 50 m |
| VHF cets | 1.8 km | 1.8 km | 1.8 km |
| Phocids | 150 m | 150 m | **160 m** |
| **SELcum - Maximum range** | | | |
| LF cets | 40 km | **40 km** | **40 km** |
| HF cets | < 100 m | <100 m | < 100 m |
| VHF cets | 31 km | 31 km | 31 km |
| Phocids | 15 km | **16 km** | **15 km** |

| Worst case monopile modelling scenario – Fish | | | |
|---|---|---|---|
| **SPLpeak - Maximum range** | | | |
| | **SW corner of the Southern Array** | **NE corner of the Northern Array** | **N edge of the Northern Array** |
| 213 dB | 130 m | 130 m | 130 m |
| 207 dB | 340 m | 340 m | 340 m |
| **SELcum - Maximum range** | | | |
| 219 dB | 1.6 km | 1.6 km | 1.6 km |
| 216 dB | 2.5 km | 2.4 km | 2.5 km |
| 210 dB | 5.4 km | 5.4 km | 5.5 km |
| 207 dB | 7.7 km | 7.6 km | 7.8 km |
| 203 dB | 12 km | 12 km | 12 km |
| 186 dB (TTS) | 36 km | 37 km | 37 km |

*Worst case pin pile modelling scenario:*

Similar to the monopile results, the largest marine mammal impact ranges for pin pile foundations are predicted at the Northern Array N edge location, but similar ranges are found at all three modelling locations. Maximum PTS ranges are predicted for LF cetaceans with ranges of up to 12 km and VHF cetaceans with PTS ranges of up to 6.6 km. All these marine mammal impact ranges are smaller than those predicted for monopiles.

For fish, the largest recoverable injury ranges (203 dB SELcum threshold) for pin piles are predicted to be 13 km assuming a stationary receptor; if a fleeing receptor is assumed, the impact ranges are reduced to 250 m. Maximum TTS ranges (186 dB SELcum threshold) are predicted up to **39 km** for a stationary animal, reducing to 19 km for a fleeing receptor. Due to the consideration of four sequential pin piles the stationary results predicted are larger than those for monopiles; for fleeing animals the monopile impact ranges are larger than for pin piles.