



White Cross Offshore Wind Farm ES Addendum

**Appendix V: Updated Draft Marine Mammal
Mitigation Protocol**



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Checked by:	AS	<i>Electronic Signature</i>
Owned by:	CB	<i>Electronic Signature</i>
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Table of Contents

1. Draft Marine Mammal Mitigation Protocol.....	1
1.1 Purpose of this document	1
1.2 Draft protocols.....	5
1.3 Vessel Management Measures.....	16
1.4 References	17

Table of Tables

Table 1.1 Key relevant parameters	4
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Glossary of Acronyms

Acronym	Definition
ADDs	Acoustic Deterrent Devices
CEMP	Construction Environmental Management Plan
ECC	Export Cable Corridor
ELO	Environmental Liaison Officer
EOD	Explosive Ordnance Disposal
EPP	Evidence Plan Process
ES	Environmental Statement
ETG	Expert Topic Group
JNCC	Joint Nature Conservancy Council
kJ	Kilojoule
LAT	Lowest Astronomical Tide
m	Metre
MA	Monitoring Area
MMMP	Marine Mammal Mitigation Protocol
MMO	Marine Management Organisation
MMOb	Marine Mammal Observer
OSP	Offshore Substation Platform
OWL	Offshore Wind Ltd
PEMMP	Project Management and Monitoring Plan
PAM	Passive Acoustic Monitoring
PTS	Permanent Threshold Shift
SAC	Special Area of Conservation
SEL_{cum}	Cumulative effect from Sound Exposure Level
SEL_{ss}	Sound Exposure Level for a single strike
SIP	Site Integrity Plan
SNCB	Statutory Nature Conservation Bodies
SPL_{peak}	Peak Sound Pressure Level
TWT	The Wildlife Trusts
UK	United Kingdom
WTG	Wind Turbine Generator

Glossary of Terminology

Defined Term	Description
Applicant	Offshore Wind Limited
Development Area	The area comprising the Onshore Development Area and the Offshore Development Area
Engineer, Procure, Construct and Install	A common form of contracting for offshore construction. The contractor takes responsibility for a wide scope and delivers via own and subcontract resources.
Export Cable Corridor	The area in which the export cables will be laid, either from the Offshore Substation or the inter-array cable junction box (if no offshore substation), to the National Grid (NGC) Onshore Substation comprising both the Offshore Export Cable Corridor and Onshore Export Cable Corridor.
Floating substructure	The floating substructure acts as a stable and buoyant foundation for the WTG. The WTG is connected to the substructure via the transition piece and the substructure is kept in position by the mooring system.
Generation Assets	The infrastructure of the Offshore Project related to the generation of electricity within the Windfarm Site, including wind turbine generators, substructures, mooring lines, seabed anchors and inter-array cables
In-combination effects	In-combination effects are those effects that may arise from the development proposed in combination with other plans and projects proposed/consented but not yet built and operational.
Mean high water springs	The average tidal height throughout the year of two successive high waters during those periods of 24 hours when the range of the tide is at its greatest.
Mean low water springs	The average tidal height throughout a year of two successive low waters during those periods of 24 hours when the range of the tide is at its greatest.
Mean sea level	The average tidal height over a long period of time.
Mitigation	<p>Mitigation measures have been proposed where the assessment identifies that an aspect of the development is likely to give rise to significant environmental impacts and discussed with the relevant authorities and stakeholders in order to avoid, prevent or reduce impacts to acceptable levels.</p> <p>For the purposes of the EIA, two types of mitigation are defined:</p> <ul style="list-style-type: none"> • Embedded mitigation: consisting of mitigation measures that are identified and adopted as part of the evolution of the project design, and form part of the project design that is assessed in the EIA • Additional mitigation: consisting of mitigation measures that are identified during the EIA process specifically to reduce or eliminate any predicted significant impacts. Additional mitigation is therefore subsequently adopted by OWL as the EIA process progresses.

Defined Term	Description
Offshore Development Area	The Windfarm Site (including wind turbine generators, substructures, mooring lines, seabed anchors, inter-array cables and Offshore Substation Platform (as applicable)) and Offshore Export Cable Corridor to MHWS at the Landfall (up to MHWS). This encompasses the part of the Offshore Project that is the focus of this application and Environmental Statement and the parts of the Offshore Project consented under Section 36 of the Electricity Act and the Marine and Coastal Access Act 2009
Offshore Infrastructure	All of the offshore infrastructure including wind turbine generators, substructures, mooring lines, seabed anchors, Offshore Substation Platform and all cable types (export and inter-array). This encompasses the infrastructure that is the focus of this application and Environmental Statement and the parts of the Offshore Project consented under Section 36 of the Electricity Act and the Marine and Coastal Access Act 2009
Offshore Substation Platform	A fixed structure located within the Windfarm Site, containing electrical equipment to aggregate the power from the wind turbines and convert it into a more suitable form for export to shore
Project	The Offshore Project for the offshore Section 36 and Marine Licence application includes all components offshore of MHWS. This includes the infrastructure within the Windfarm Site (e.g., wind turbine generators, substructures, mooring lines, seabed anchors, inter-array cables and Offshore Substation Platform (as applicable)) and all infrastructure associated with the export cable route and landfall (up to MHWS) including the cables and associated cable protection (if required).
Safety zones	A marine zone outlined for the purposes of safety around a possibly hazardous installation or works / construction area
Service operation vessel	A vessel that provides accommodation, workshops and equipment for the transfer of personnel to turbine during OMS. Vessels in service today are typically up to 85m long with accommodation for about 60 people.
White Cross Offshore Windfarm	Up to 100MW capacity offshore windfarm including associated onshore and offshore infrastructure
Wind Turbine Generators (WTG)	The wind turbine generators convert wind energy into electrical power. Key components include the rotor blades, nacelle (housing for electrical generator and other electrical and control equipment) and tower. The final selection of project wind turbine model will be made post-consent application
Windfarm Site	The area within which the wind turbines, Offshore Substation Platform and inter-array cables will be present
Works completion date	Date at which construction works are deemed to be complete and the windfarm is handed to the operations team. In reality, this may take place over a period of time.

1. Draft Marine Mammal Mitigation Protocol

1.1 Purpose of this document

1. The purpose of this draft marine mammal mitigation protocol (MMMP) is to demonstrate the principles of the final MMMP which will be submitted for approval by the Marine Management Organisation (MMO) for the White Cross Offshore Windfarm (hereafter referred to as 'the Offshore Project'). The final MMMP will be submitted prior to any construction works commencing.
2. The document replaces **Appendix 12.C: Draft Marine Mammals Mitigation Protocol** of **Chapter 12: Marine Mammal and Marine Turtle Ecology** of the **Offshore Environmental Statement (ES)** and has been updated to remove references to Unexploded Ordnance (UXO) clearances, following the MMO consultation responses (reference number 2.14) received on the 17th of November 2023.
3. This draft MMMP outlines the proposed mitigation to reduce the risk of injury, including permanent auditory injury / a permanent shift in hearing sensitivity, including any Permanent Threshold Shift (PTS), to marine mammals and marine turtles during all piling operations at the Offshore Project. It also sets out a commitment to provide appropriate mitigation measures to reduce the risk of entanglement of marine mammals and marine turtles in the subsea infrastructure of the Offshore Project.
4. The aim of the MMMP is to reduce the risk of PTS during piling for either Wind Turbine Generators (WTG) or Offshore Substation Platform (OSP) mooring and anchors from:
 - First strike of the starting hammer energy of the soft start
 - Single strike of the maximum hammer energy
 - Cumulative exposure during installation, based on worst-case for one pin-pile installed or one OSP jacket pile installed.
5. Underwater noise modelling will be used to derive the maximum potential PTS ranges once the design of the Offshore Project has been finalised. Using the current precautionary worst-case scenarios for the Offshore Project, piling during construction has the potential to produce underwater noise capable of causing auditory injury to marine mammals and marine turtles. It is important to note that the guidance from Joint Nature Conservancy Council (JNCC) (2010) includes turtles and states the following:

“JNCC notes that other protected fauna, for example turtles, occur in waters where these guidelines may be used, and would suggest that, whilst the appropriate mitigation may require further investigation, the protocols

recommended for marine mammals would also be appropriate for marine turtles."

6. This draft MMMP details how White Cross Offshore Wind Ltd (WCOWL) will further reduce the risk of underwater noise of piling from causing auditory injury to marine mammals and marine turtles that could be present in and around the Offshore Project. A final MMMP will be produced closer to construction commencing when the Offshore Project design has been further refined post consent. This final MMMP will take account of the most suitable mitigation measures for both reduction of underwater noise and entanglement risk, and up to date scientific understanding at the time of construction. These measures will be consulted upon with the MMO, Statutory Nature Conservation Bodies (SNCBs) and The Wildlife Trusts (TWT).
7. It should be noted that, pre-construction, a separate Marine Licence for UXO clearance will be sought, with the necessary information (including the final MMMP for UXO clearance), being provided through the marine licensing process.
8. The draft MMMP will be shared with the relevant SNCBs. The comments received will then be actioned upon before the final MMMP is submitted. The final MMMP will be submitted to the MMO at least six months prior to construction, for approval in consultation with the relevant SNCBs.
9. The final MMMP will be developed in the pre-construction period and will be based upon best available information, methodologies, and industry good practice, latest scientific understanding, current guidance and detailed project design. Current guidance includes JNCC guidelines for minimising the risk of injury to marine mammals and marine turtles from piling noise (JNCC, 2010).
10. Following Natural England's request, the **Outline Construction Environmental Management Plan (CEMP)** (WHX001-FLO-CON-ENV-PLN-0010) provides further information on the proposed good practice and code of conduct that will be undertaken by vessel operators to reduce any risk of collisions with marine mammals and marine turtles.
11. Vessel management measures are also provided within **Section 1.3** of this draft MMMP, in line with the requirements set out in **Chapter 12: Marine Mammal and Marine Turtle Ecology** of the **Offshore ES**.
12. In addition to the draft MMMP, **Appendix 12.D of Chapter 12** of the **Offshore ES: In Principle Site Integrity Plan (SIP) for the Bristol Channel Approaches Special Area of Conservation** (SAC) has been submitted with the original ES. The In Principle SIP sets out the approach for delivery of the required mitigation measures for the Offshore Project to ensure the avoidance

of Adverse Effect on Integrity (AEoI) of the Bristol Channel Approaches SAC in combination with other plans and projects.

13. The **Outline Project Environmental Management and Monitoring Plan (PEMMP)** (WHX001-FLO-CON-ENV-PLN-0003) will also be finalised prior to construction once the Offshore Project design has been further refined. The PEMMP sets out the approach for delivery of the required monitoring and mitigation measures for marine mammals for the Offshore Project. This includes ensuring the risk of entanglement is monitored throughout the construction, operation and maintenance, and decommissioning phases of the Offshore Project; and the levels of operational underwater noise are recorded. See WHX001-FLO-CON-ENV-PLN-0006 (**Outline Underwater Noise Monitoring Plan**) and WHX001-FLO-CON-ENV-PLN-0002 (**Outline Entanglement Monitoring and Remediation Plan**) for further information.

1.1.1 Description of the Offshore Project

14. The Applicant is seeking a Section 36 consent and appropriate Marine Licences for the creation of a floating offshore windfarm located in the Celtic Sea for up to 100MW, see **Chapter 5: Project Description** of the **Offshore ES** for further information.
15. The Windfarm Site will cover an area of 49.35km² and the closest point to the coast is 52.5km. Depths range from 60m to 80m below Lowest Astronomical Tide (LAT) in the Windfarm Site.
16. Water depths within the Offshore Export Cable Corridor (ECC) range from 80m below LAT in the offshore part closest to the Windfarm Site and then decreasing progressively to 0m at the coast.
17. Once built, the Windfarm Site would comprise the following offshore components:
 - WTGs
 - Semi-submersible floating platforms
 - Subsea catenary mooring lines
 - Anchoring solutions (drag embedment anchors, suction anchor or pin piles)
 - Inter-array cables and associated protection
 - OSP
 - Offshore export cable
 - Other associated offshore infrastructure, such as navigational markers.
18. The detailed design of the Offshore Project (e.g., number of WTGs, layout configuration, mooring type and requirement for scour protection) will be determined post-consent. Therefore, the key parameters presented in **Table 1.1**

are indicative based on current information and assumptions. Further detailed parameter information related to entanglement risk and operational underwater noise is available in WHX001-FLO-CON-ENV-PLN-0002 (Outline Entanglement Monitoring and Remediation Plan) and WHX001-FLO-CON-ENV-PLN-0006 (Outline Underwater Noise Monitoring Plan), respectively. These parameters have formed the worst-case scenario for the assessments of underwater noise and entanglement risk both during construction and operation, as presented in **Chapter 12: Marine Mammal and Marine Turtle Ecology**.

19. The earliest any offshore construction works would start is assumed to be 2028. Offshore construction works would require up to 16 months (excluding pre-construction activities such as surveys¹).
20. There will be up to six mooring pin-piles per WTG, although it has been assumed that a maximum of up to 8 piles may be installed in a 24-hour period; and up to four OSP jacket piles installed in the same 24-hour period.
21. It should be noted that the construction programme is dependent on numerous factors including consent timeframes and funding mechanisms.

Table 1.1 Key relevant parameters

Parameter	Details
Approximate offshore construction duration	16 months
Windfarm Site area (excluding offshore temporary works area) (km²)	49.35
Offshore ECC area (excluding offshore temporary works area) (km²)	94.94
Windfarm Site water depth range (m)	60 - 80
Distance from Windfarm Site to coast (closest point) (km)	52.5
Number of WTG	6 - 8
Number of OSP/s	0 - 1
Maximum number of moorings per WTG	6
Maximum number of foundations per OSP	6 legs
WTG mooring type options	Catenary mooring system
WTG anchor type options	Drag embedment anchors Suction piles Driven piles Drilled piles
WTG mooring line type options	Anchor chain Mooring cables Polyester mooring lines
OSP foundation type options	Jacket piles

¹Please note that pre-construction surveys may require separate activity-specific MMMPs which are not covered in this MMMP for piling and entanglement risk.

Parameter	Details
	Suction Anchor
Maximum number of piles for each WTG	3 - 6
Maximum number of piles for OSP	4
Hammer energies (kilojoules) (kJ)	Jacket pile – 2,500 Pin pile - 800
Maximum pile diameter (m)	Jacket pile – 4m Pin pile – 2m

1.2 Draft protocols

22. A Marine Wildlife Licence application will be made for all activities that have the potential for injury or disturbance on European Protected Species (EPS) (cetaceans). The activities that may require an EPS licence are:
- Piling and offshore construction activities
 - Construction and operation of floating WTGs that pose an entanglement risk.
23. Prior to any of these activities taking place, an EPS risk assessment will be undertaken, following the staged approach as outlined in JNCC *et al.* (2010). Mitigation will be put in place following current guidelines and advice, see **Section 1.2.1.1** below for further information.

1.2.1 Piling

24. Depending on the installation method of the mooring and anchors for the WTGs and the OSP (if required), impact piling could be required. The purpose of this draft MMMP is to demonstrate the principles of the final MMMP that could be required.
25. As set out in **Section 1.1**, the final MMMP for piling will be submitted for approval under a future Marine Licence application. This future application will be in addition to the consent Application under Section 36 of the Electricity Act 1989 and relevant Marine Licences under the Marine and Coastal Access Act 2009 for the Offshore Project.
26. The final MMMP will be developed in the pre-construction period, when there is more detailed information on the Offshore Project design and will incorporate the most appropriate mitigation measures based upon the latest and best available information and proven methodologies at that time. The final MMMP will be developed in consultation with the MMO, relevant SNCBs and TWT.
27. The final MMMP will include details of the mitigation measures, such as soft-start and ramp-up, as well as details of the Monitoring Area (MA) and any additional mitigation measures (potential use of acoustic deterrent device (ADD), marine mammal observers (MMOb), and/or passive acoustic monitoring (PAM)) required to minimise potential impacts of any physical injury or PTS. Furthermore,

consideration will be given to the mitigation requirements following any breaks in piling as well as prior to piling commencing.

28. The measures outlined in the final MMMP to mitigate the potential impacts from the Offshore Project will be based on current best practice, guidance and information, including updated underwater noise modelling, if required, and will be updated no later than six months prior to piling operations.

1.2.1.1 Mitigation

29. The final MMMP would involve the establishment of a MA around the pile location before each pile driving activity, based on the maximum predicted impact area from single strike of the maximum hammer energy for PTS. The final MMMP will provide details of the maximum predicted impact PTS ranges and areas for piling based on the respective cumulative exposer for pin-piles or jacket piles respectively.
30. The Applicant will ensure that the mitigation measures are adequate to minimise the risk of marine mammals and marine turtles being present within the MA prior to piling activity commencing, to reduce the risk of any physical or auditory injury (PTS).
31. The methods for establishing the MA and reducing the potential impacts of piling operations would be agreed with the MMO in consultation with the relevant SNCBs and TWT and would be secured as commitments within the final MMMP.
32. The piling mitigation measures could include:
 - Establishment of a MA with a minimum 500m radius (see **Section 1.2.1.1.1**)
 - The observation of the MA will be conducted by trained, dedicated and (at least one) experienced MMObs during daylight hours and when conditions allow suitable visibility (visibility of entire MA; sea state 4 or less²)
 - Deployment of PAM devices in the MA during poor visibility or at night.
 - The activation of ADD (see **Section 1.2.1.1.4**)
 - Soft-start and ramp-up (see **Section 1.2.1.1.5**)
 - Procedure for breaks in piling (see **Section 1.2.1.1.6**)
 - Piling at night / poor visibility (see **Section 1.2.1.1.7**)
33. In addition to the above listed mitigation options, the use of noise reduction methods will be considered and determined for the final MMMP in the event of impact piling being undertaken. Noise reduction methods could include noise

² Sea states defined by the Beaufort wind scale (<https://www.weather.gov/pqr/beaufort>)

abatement (such as bubble curtains) or alternative installation techniques or hammers (such as quiet hammers). While these measures will be considered, it should be noted that the water depth present within the Offshore Project results in some of these options being unviable or inefficient in terms of noise reduction.

1.2.1.1.1 Monitoring area

34. The MA is the area in which visual observations will be undertaken by trained, dedicated, and experienced MMObs. The required minimum radius of 500m around each WTG and OSP (if required) location is in line with the current JNCC (2010) guidelines, to reduce the risk of PTS.
35. The radius of the MA will be greater than the maximum predicted impact range for PTS for marine mammal or marine turtle species that could be present in or around the Windfarm Site.
36. The MA will be monitored for a minimum of 30 minutes prior to ADD activation.

1.2.1.1.2 Marine mammal observers

37. Marine mammal and marine turtle observations will be undertaken by JNCC accredited MMObs. This may be subcontractors or assigned installation vessel crew members that have undertaken the JNCC MMOB course and are dedicated, being available to work alongside at least one experienced MMOB, when required, taking into account their other duties.
38. 'Dedicated' is defined as a trained MMOB with the sole purpose of undertaking visual observations to detect marine mammals and marine turtles.
39. 'Experienced' is defined as minimum of 20 weeks experience of implementing JNCC guidelines in UK water within the previous five years. Although the training is marine mammal focused, it will be sufficient for marine turtle observations too.
40. At least two MMObs will conduct surveys to cover the entire MA around each pile location. Marine mammal and marine turtle observations will be carried out from vantage points to allow unobstructed observations of the entire MA.
41. The MMObs will be equipped with binoculars and a tool to estimate distance i.e., range finding stick or binoculars with reticules and reporting forms. The MMObs will scan the MA with the unaided eye and use binoculars when needed to look in detail at an area where a possible sighting has been made. Binoculars should not be used continually as they restrict peripheral vision and views close to the vessel.
42. Marine mammal and marine turtle observations will be carried out to monitor the MA:
 - During the pre-piling monitoring period
 - During ADD activation

- During the soft-start and ramp-up procedure
 - During any breaks in piling prior to piling recommencing.
43. Where possible, MMObs will continue monitoring during piling to allow for any breaks in piling (for further information see **Section 1.2.1.1.6**).
 44. The pre-piling monitoring will commence prior to all piling events, or after any break in piling. The visual observations by the MMObs will commence at least 30 minutes prior to the ADD activation. This will continue until 30 minutes have passed and no marine mammals or marine turtles have been detected within the MA, the MMObs will then advise that the ADD activation can commence.
 45. If a marine mammal or marine turtle is detected within the MA during the pre-piling monitoring, then the activation of the ADD will be delayed. If a marine mammal or marine turtle has been sighted within the MA, it will be monitored and tracked until it is clear of the MA and the Piling Supervisor notified. The marine mammal(s) or marine turtle(s) must be clear of the MA for at least 30 minutes before the ADD is activated.
 46. During ADD activation, if animals are sighted within the MA, they will be tracked and monitored. If, at the end of the ADD activation period, the individual(s) remains within the MA, then the soft-start will be delayed, and the full mitigation procedure, including the pre-monitoring, will be undertaken again.
 47. If the marine mammal(s) or marine turtle(s) remains clear of the MA for at least 30 minutes and the pre-piling monitoring has been completed, and the required ADD activation time has been completed, then the soft-start can commence. A precautionary approach will always be used. Therefore, if the MMObs cannot be sure whether a marine mammal or marine turtle is within the MA or not, then the soft-start will be delayed accordingly until the MMObs are sure that there are no marine mammals and marine turtles present within the MA based on their expert judgement.
 48. The MMObs will record all periods of marine mammal and marine turtle observations, including start and finish time of observations, when soft-start and piling commenced and conditions during observations (e.g., sea state, visibility, weather, etc.). Any sightings of marine mammals or marine turtles around the piling vessel will also be recorded. The MMObs will complete the relevant marine mammal recording form(s) and reporting (for further information see **Section 1.2.1.2**).
 49. There will be clear communication channels between the MMObs, the ADD operator and the Piling Supervisor (see **Section 1.2.1.3**). The communication procedures will be established and agreed prior to any piling to ensure clear communication of any marine mammal or marine turtle observations within the

MA, the deployment of ADD, and when the MA is clear for the piling soft-start to commence.

1.2.1.1.3 Passive acoustic monitoring

50. The use of PAM will be undertaken by trained, dedicated and experienced PAM-operators (PAM-Ops) during periods of poor visibility and darkness prior to piling. PAM will follow the *JNCC guidance for the use of Passive Acoustic Monitoring in UK waters for minimising the risk of injury to marine mammals from offshore activities* (JNCC, 2023).
51. PAM-Ops will be trained to JNCC standards, with an appropriate level of field experience. The PAM equipment will be appropriate to detect vocalising cetaceans in the MA. PAM-Ops will be responsible for deployment, operation and maintenance of the equipment, including spare equipment, in relation to all piling activities.
52. The PAM-Ops will ensure that the equipment and spares are functioning correctly prior to the start of the mitigation. Hydrophones and software should be configured to detect the species relevant to the area (including harbour porpoise and dolphin species). If the PAM equipment is to be deployed from the deck of the piling vessel, a survey of the piling vessel will be conducted, prior to when deployment may be needed, to agree the best locations for deployment and monitoring. PAM-Ops will assist in preparation and update of risk assessment for hydrophone deployment in collaboration with vessel personnel.
53. If required, PAM will be carried out to monitor the MA:
 - During the pre-piling monitoring period
 - During ADD activation
 - During the soft-start and ramp-up procedure
 - During any breaks in piling prior to piling recommencing.
54. Where possible, PAM will continue monitoring during piling to allow for any breaks in piling.
55. The PAM-Ops will record and report all periods of PAM, including start and finish time of monitoring, if and when marine mammals or marine turtles were detected, especially in relation to when ADDs were activated and, when soft-start, ramp-up and piling was underway. The PAM-Ops will provide the necessary data and information to be included in the reporting (see **Section 1.2.1.2**).
56. There will be clear communication channels between the PAM-Ops, MMObs, the ADD operator and the Piling Supervisor (see **Section 1.2.1.3**).

1.2.1.1.4 Acoustic deterrent device (ADD)

57. ADDs are a form of technology that sends out a high-pitched frequency of sound which is uncomfortable for the intended target to hear, and therefore will move away from the preferred location. An ADD will be activated prior to all piling activities to ensure marine mammals and marine turtles are deterred from the area and reduce the risk of any physical or auditory injury.
58. ADDs have proven to be effective mitigation for harbour porpoise, dolphin species, and grey seals (Sparling *et al.*, 2015; McGarry *et al.*, 2017; 2020). ADDs have been widely used as mitigation to deter marine mammals and marine turtles during offshore wind farm piling and UXO clearance at sites in Europe (for example, Brandt *et al.*, 2011, 2012, 2013a; 2013b) and offshore Windfarm Sites in the UK, including but not limited to, Galloper, Dudgeon Offshore Windfarm, East Anglia ONE and Moray East.
59. An ADD will be activated prior to the soft-start as mitigation to reduce the risk of PTS during piling.
60. The type and model of ADD will be determined in the final MMMP, based on the latest information and advice, and will provide sufficient evidence to demonstrate that it is effective at deterring the marine mammal or marine turtle species that could be present in the MA.
61. The ADD will be tested prior to the pre-piling monitoring to ensure it is working correctly. If there are any technical problems with the ADD then, if required, the soft-start would be delayed until these issues are resolved. A back-up ADD will be present on board, in case there are issues with activation of the primary system.
62. The ADD will be deployed and ready to be activated prior to soft-start commencing.
63. The ADD will be positioned within the water column to ensure that sound can be emitted in all directions. The ADD will be deployed from the piling vessel in close proximity to the piling location, where it is safe to be positioned prior to the commencement of the soft-start.
64. For deployment of the ADD, the transducer part of the device will be lowered over the side of the deck to a water depth that is below the draft of the vessel to ensure the sound can be emitted in all directions and not dampened by the presence of the vessel. The depth for the ADD deployment will be predetermined to ensure it is below the draft of the vessel, and well above the seabed (preferably in the middle of the water column) at the piling location.

65. The ADD will be activated following the pre-piling monitoring period, and immediately prior to soft-start commencing to allow marine mammals and marine turtles to move beyond the area of potential PTS risk.
66. The duration of the ADD activation time will be determined based on the maximum range for PTS. The maximum duration of the ADD activation time will also be determined to reduce risk of increased disturbance. This is currently deemed as 62 minutes for OSP jacket piles, or 31 minutes for mooring pin piles (for further information see **Section 12.7.1.1.3.6** in **Chapter 12: Marine Mammal and Marine Turtle Ecology**) and will be reviewed and updated, if required, based on the final Offshore Project design and underwater noise modelling.
67. The MA will be monitored by MMObs and / or PAM-Ops during the ADD activation period. Once the soft-start proceeds, the ADD will be switched off.
68. The procedures for ADD activation for breaks in piling is outlined in **Section 1.2.1.1.6**. ADD will not be operated intermittently during any breaks in piling.
69. The ADD will be deployed from the deck of the piling vessel, with the control unit and power supply on board the piling vessel in suitable positions on deck. Prior to deployment, a survey of the piling vessel will be conducted to agree the best location and method of providing power supply and communications. ADD equipment will have sufficient cable from the power point on the vessel to be deployed in the mid-water column.
70. The ADD operator will maintain a detailed record of all ADD deployments and activation (see **Section 1.2.1.2**). These reports will include a record of all ADD start and stop times, a record of each verification of ADD activation and a record of any issues with ADD deployment and activation.

1.2.1.1.5 Soft-start and Ramp-up

71. Following the activation period of the ADD, the soft-start procedure will commence. The soft-start starting hammer energy will be the lowest possible starting hammer energy.
72. A ramp-up period will follow the soft-start, with the energy used per hammer blow gradually increasing so that if any marine mammals or marine turtles are in the area, despite the pre-piling activation of the ADD, they are encouraged to leave by the initial low levels of underwater noise prior to the noise reaching levels which could cause PTS.
73. The Applicant would ensure that a soft-start and ramp-up procedure for piling is conducted for a minimum of 30 minutes.

74. It is proposed that each piling event would commence with a minimum of 10 minutes at 10% of the maximum hammer energy, followed by a gradual ramp-up for at least 20 minutes up to 80% of the maximum hammer energy for all pile driving activities.
75. This 30-minute soft start and ramp-up procedure is more precautionary than the current JNCC (2010) guidance, which recommends that the soft-start and ramp-up duration should be a period of not less than 20 minutes.
76. During the 30 minutes for the soft-start and ramp-up it is estimated that marine mammals and marine turtles would move at least 2.7km from the piling location. This would be greater than the maximum predicted distance for PTS from a single strike at the maximum hammer energy:
- During the 10-minute soft-start it is estimated that marine mammals would move a minimum of 0.9km from the piling (based upon a precautionary swimming speed of 1.5m/s (Otani *et al.*, 2000))
 - During the 20-minute ramp-up it is estimated that marine mammals would move a minimum of 1.8km from the piling location (based upon a precautionary average swimming speed of 1.5m/s (Otani *et al.*, 2000)).
77. In the event that piling activity is stopped for 10 minutes or more, the Applicant would ensure that an appropriate soft-start and ramp-up procedure is conducted prior to piling re-commencing.
78. The soft-start and ramp-up procedure would be embedded mitigation for all piling operations.

1.2.1.1.6 Breaks in piling

79. For any breaks in piling the following mitigation is proposed, depending on the duration of the break:
- For any breaks in piling of less than 10 minutes, piling may continue as required (i.e. as if there was no break).
 - For any breaks in piling of more than 10 minutes but less than two hours, as long as MMObs and/or PAM Ops have been in continuous watch and no marine mammals are detected within the MA during the break period then piling can recommence with an altered soft-start procedure (e.g. five to six blows of the hammer at starting hammer energy) before continuing as required³, provided there are no marine mammals within the MA.

³ Based on the evidence that marine mammals do not return to the piling area within two hours of piling ceasing (e.g. Nabe-Neilson *et al.*, 2018, Dähne *et al.*, 2013, Brandt *et al.*, 2009; 2011).

- If there are marine mammals within the MA, then the full mitigation procedure (as outlined above) would be undertaken, including 30 minute monitoring of the MA by MMObs and / or PAM, ADD deployment and activation for the required time, followed by the soft-start and ramp-up procedure (for a minimum of 20 minutes).
- For any breaks in piling of more than two hours then the full mitigation procedure (as outlined above) is required, including 30 minute monitoring of the MA by MMObs and / or PAM, ADD deployment and activation for the required time, followed by the soft-start and ramp-up procedure.
 - If monitoring was conducted during piling prior to any breaks and the MA has been confirmed as having no marine mammals or marine turtles, then it may be possible to commence the soft-start immediately. The soft-start and ramp-up procedure would be for a minimum of 20 minutes as outlined in the JNCC guidance.
- Monitoring of the MA during any breaks in piling will be conducted by MMObs during daylight hours and suitable visibility or by PAM-Ops during poor visibility or at night.

1.2.1.1.7 Piling at night / poor visibility

80. If piling is to commence in poor visibility or at night, the monitoring of the MA will be done by PAM as outlined in **Section 1.2.1.1.3**.
81. The deployment and activation of the ADD in poor visibility and at night will follow the same procedure as outlined in **Section 1.2.1.1.4**, as will the soft-start and ramp-up procedure as outlined in **Section 1.2.1.1.5**.

1.2.1.2 Reporting

82. Reports detailing the piling activity and mitigation measures would be prepared for all piling activity. This would include, but not necessarily be limited to:
- A record of piling operations detailing date, location, times (including soft-starts and ramp-up) and any technical or other issues for each pile
 - A record of mitigation measures such as ADD deployment and activation, detailing date, location, times and any operational issues
 - A record of all occasions when piling occurred, including details of the activities used to ensure the MA is established and any occasions when piling activity was delayed or stopped due to presence of marine mammals or marine turtles
 - Any relevant details on the efficiency of the marine mammal and marine turtle exclusion methodology

- A record of marine mammal and marine turtle observations, conditions, description of any marine mammal or marine turtle sightings and any actions taken
 - Details of any problems encountered during the piling process including instances of non-compliance with the agreed piling and / or mitigation protocol.
83. The reporting schedule is to be agreed with the MMO post-consent and may include weekly reports and a final report. Any final report would include information, such as:
- Data collected during piling operations
 - Details of ADD deployment and / or other mitigation measures
 - A detailed description of any technical problems encountered and what, if any, actions were taken.
84. The report would also discuss the protocols followed and put forward any recommendations and lessons learned based on the mitigation measures used that could benefit future construction projects.

1.2.1.3 Communication and responsibility

85. The final MMMP will detail the communication protocol to ensure that all marine mammal and marine turtle mitigation measures, including any delays in commencing piling due to marine mammals and marine turtles being present in the area, are successfully undertaken for all piling activity.
86. The final MMMP will also detail all key personnel and their responsibilities to ensure that all marine mammal and marine turtle mitigation measures are successfully undertaken for all piling activity. This will be developed based on the mitigation measures and personnel required (e.g., ADD operators, MMOs, PAM operators, ELO, Piling Supervisor / Offshore Installation Manager) with the titles and responsibilities being refined depending on the contractual agreement.

1.2.2 Entanglement risk

87. Entanglement is the potential risk of marine mammals and marine turtles becoming caught within WTG mooring lines and dynamic cables as a primary cause; as a secondary cause, becoming caught in fishing gear that has first become caught within WTG mooring lines and dynamic cables; and as a tertiary cause the potential risk of marine animals, who are trailing fishing gear, to swim in close proximity to the subsea infrastructure, allowing the trailing gear to become entangled. Entangled animals may drown, asphyxiate, starve, suffer exhaustion, physical trauma or infections from the equipment which can cause bodily damage.

88. The subsea infrastructure for the Offshore Project includes a maximum of 48 WTG mooring lines (up to six per WTG, with a maximum of eight WTGs). The mooring lines will be either catenary, taut, or semi-taut (see **Figure 3-1** of WHX001-FLO-CON-ENV-PLN-0002 **Outline Entanglement Monitoring and Remediation Plan**), and will be comprised of anchor chain, mooring cables or polyester mooring line.
89. It is expected that the full length of each mooring line will be suspended in the water column, with temporary surface buoys used during construction. See **Figure 12.27** of **Chapter 12: Marine Mammal and Marine Turtle Ecology** of the **Offshore ES** (document reference FLO-WHI-REP-0002-12) for an example of each of these mooring systems, and **Section 5.4.6** of **Chapter 5: Project Description** of the **Offshore ES** (document reference FLO-WHI-REP-0002-05) for further detail on each of these types of mooring lines.
90. The worst-case scenario for entanglement is during the operational and maintenance phase of the Offshore Project due to the length of time the structures will be in place, creating a higher probability of receptors becoming caught within the WTG mooring lines and dynamic cables. However, there is the potential for a short period of time within the construction period where the WTGs will be installed before the operational period commences, and therefore a short period of time where there may be a risk of entanglement to marine mammals and marine turtles. Entanglement during the construction period is therefore a temporary risk, while entanglement during the operational phase is a long-term risk.

1.2.2.1 Mitigation

91. Mitigation to reduce entanglement risk during the construction and operation of the Offshore Project is currently being developed. WCOWL are investigating the feasibility of tethering inter-array cables to reduce the water column area that poses an entanglement risk. However, tethering cables together may increase EMF strength. Although the sensitivity of marine biodiversity to EMF exposure is not yet well understood, this could be a disadvantage of tethering.
92. The final MMMP will outline the proposed mitigation to reduce the likelihood of any injury or death (drowning, asphyxiation, starvation, exhaustion or physical trauma), to marine mammals and marine turtles during all construction and operations at the Offshore Project.
93. The Applicant is committed to using the best practicable means at the time to mitigate the potential impacts of Offshore Project.

1.3 Vessel Management Measures

94. Management measures will be implemented to reduce the potential for vessel collision with marine mammals and marine turtles. These measures will also reduce the potential for disturbance to marine mammals due to an increase in vessel presence.
95. The management measures that will be implemented throughout the construction, operation and maintenance, and decommissioning phases are:
- Vessel movements, where possible, will follow set vessel routes and hence areas where marine mammals and marine turtles are accustomed to vessels;
 - All vessel movements will be kept to the minimum number that is required;
 - Additionally, vessel operators will follow best practice guidance to reduce any risk of collisions with marine mammals and marine turtles, such as following the Cornwall Marine and Coastal Code for Vessels⁴;
 - All vessels transiting within 2km of the coast or through an SAC designated for seals will travel at less than 14 knots⁵ to further reduce the potential for collision risk;
 - All vessels transiting to and from the Windfarm Site outside of SACs designated for seals and beyond 2km from a coast should minimise speed where practical to further reduce the potential for collision risk;
 - No vessel will transit within 600m of any known seal haul out site at any time, or within 2km of Lundy.
96. The above listed vessel management measures will be secured within the final MMMP.

⁴<https://www.cornwallwildlifetrust.org.uk/sites/default/files/2019-03/Cornwall%20Marine%20and%20Coastal%20Code%20Guidelines.pdf>

⁵ Based on the information presented in Laist *et al.* (2001).

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