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Morlais Project

Proof of Evidence
Dr Jennifer A. Learmonth –Marine Mammals

Applicant: Menter Môn Morlais Limited

Document Reference: MMC436 Proof of Evidence: Dr Jennifer A. Learmonth - Marine Mammals

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Morlais Document No: MDZ/P2-MMC436	Status: Final	Version No: F1.0	Date: 30/10/20

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Proof of Evidence: Marine Mammals

1. Introduction

1.1 My name is Dr Jennifer A. Learmonth and I am the Principal Marine Mammal Consultant at Royal HaskoningDHV. I am the marine mammal witness for the Morlais Demonstration Zone. I have a BSc Honours Degree in Biology from the University of Stirling, an MSc in Marine and Fisheries Science and PhD both from the University of Aberdeen in cetacean research.

1.2 I have over 20 years of experience in marine mammal research, including more than 15 years consultancy experience, primarily in marine Environmental Impact Assessments (EIA), preparing Environmental Statements (ES), information for European Protected Species (EPS) licence applications, developing Marine Mammal Mitigation Plans (MMMP), determining monitoring requirements and conducting Habitats Regulation Assessments (HRA) for offshore and coastal developments.

1.3 I am the Lead Marine Mammal Technical Specialist for the Morlais project and have been involved with the project since 2017 including conducting impact assessments and marine mammal collision risk modelling based on different types of tidal devices. I prepared Chapter 12 Marine Mammals of the Morlais ES Volume 1 (MDZ/A25.12 / MDZ/A31.14) and supporting Appendices provided in Volume 3 (MDZ/A27.6 / MDZ/A31.15) and the marine mammal Information to Support HRA (MDZ/A27.11 / MDZ/A31.16). I have also been involved in developing the Morlais Outline Environment Mitigation and Monitoring Plan (OEMMP; MDZ/A10). Post submission I have prepared the marine mammal related responses and additional information during determination process (including additional collision risk modelling (MDZ/A28.12 / MDZ/A31.13), underwater noise modelling and assessments (MDZ/A28.10 and MDZ/A28.11), further information for mitigation and monitoring options (MDZ/A28.13)). I have also been involved in the ongoing consultation with Natural Resources Wales (NRW) and development of the Marine Mammal Statement of Common Ground (SoCG; MDZ/L1).

1.4 The topic of evidence is Biodiversity - Marine Mammals.

1.5 This evidence concerns the possible effects on marine mammals (with bottlenose dolphin *Tursiops truncatus*, harbour porpoise *Phocoena phocoena* and grey seal *Halichoerus grypus* being the main species of concern), focusing on the offshore elements of the Morlais Demonstration Zone (MDZ), primarily the potential collision risk for marine mammals with tidal devices; and potential disturbance of marine mammals during operation.

1.6 This proof of evidence should be read in conjunction with the OEMMP Proof of Evidence.

1.7 The evidence addresses the key marine mammal issues regarding collision risk and disturbance from underwater noise, and confirms in support of the project that the methodology employed to estimate theoretical collision risk, using two methods taken from published guidance on the subject, is wholly appropriate, and the best available. The level of precaution that is built into the calculation of theoretical collision risk in both methods is also appropriate, and despite the uncertainty associated with aspects

of the models, the modelling and assessments can be considered to represent a worst-case scenario and a highly precautionary approach has been taken.

1.8 The proposed approach of the Morlais EMMP (MDZ/A10) outlines the adaptive management approach to environmental mitigation and monitoring during the phased deployment of the Morlais Project, including the collision risk and disturbance of marine mammals. This approach will ensure that the first phase (Phase 1) of deployment will be defined by the Potential Biological Removal (PBR) for bottlenose dolphin and the species collision limits provided by Natural Resources Wales (NRW), as outlined in **Section 5**, to ensure no significant impact on marine mammals or adverse effect on any designated sites with marine mammals as a qualifying feature. The EMMP outlines the commitments of Menter Môn to safeguarding of marine mammals through the identification, avoidance and mitigation of potential adverse environmental impacts associated with the construction, operation and decommissioning of the Project, including the agreement that the deployment of tidal devices by the Project will be subject to approval of the Regulators. The EMMP demonstrates how the potential effects of the Project on marine mammals can be mitigated, monitored and managed to allow deployment of tidal devices in compliance with the requirements of the Habitats Directive. The EMMP also incorporates the recent advice from NRW on adaptive management of the risk of collision impacts on protected marine mammal species in Welsh waters from the Morlais Project (MDZ/F15.3).

1.9 This proof of evidence represents my professional opinion, based on my knowledge and experience.

1.10 Key documents in support of the marine mammal proof of evidence are outlined in **Table 1**.

Table 1: Key Marine Mammal Documents

Reference	**Core Documents (Submission Documents)**
MDZ/A25.12	Chapter 12 Marine Mammals Environmental Statement Volume 1 (Main Report) (document: MMC065 MOR-RHDHV-DOC-0020)
MDZ/A26.7	Chapter 12 Marine Mammals Environmental Statement Volume 2 (Figures) (document: MMC092 MOR-RHDHV-DRW-0086)
MDZ/A27.6	Chapter 12 Marine Mammals Environmental Statement Volume 3 (Appendices 12.1; 12.2, 12.3, 12.4) (documents: MMC108 MOR-RHDHV-APP-0021-0024)
MDZ/A27.11	Information to Support Habitats Regulations Assessment (document: MMC033 MOR-RHDHV-DOC-0067)
Reference	**Post-Submission Documents**
MDZ/L1	Statement of Common Ground – NRW - Marine Mammals
MDZ/A10	Revised Outline Environmental Mitigation and Monitoring Plan (EMMP) - Outline Adaptive Management Approach to Environmental Mitigation and Monitoring during the Phased Deployment of the Morlais Project (document: MMC175 MOR-RHDHV-DOC-0072 (03))
MDZ/A28.12	Marine Mammals Additional Collision Risk Modelling (document: MMC322 MOR-RHDHV-DOC-0118, submitted 27th March 2020)

MDZ/A28.10	Underwater Noise Modelling Report (document: MMC320 MOR-RHDHV-DOC-0116, submitted 27th March 2020)
MDZ/A28.11	Marine Mammals Underwater Noise Modelling Note (document: MMC321 MOR-RHDHV-DOC-0117, submitted 27th March 2020)
MDZ/A28.13	Marine Mammals Monitoring and Mitigation Options (document: MMC323 MOR-RHDHV-DOC-0119, submitted 27th March 2020)
MDZ/A31.13	Marine Mammal Additional Collision Risk Modelling (CRM updates; document: MMC364 MOR-RHDHV-DOC-0118(02))
MDZ/A31.14	Chapter 12 Marine Mammals Environmental Statement Volume 1 (Main Report) (CRM updates; document: MMC365 MOR-RHDHV-DOC-0020 (02))
MDZ/A31.15	Chapter 12 Marine Mammals Environmental Statement Volume 3 (Appendix 12.2) (CRM updates; documents: MMC366 MOR-RHDHV-APP-0022 (2))
MDZ/A31.16	Information to Support Habitats Regulations Assessment (CRM updates; document: MMC367 MOR-RHDHV-DOC-0067 (02))
MDZ/A31.17	Marine Mammals Revised Collision Risk Modelling Signposting document (CRM updates; document: MMC368 MOR-RHDHV-DOC-0154)
Reference	**NRW advice and Key Relevant Representations**
MDZ/F13	Advice to Morlais on pre-consent assessment of collision risk and adaptive management. NRW 13/05/2020.
MDZ/F14	Morlais Demonstration Zone: Additional information provided by NRW Advisory following marine mammals meeting on 06/01/20
MDZ/F15.3	NRW Advice on adaptive management of the risk of collision impacts on protected marine mammal species in Welsh waters from the Morlais Project Dated 15/10/2020.
ML001	NRW (ORML1938)
FEI-OBJ015	North Wales Wildlife Trust (NWWT) (OBJ015)
FEI-OBJ014	RSPB (OBJ014)
Reference	**Relevant Guidance and Reports**
MDZ/F19	Scottish Natural Heritage (SNH) (2016) Assessing collision risk between underwater turbines and marine wildlife. SNH Guidance Note (version 1 May 2016)
MDZ/F15.2	ABPmer, (2020). Review of potential collision between tidal stream devices and marine animals, NRW Evidence Report No. 444, (ABPmer Report No. R.3322). A report produced by ABPmer for Cyfoeth Naturiol Cymru (Natural Resources Wales), June 2020.
MDZ/F15	Sparling and Smith (2019). Defining Project Envelopes for Marine Energy Projects: Review and Tidal Energy Test Facility and Marine Mammals Case Study (unpublished).
Reference	**Statements of Case and Replies**
MDZ/N9	Statement of Case Natural Resources Wales

MDZ/N11	Statement of Case North Wales Wildlife Trust (NWWT)
MDZ/N15	Response to North Wales Wildlife Trust Statement of Case (document: MMC355 MOR-RHDHV-DOC-0151)
MDZ/N5	Statement of Case RSPB
MDZ/N8	Statement of Case M Llewellyn

1.11 During work undertaken in preparation for the Inquiry, an error was found in some of the calculations for the collision risk estimates for marine mammals. The error only affected the CRM outputs for some of the devices. As such the CRM results have been updated in the Marine Mammal Additional Collision Risk Modelling (MDZ/A31.13), relevant sections of ES Chapter 12: Marine Mammals (MDZ/A31.14), ES Appendix 12.2: Additional Collision Risk Assessments (MDZ/A31.15) and relevant section in Information to Support HRA (MDZA31.16), as outlined in **Table 1**.

1.12 Although the updated CRM resulted in some numbers increasing for some species and devices, overall, the updates have not made any changes to the overall assessment conclusions in the ES or Information to Support HRA. There were no changes to the overall magnitude of impacts and the impact significance assessments. There were also no changes in the assessment of the potential effects on the integrity of the SACs in relation to the Conservation Objectives for the relevant marine mammal species.

1.13 It has been agreed with NRW (meeting dated 27/10/2020), that as there is no change in the outcomes of the updated assessments there is no change to NRW advice.

2. Structure of Evidence

- Section 3 - Factual Background
- Section 4 - Relevant legislation and guidance to the subject matter
- Section 5 - Other relevant constraints
- Section 6 - Matters for the Inquiry - The Project's Response
- Section 7 - Addressing representations made by interested parties and how the Project has responded to the concerns raised
- Section 8 - Summary and Conclusions

3. Factual Background

3.1 Determination and agreement of the MDZ was undertaken in 2014-2016. At this time the MDZ was not located within any designated sites where marine mammals were a qualifying feature. However, initial advice on a network of sites identified within UK waters for harbour porpoise was submitted to UK and Devolved Governments as a series of draft Special Areas of Conservation (SACs) in June 2015, this included the

North Anglesey Marine/Gogledd Môn Forol area (**Figure 1**). The Welsh and Northern Ireland Governments, along with Defra on behalf of England and relevant offshore waters, gave approval for sites within their areas of jurisdiction to proceed to consultation (January to May 2016). In light of the responses to the consultation, five sites were submitted to the European Commission as candidate SACs in January 2017, this included the North Anglesey Marine/Gogledd Môn Forol area. These five sites were adopted by the European Commission (EC) as Sites of Community Importance (SCIs) on 12 December 2017 and designated as SACs by Ministers on 26th February 2019.

3.2 The MDZ is located within the North Anglesey Marine/Gogledd Môn Forol SAC area (**Figure 1**). The qualifying feature of the site is the Habitats Directive Annex II species the harbour porpoise. North Anglesey Marine / Gogledd Môn Forol SAC has been designated because of its importance to harbour porpoises in the summer months (April to September) (JNCC *et al*., 2019)[1].

3.3 Bottlenose dolphin are an Annex II species and qualifying feature of the Pen Llŷn a'r Sarnau/Lleyn Peninsula and the Sarnau SAC and the Bae Ceredigion/Cardigan Bay SAC (**Figure 1**). Bottlenose dolphin from the Bae Ceredigion/Cardigan Bay SAC and the Pen Llŷn a'r Sarnau/Lleyn Peninsula and the Sarnau SAC are known to move along the coast with sightings off Anglesey. The MDZ is located 34km from the Pen Llyn a'r Sarnau/Lleyn Peninsula and the Sarnau SAC and 100km from the Bae Ceredigion/Cardigan Bay SAC. Therefore, there is no direct effect within the SAC areas. However, there is the potential to affect bottlenose dolphin from the SACs if they are foraging or moving through the MDZ.

3.4 Grey seal are an Annex II species and qualifying feature of the Pen Llŷn a'r Sarnau/Lleyn Peninsula and the Sarnau SAC, Bae Ceredigion/Cardigan Bay SAC, Sir Benfro Forol/Pembrokeshire Marine SAC, the Maidens SAC, Lambay Island SAC and Saltee Islands SAC (**Figure 1**). Although there is no direct effect within the SAC areas, there is the potential to affect grey seal from the SACs if they are foraging or moving through the MDZ.

3.5 Harbour seal *Phoca vitulina* are an Annex II species and qualifying feature of the Lambay Island SAC (**Figure 1**). Although there is no direct effect within the SAC area, there is the potential to affect harbour seal from the SACs if they are foraging or moving through the MDZ.

3.6 All cetacean species are European Protected Species (EPS)[2]. Cetacean species which could be present in the area in and around the MDZ are harbour porpoise, bottlenose dolphin, Risso's dolphin, common dolphin and minke whale. Although the key cetacean species of concern are the Annex II species, harbour porpoise, bottlenose dolphin, any mitigation for these species would also reduce the impacts on other cetacean species.

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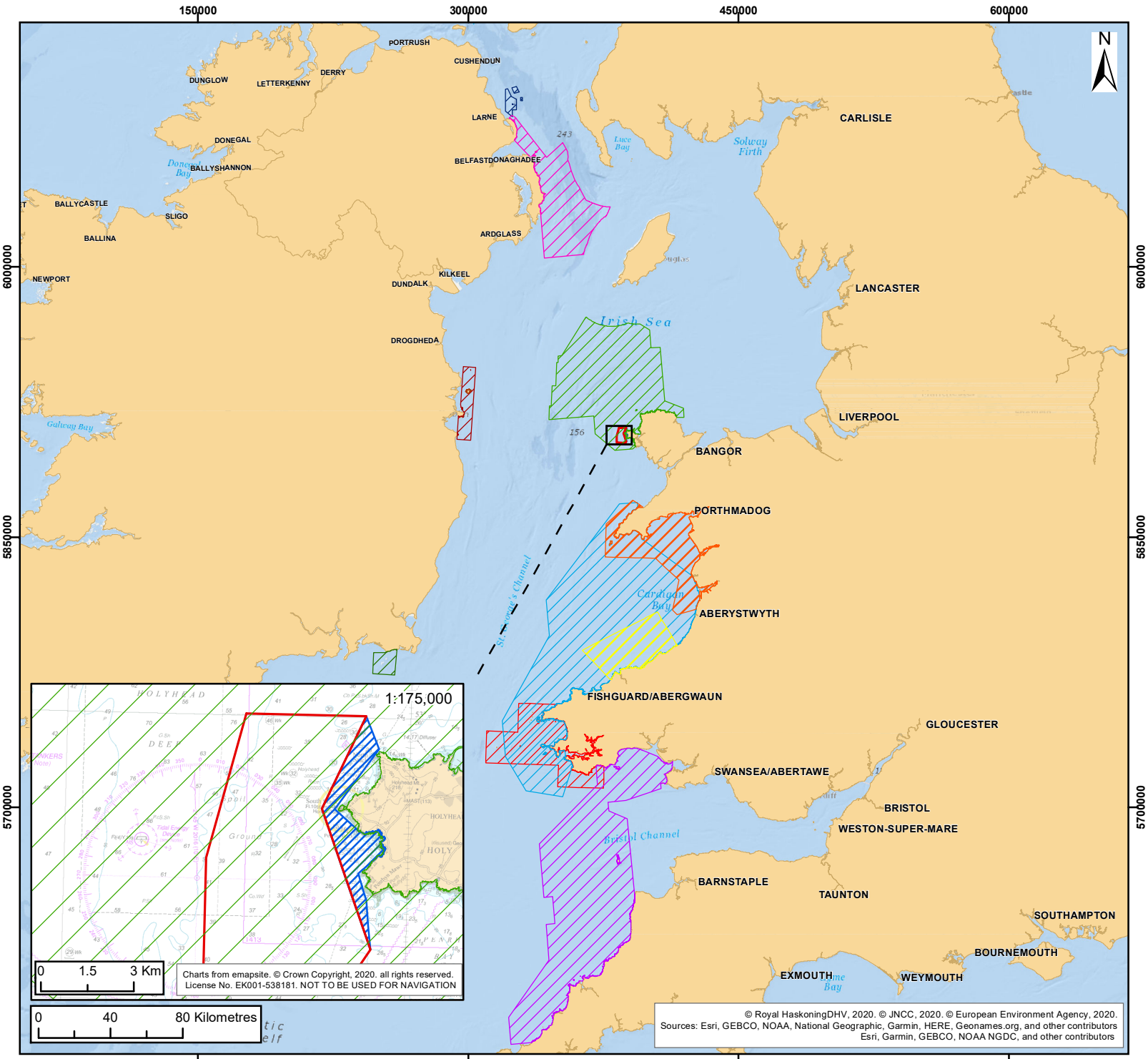
[1] JNCC, NRW and DAERA (2019). Harbour Porpoise (*Phocoena phocoena*) Special Area of Conservation: North Anglesey Marine/Gogledd Môn Forol Conservation Objectives and Advice on Operations. March, 2019

[2] Seal species are not EPS.



Legend:

- Morlais Demonstration Zone (MDZ)
- Export Cable Corridor (ECC)

Special Area of Conservation (SAC)

- Lambay Island (SAC)
- Cardigan Bay/ Bae Ceredigion (SAC)
- Pen Llyn a`r Sarnau/ Lleyn Peninsula and the Sarnau (SAC)
- The Maidens (SAC)
- Pembrokeshire Marine/ Sir Benfro Forol (SAC)
- Saltee Islands (SAC)
- North Channel (SAC)
- North Anglesey Marine / Gogledd Môn Forol (SAC)
- West Wales Marine / Gorllewin Cymru Forol (SAC)
- Bristol Channel Approaches / Dynesfeydd Môr Hafren (SAC)
- Rockabill to Dalkey Island (SAC)

Client: morlais / MENTER MÔN

Project: morlais ANGLESEY MARINE ENERGY

Title:

Marine Mammal SACs

Figure:	1	Drawing No:	PB5034-POE-007-001		
Revision:	Date:	Drawn:	Checked:	Size:	Scale:
01	02/09/2020	AB	SM	A4	1:3,000,000

Co-ordinate system: WGS 1984 UTM Zone 30N

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4. Legislation Context and Relevant Guidance

Principal Legislation

4.1 The **principal legislation** includes:

4.2 **The Habitats Directive (MDZ/B5)**: The European Union Directive on the Conservation of Natural Habitats and of Wild Fauna and Flora (92/43/EEC) (hereafter called the Habitats Directive) gives regulation to the conservation and management of natural habitats, wild fauna (except birds) and flora in Europe. Its primary aim is to maintain or restore natural habitats and wild species at a favourable conservation status.

4.3 Annex II of the Habitats Directive lists species for which member states are expected to establish a "*consistent network of special areas of conservation*". This list includes harbour porpoise, bottlenose dolphin, grey seal and harbour seal.

4.4 The Habitats Directive protects all species of cetaceans under Annex IV as EPS, being classed as endangered, vulnerable or rare, and grey and harbour seals are protected under Annex V which requires their exploitation or removal from the wild to be subject to management measures. Harbour porpoise, bottlenose dolphin, grey seal and harbour seal are additionally listed under Annex II, which requires member states to designate sites, identified as being key areas for their life and reproduction, as SACs.

4.5 **The Habitats Regulations (MDZ/B6)**: The Conservation of Habitats and Species Regulations 2017 and the Conservation of Offshore Marine Habitats and Species Regulations 2017 (collectively referred to as 'the Habitats Regulations 2017') transpose the Habitats Directive into national law. The Habitats Regulations place an obligation on 'competent authorities' to carry out an Appropriate Assessment (AA) of any proposal likely to have a significant effect on a Natura 2000 site, to seek advice from Statutory Nature Conservation Bodies (SNCBs) and to reject an application that would have an adverse effect on the integrity of a Natura 2000 site except under very tightly constrained conditions.

4.6 All cetacean species are listed under Schedule 2 and defined as EPS and all seals are listed under Schedule 4.

4.7 Under the Habitats Regulations 2017 a person is guilty of an offence if that person:

- Deliberately captures, injures or kills a wild animal belonging to a species with EPS status;
- Deliberately disturbs such animal; or
- Damages or destroys any resting or breeding place of such animal.

4.8 However, there is a provision to apply for an EPS licence where any of the above is expected to occur, provided there is no satisfactory alternative, and there will be no long-term detrimental effects.

4.9 **The Wildlife and Countryside Act 1981** (as amended): All cetaceans listed on Schedule 5 are fully protected within UK territorial waters. The Act protects them from killing or injury, sale, destruction of a particular habitat (which they use for protection or shelter) and disturbance.

4.10 Short-beaked common dolphin *Delphinus delphis*, bottlenose dolphin and harbour porpoise are listed on Schedule 6 of the Act. Under the Act these species are prohibited from being used as a decoy to attract other animals. The Act also prohibits the use of vehicles in immediate pursuit to take, kill or drive them, it prevents nets, traps or electrical devices from being set in such a way that would injure them and prevents the use of nets or sounds to trap or snare them.

4.11 **The Countryside and Rights of Way Act 2000 ('CRoW')**: Under the CRoW Act, it is an offence to intentionally or recklessly disturb any wild animal included under Schedule 5 of the Wildlife and Countryside Act.

4.12 **Conservation of Seals Act 1970**: The Conservation of Seals Act in England and Wales provides closed seasons, during which it is an offence to take or kill any seal, except under licence or in certain circumstances.

Relevant Guidance

4.13 The **principal guidance documents** used to inform the assessment of potential impacts on marine mammals, include, but are not limited to:

- Assessing collision risk between underwater turbines and marine wildlife. Scottish Natural Heritage ('SNH') (2016) guidance note. The SNH (2016) guidance note has been included as a core document (MDZ/F19).
- Approaches to Marine Mammal Monitoring at Marine Renewable Energy Developments Final Report (Sea Mammal Research Unit Ltd ('SMRU Ltd') on behalf of The Crown Estate, 2010).
- Guidance to inform marine mammal site characterisation requirements at wave and tidal stream energy sites in Wales (Sparling *et al*., 2015).
- Defining Project Envelopes for Marine Energy Projects: Review and Tidal Energy Test Facility and Marine Mammals Case Study (Sparling and Smith, 2019, unpublished). This report has been included as a core document (MDZ/F15).

4.14 Since submission of the ES (MDZ/A25.12) and Information to Support HRA (MDZ/A27.11), NRW commissioned ABPmer to provide a 'review of potential collision between tidal stream devices and marine animals', which was issued June 2020. This report has been included as a core document (MDZ/F15.2).

4.15 As outlined in the executive summary of the NRW commissioned report (MDZ/F15.2):

The "*review found that field monitoring techniques used to determine the spatial-temporal distribution patterns of marine animals (mainly marine mammals and seabirds), provided valuable information for describing the presence, distribution and likely vulnerability of species to tidal stream devices. These initial visual observation studies were undertaken both before the installation of a device (baseline monitoring) and after its deployment (impact monitoring) enabling distribution shifts (e.g. far field*

avoidance) to be monitored. They also provide density estimates that are a necessary input parameter for collision risk modelling. These methods do not provide direct evidence of collision but enable some of the consequences of installation of the devices to be assessed and monitored."

4.16 This therefore supports the proposed monitoring approach outlined in the OEMMP (MDZ/A10).

4.17 The NRW commissioned report (MDZ/F15.2), also found, as outlined in **paragraph 6.2** and **Table 2** below: "*to date, none of the monitoring studies on marine mammals and seabirds have been able to record a direct collision with a tidal device. This may reflect an absence of collisions or because of methodological limitations (e.g. shut down clause, no analysis of all available data and/or no actual monitoring of direct collision) that may have prevented detection of a collision even if it had occurred."*

4.18 However, the report also notes: *"there is a paucity of monitoring data because there have only been a small number of tidal devices deployed and monitored thus far. Despite this, the data that has been collected to date provides valuable evidence on the behaviour (e.g. far-field avoidance) and likely overlap of different marine species around devices."*

4.19 This supports the assessments and conclusions in the ES (MDZ/A25.12) and Information to Support HRA (MDZ/A27.11), that marine mammals will be able to detect and avoid collision with the tidal devices in the Morlais tidal array. This also highlights the need for more data and information. Therefore, the deployment and monitoring of the tidal devices in the Morlais tidal array provides an important opportunity for collecting this data and information. This information will not only be important for informing the modelling and assessments for the next phases of the Morlais development, but also for the ongoing development of tidal energy elsewhere.

4.20 The NRW commissioned report (MDZ/F15.2), also indicates that "*modelling continues to be the most commonly used approach to assess the risk of collision of marine animals. There are a range of collision risk modelling tools available, each with different input parameter requirements and assumptions which are often conservative. There appears to have been limited validation of these models with the results of monitoring during operation. The level of confidence in the outputs of these modelling tools is therefore low, but to date, they are still the best way to assess the potential risk of collision."*

4.21 This also supports that the modelling undertaken to determine the potential collision risk of marine mammals for the Morlais tidal array was undertaken using "*the best way to assess the potential risk of collision"*. This also highlights the need for more data and information in order to validate collision risk modelling. The deployment and monitoring of the tidal devices in the Morlais tidal array will provide again another important opportunity for collecting this data and information, in order to validate and where possible develop and improve collision risk modelling, to reduce uncertainty and the need to overly precautions and conservative assumptions and parameters.

4.22 The NRW commissioned report (MDZ/F15.2), identified that (i) "*the key evidence gaps for all marine animals relate to avoidance or encounter rates, as well as confirming if*

an actual collision has occurred and what the effects of a collision would be", that there is (ii) "limited monitoring data that is currently available is species, location and device specific and may therefore, not be transferable or applicable to the assessment of other tidal stream projects", and (iii) "the potential implication of collision mortality at the population level and the cumulative effects of deploying multiple tidal devices and arrays in the marine environment."

4.23 One of the main recommendations in the NRW commissioned report (MDZ/F15.2), for "*addressing these key gaps is to collect further evidence on underwater behaviour (including near field evasion) to be able to generate robust avoidance rates. Other technologies, such as blade mounted pressure sensors or rapidly improving hydroacoustic imagery, could be explored and developed further in order to confirm if they are effective in determining a collision event. More information on the physical consequences of a collision (with the blade or pressure differential) is also required to fully understand the potential for death or injury."*

4.24 As outlined above, the deployment and monitoring of the tidal devices in the Morlais tidal array will provide an important opportunity for collecting data and information to address these data gaps, which will enable better assessments for the ongoing development of tidal energy.

5. Other constraints

5.1 Since submission of the ES and information for the HRA, additional information was provided by NRW Advisory following a marine mammals meeting on 06/01/20 (MDZ/F14), which included the current NRW Potential Biological Removal (PBR)[3] calculations. These are the current PBR values that NRW Advisory considers to be the limit of anthropogenic mortality in the relevant Management Unit (MU)[4] which would be considered a significant adverse effect on the population.

5.2 Therefore, additional collision risk modelling (MDZ/A28.12 / MDZ/A31.13) was undertaken to take into account the NRW PBR values, specifically the 0.7 PBR for bottlenose dolphin, and address other NRW comments on the collision risk assessments in the ES and Information for the HRA.

5.3 Prior to submission of the ES and Information for the HRA it had been agreed with NRW that the collision risk should be less than one bottlenose dolphin (1st TWG meeting 27/11/18 and 2nd TWG meeting 19/02/19; see SoCG (MDZ/L1)).

5.4 Following a meeting with NRW on 15 October 2020, NRW provided 'advice on adaptive management of the risk of collision impacts on protected marine mammal species in Welsh waters from the Morlais Project' (MDZ/F15.3). This advice, in addition to outlining NRW's requirements in relation to adaptive management,

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[3] PBR is often regarded as a tool for estimating the number of individuals that can be "safely" removed from a population while still allowing that population to maintain or achieve a pre-determined target level (Sparling et al., 2017) – see paragraphs 6.31-6.36 below for further information.

[4] MUs provide an indication of the spatial scales at which impacts of plans and projects alone, cumulatively and in-combination, need to be assessed for the key cetacean species in UK waters, with consistency across the UK (IAMMWG (2015). Management Units for cetaceans in UK waters (January 2015). JNCC Report No. 547, JNCC Peterborough)

monitoring and mitigation (see Section on **Adaptive Management** below), also provides marine mammal species maximum collision limits:

- Harbour porpoise = 3 per year
- Grey seal = 5 per year
- Bottlenose dolphin = 2 over 3 years
- Common dolphin = 5 per year
- Risso's dolphin = 1 per year
- Minke whale = 1 per year
- All other cetacean species = 1 per year

5.5 As outlined by NRW (MDZ/F15.3), '*these limits do not represent the point at which mitigating action should first occur; they represent the point at which any further impact must be fully mitigated to the extent that there should be no further risk to the species from the device'*.

5.6 As such these thresholds will be included in the OEMMP. Development of detailed EMMP will involve updated collision risk assessments prior to deployment, based on the latest information and tidal device parameters, to demonstrate that these thresholds will not be exceeded.

6. Matters for the Inquiry - The Project's Response

6.1 It is my understanding the key objections and outstanding issues related to marine mammals are:

- The uncertainty regarding the marine mammal collision risk modelling;
- The potential for population effects as a result of any collisions, particularly for bottlenose dolphin.
- The potential for disturbance, displacement and any barrier effects as a result of underwater noise during operation from the operational tidal devices and the use of Acoustic Deterrent Devices (ADDs); and
- The requirements and implementation of marine mammal mitigation and monitoring.

This is consistent with the Statement of Case (SoC) from NRW (MDZ/N9) (as outlined in **Table A1** in **Appendix 1**). This also takes into account the marine mammal issues raised in the SoCs from NWWT (MDZ/N11; also see **Table A2** in **Appendix 1** of this document), M Llewellyn (MDZ/N8) and RSPB (MDZ/N5).

Collision Risk Modelling - uncertainties and precautionary approach

6.2 There have been no recorded incidents at any operational tidal turbine installations, this includes, in the UK:

- SeaGen tidal turbine, Strangford Lough, Northern Ireland: 1.2MW tidal device, operational from 2008 to 2016;
- Ramsey Sound, Wales: Deltastream device, installed from December 2015 to March 2016;
- European Marine Energy Centre (EMEC) Fall of Warness Tidal Test Site, Orkney: various devices since 2006;
- MeyGen, Pentland Firth Scotland: Phase 1a of four turbines (6MW) installed in 2016/2017; and
- Minesto sea trials of DG500 tidal kite at Holyhead Depp, North Wales.

6.3 **Table 2** provides an overview of operational tidal power stations, all of which have had no recorded marine mammal incidents. Although acknowledged that none of the tidal turbine installations listed in **Table 2** have been operational for as long as is planned for Morlais, it does however, give a good indication for different types of tidal turbines, in different locations, including locations where marine mammals are known to be present in and around the area.

Table 2: Overview of operational tidal turbine installations

Tidal power station	MW	Years operational (approx.)
Atlantis, Meygen	6.0	4.0
Seagen, Strangford Loch	1.2	6.0
Tocardo Eastern Scheidt	1.2	3.0
Orbital, EMEC	2.0	1.0
Tidal Stream Power Generation, EMEC	1.0	2.0
Magallanes, EMEC	2.0	1.0
Hammerfest Strom, Norway	0.3	6.0
Nova Innovation, Bluemull sound	0.3	4.0
Open Hydro, EMEC	0.3	4.0
Open Hydro, Paimpol-Brehat	2.0	0.5
Open Hydro, Cape Sharp	2.0	0.5
Voith Hydro, EMEC	1.0	1.0
Seaflow, Lynmouth	0.3	3.0
Verdant, New York East River	0.2	3.0
Flumill, EMEC	0.3	1.0
Simec Atlantis, Zhoushan	0.5	0.5
SME PLAT-I, Nova Scotia	0.3	0.8

Tidal power station	MW	Years operational (approx.)
Instream, Nova Scotia	0.1	2.0
Minesto, Deep Green, Anglesey	0.3	0.5
Pulse Generation, Humber	0.2	1.0
Minesto, Strangford Loch	0.05	1.0
Atlantis, EMEC	1.0	1.5
Andritz, EMEC	1.0	4.0
Total	**23.5**	**51.3**

6.4 It is, however, theorised that the moving rotors of tidal energy devices pose a potential collision risk for marine mammals. There is currently limited understanding and empirical data relating to interactions between marine mammals with tidal devices, therefore, therefore there is uncertainty regarding the collision risk of marine mammals with all tidal turbine types.

6.5 As a precautionary approach the realistic worst-case parameters were determined and assessed, this included:

- Tidal device parameters and scenarios.
- Marine mammal parameters, including density estimates.

6.6 It is appreciated that there are uncertainties with any modelling, however, to limit these uncertainties a very precautionary approach has been undertaken, using the worst-case parameters for marine mammal species and the tidal devices. This precautionary approach also included, but was not limited to:

- Using two models and using worst-case for maximum predicted collision risk;
- Linear scaling of individual device to array, assuming all devices in array could have the same collision risk (**paragraph 6.17** below outlines why this is a precautionary approach);
- Highest marine mammal density estimates used, assuming evenly distributed across the site and wider area throughout the year; and
- Assuming all collisions or encounters would be fatal.

6.7 The assessments have also been undertaken without the proposed mitigation and monitoring outlined in the OEMMP (MDZ/A10). **Table 3** presents an example of the assessment without the proposed mitigation and residual impact after proposed mitigation.

Table 3: Assessment of impact significance for collision risk with operational turbines at MDZ based on examples of Phase 1 scenarios for less than 0.7 bottlenose dolphin in additional collision risk modelling note (MDZ/A28.12 / MDZ/A31.13)

Potential Impact	Receptor	Sensitivity (sensitivity of Welsh population[5])	Magnitude	Significance	Mitigation	Residual Impact
Collision risk for less than 0.7 bottlenose dolphin scenarios	Harbour porpoise	Low (Low)	Medium	Minor	Phased deployment, monitoring and mitigation (EMMP)	Minor (not significant)
	Bottlenose dolphin	Low (High)	Medium	Minor (Major)		Minor (not significant)
	Risso's dolphin	Low (Low)	Medium	Minor		Minor (not significant)
	Common dolphin	Low (Low)	Medium	Minor		Minor (not significant)
	Minke whale	Low (Low)	Medium	Minor		Minor (not significant)
	Grey seal	Low (Low)	Medium	Minor		Minor (not significant)
	Harbour seal	Low (Low)	Medium	Minor		Minor (not significant)

6.8 Where currently possible, comments in relation to the collision risk of marine mammals have been addressed in the additional collision risk modelling note (MDZ/A28.12 / MDZ/A31.13) prepared post submission. However, further assessments and updates will be made during the development of the EMMP as the project develops, based on the latest information, project requirements and details, as well as latest research and guidance.

Models

6.9 For the marine mammal collision risk assessment two methods, Encounter Rate Modelling (ERM) and Collision Risk Modelling (CRM), using the Scottish Natural Heritage (SNH) guidance for assessing collision risk between underwater turbines and marine wildlife (SNH, 2016; MDZ/F19) and accompanying spreadsheets. This approach was agreed with NRW at the 2nd Marine Mammal Technical Working Group (TWG) in February 2019, as outlined in the SoCG (MDZ/L1).

6.10 The difference in the models and the parameters used result in different results for different devices and scenarios. Therefore, as a precautionary approach, the collision risk assessments were conducted using both the ERM and CRM for all marine mammal species. It should be noted, as acknowledged by SNH (2016; MDZ/F19), that the ERM and CRM methods will provide at best, an order of magnitude estimate[6] of collision risk. However, it is this method that has been used successfully in developments elsewhere and offers the best available scientific approach.

[5] Based on Table 2: Sensitivity classification of Welsh marine mammal populations in Sparling *et al.* (2015)

[6] As stated in SNH (2016) (MDZ/F18): "*Neither the ERM nor the CRM can be regarded as an accurate calculator of encounter or collision rate. However, both are likely to provide a reasonable order-of-magnitude estimate.*" In that, based on the parameters used in the models the results should provide reasonable estimations of the number of individuals that could encounter or collide with a turbine device, which is then scaled up for the potential number of devices that could be deployed.

6.11 Results for the ERM and CRM were presented in the ES and information for the HRA, assessments were based on the worst-case, i.e. the model which indicated the greatest collision risk. NRW supports this approach (as agreed at the 1st TWG meeting 27/11/18 and 2nd TWG meeting 19/02/19; see SoCG (MDZ/L1)).

Tidal device parameters

6.12 As a demonstration zone, Morlais expects to accommodate a range of tidal device types. The industry is still in development so the exact design of these may not yet be known. As a result, a series of key design principles were identified, and worst-case parameters were used in the assessments. This approach allows a range or "envelope" of design parameters, and the likely worst case of each parameter, to be defined. This approach is tested in planning law and referred to as the 'Rochdale Envelope' approach, often called a Project Design Envelope (PDE).

6.13 It is important to note that because of the potential for a wide range of different tidal device types (currently available and may be available in the future), the tidal device types were put into categories considered representative for each of the potential device types that could be utilised at Morlais, therefore the parameters are indicative as a worst-case for each of the potential tidal device categories and do not represent specific devices.

6.14 The worst-case parameters used to define the PDE in terms of the device parameters and the relevant worst-case scenarios for the Project were used in the assessments.

6.15 There are a number of different features of tidal devices and arrays which can have an effect on the magnitude of theoretical collision risk for marine mammals (Sparling and Smith, 2019; MDZ/F15), including:

- The number and size of Tidal Energy Converters (TEC) moving parts (e.g. for horizontal and vertical axial flow designs; number of rotors and rotor dimensions and shape);
- The total number of devices with moving parts;
- The speed of movement of moving parts; and
- The position of TECs in the water column (in relation to the depth distribution of marine mammals).

6.16 These factors were taken into account when determining the realistic worst-case parameters for the collision risk assessments.

6.17 The total number of TECs is a major factor in determining collision risk. As outlined by Sparling and Smith (2019; MDZ/F15), currently there is no way of realistically modelling the collision risk posed by multiple devices, other than simply multiplying the risk for a single device by the total number of devices. However, this is likely to be unrealistic as it is difficult to predict how animals might respond to an array of devices. For example, the probability of avoidance is likely to be modified as a result of a close-range encounters with preceding devices. There is the possibility that animals might learn from encountering and avoiding the first device and then subsequently avoid

additional devices at a greater distance. However, there could also be the possibility that avoiding one device might bring an animal into the path of a subsequent device with an increased probability of collision, although this will depend on device spacing and layout. Although collision risk may not scale linearly with the number of TECs in an array, given current uncertainty regarding marine mammal behaviour, and a lack of empirical data, as a worst-case the assessments were made on the assumption that there will be a linear increase in risk with the total number of devices installed. However, it is thought to be more likely that marine mammals would encounter and therefore avoid the outer array devices and would, as such, be less likely to encounter the inner devices, depending on the layout of the array and spacings, based on interpretation of the information outlined by Sparling and Smith (2019; MDZ/F15).

6.18 As outlined below, monitoring at Morlais would provide a unique opportunity to collect information on how marine mammals behave around an array of multiple devices, compared to most studies which have involved only one device (**Table 2**). This would be very important in addressing data gaps, improving our understanding of the potential risk from multiple devices and how this can be used to remove some of the uncertainty associated with collision risk modelling. Therefore, it is important that the scale of the Morlais first phase is sufficient in order to ensure adequate data is collected to inform the next phase of deployment and other tidal projects.

6.19 Further assessments and updates will be made during the development of the EMMP as the project develops, based on the latest information, project requirements and details, as well as latest research and guidance.

6.20 The requirements of the EMMP will be secured in the TWAO and Marine Licence consent conditions, the following outlines the proposed draft condition:

"*No tidal device(s) may be constructed or repowered until a Detailed Environmental Management and Monitoring Plan (DEMMP) the intention of which is to prevent injury marine mammals and diving birds in the operation of those devices, and which is in accordance with the requirements of the Outline Environmental Management and Monitoring Plan (OEMMP), and which incorporates the following (insofar as relevant to that activity or phase of activity) has been submitted to and approved in writing by NRW":*

6.21 It is intended that monitoring of the operational tidal array at Morlais will be able to provide valuable information which could be used to improve the modelling for collision risk from multiple devices.

6.22 This information will be important for not only informing the modelling and assessments for the next phases of the Morlais development, but also other national and international tidal array projects. This has been identified as a key data gap in the APBmer (2020) review of potential collision between tidal stream devices and marine animals, commissioned by NRW (MDZ/F15.2).

Marine mammal parameters

6.23 The marine mammal parameters, including density estimates and reference populations, used in the assessments were agreed with NRW at the 2nd Marine Mammal TWG in February 2019 (see SoCG (MDZ/L1)).

6.24 The density estimate of each species is key parameter in the collision risk modelling, therefore, as a worst-case scenario the higher density estimates were used in the assessments. For harbour porpoise this was based on the SEACAMS data (see ES Volume I Chapter 12 Table 12-12). The SEACAMS harbour porpoise density estimate was 0.783/km^2 compared to SCANS-III density estimate for wider area of 0.239/ km^2.

6.25 For bottlenose dolphin, there was insufficient data due to the very low number of sightings in and around the MDZ during the site-specific surveys to provide density estimates (see ES Volume III Appendix 11.1 and 12.1). During the Natural Power boat surveys between November 2016 and October 2018, one group of 12 bottlenose dolphin were recorded during the February 2018 survey. During the 18 SEACAMS boat surveys from January 2015 to December 2016, three sightings of bottlenose dolphin were recorded.

6.26 Therefore, as a precautionary approach, it was assumed that the 330 bottlenose dolphins from the Cardigan Bay area could be evenly distributed over the area from Anglesey to Cardigan Bay. This is likely to overestimate the number of bottlenose dolphins that could be in the Morlais site, as the dolphins are known to concentrate in the areas of Cardigan Bay and Lleyn Peninsula (e.g. Feingold and Evans, 2014[7]).

6.27 It has been agreed with NRW that further post-consent assessments for the EMMP will take into account any updates and changes to density estimates, reference populations and PBR values. This is highlighted as ongoing in the SoCG (MDZ/L1), however, it is agreed with NRW that the reference populations and density estimates used in current assessments are appropriate and precautionary.

Avoidance rates

6.28 There is an absence of data to determine the ability of animals to avoid coming into contact with devices, either through close-range evasion, where animals take last minute evasive action, or through avoidance, which may operate at a wider scale with animals avoiding the area the devices are located in (Sparling and Smith, 2019; MDZ/F13).

6.29 Due to the lack of evidence on marine mammal avoidance from operational tidal turbines[8] a range of collision estimates were presented using six avoidance rates: 0%[9], 50%, 90%, 95%, 98%, and 99% as recommended by SNH guidance (MDZ/F19) and as requested by NRW (see ES Volume III Appendix 12.2 (MDZ/A27.6 / MDZ/A31.15) and Additional Collision Risk Modelling (MDZ/28.12 / MDZ/A31.13)).

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[7] Feingold, D. and Evans, P.G.H. (2014). Bottlenose Dolphin and Harbour Porpoise Monitoring in the Cardigan Bay and Pen Llŷn a'r Sarnau Special Area of Conservation 2011 – 2013. NRW Evidence Report Series, Report No: 4, 120 pp. Natural Resources Wales, Bangor Sea Watch Foundation. Report Number. 95. 124 pp.

[8] ABPmer 2020. Review of Potential Collision Between Tidal Stream Devices and Marine Animals. NRW Evidence Report No: 444, 65 pp, NRW, Bangor.

[9] For example, where 0% means no avoidance.

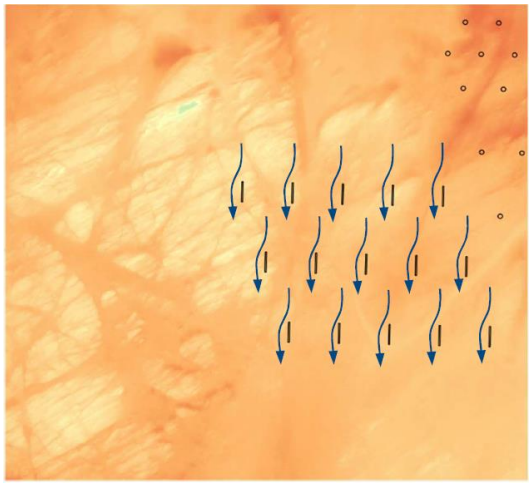
6.30 NRW is concerned that the choice of avoidance rate used in the modelling has a major impact on the output, which further underlines the lack of certainty in the predicted risk of collision from the project (see MDZ/A28.12 / MDZ/A31.13).

6.31 The collision risk assessments in the ES and HRA were based on an avoidance rate of 98%, which was consistent with other assessments, such as Falls of Warness tidal test site off Orkney, Scotland (EMEC, 2014)[10]. The assessment for the Minesto tidal kite off North Wales also assumed that 98% avoidance was most realistic avoidance rate in the ES for the Deep Green Holyhead Deep Project Phase I (0.5 MW) (Minesto, 2016)[11]

6.32 An avoidance rate of 98% is considered a precautionary and yet realistic approach. Underwater noise from operational turbines will be detected by marine mammals and has the potential to cause disturbance (see below and Underwater Noise Modelling Note (MDZ/A28.11)). To allow for the potential for masking of the devices' operational noise due to high background noise levels, 100% avoidance behaviour is not assumed to occur in response to tidal device noise. However, the tidal devices are relatively large with solid structures, which would be detectable by marine mammals. The assessments were undertaken without the proposed mitigation and monitoring outlined in the EMMP. It is also important to note that, to date there have been no recorded incidents of marine mammal collisions for any operational tidal devices.

6.33 Improving the scientific understanding of the ability of marine animals to avoid tidal stream turbines is critical to enable the subsequent phases of deployment at Morlais and for the industry as a whole and achieving its carbon reduction potential.

6.34 Presently, to enable consideration of potential effects on marine animals, any particular animal is assumed to encounter each turbine individually as illustrated by the conceptual example of blue arrows representing animal paths and black lines representing turbines in **Figure 2**.



[10] EMEC (2014). EMEC Fall of Warness Test Site: Environmental Appraisal. European Marine Energy Centre, Orkney.
[11] Minesto. (2016). Deep Green Holyhead Deep Project Phase 1 (0.5. MW) Environmental Statement. L-100194-S00-EIAS-001. 580 pp.

Figure 2: Indicative representation of marine mammals moving around individual tidal turbines in an array

6.35 This is likely to overestimate collision risk, as array avoidance rather than individual tidal turbine avoidance is expected to occur as shown in **Figure 3**. In this situation, the animals would be expected to change course to avoid the entire array and hence the collision risk is reduced by an order of magnitude. The only way to demonstrate this effect is to install multiple devices in an array, and hence the first phase of deployment must be large enough to allow this to be monitored, i.e. multiple rows and multiple columns in the array.

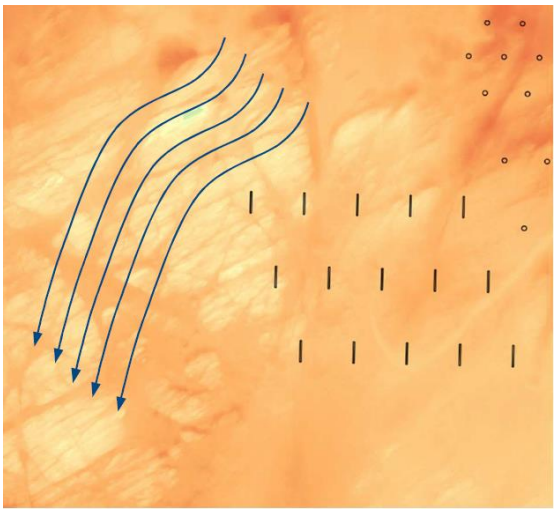


Figure 3: Indicative representation of marine mammals moving around tidal array

Impacts from collision

6.36 There is also uncertainty associated with the potential for a collision to result in fatality, and the potential physical effect of collision impacts on marine mammals. Studies indicate that the risk of serious injury or mortality increases with blade speed (Thompson *et al*., 2016[12]; Onoufriou *et al*., 2019[13]). Larger blades will have a larger sweep area, potentially putting a higher proportion of animals at risk of collision, however, larger blades are also likely to be slower than smaller blades (Sparling and Smith, 2019; MDZ/F15). These factors were taken into account when determining the worst-case parameters for the tidal device categories PDE. As a precautionary approach the modelling and assessments assumed that all encounters and collisions were fatal.

Addressing evidence gaps

6.37 The key evidence gaps for all marine mammals relate to avoidance or encounter rates, as well as confirming if an actual collision has occurred and what the effects of a collision would be (ABPmer, 2020; MDZ/F15.2).

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[12] Thompson, D., Brownlow, A., Onoufriou, J. and Moss, S. (2016). Collision risk and impact study: field tests of turbine blade-seal carcass collisions. Report to Scottish Government No MR 5.

[13] Onoufriou, J., Brownlow, A., Moss, S., Hastie, G. and Thompson, D. (2019) Empirical determination of severe trauma in seals from collisions with tidal turbine blades. Journal of Applied Ecology.

6.38 The monitoring of the operational tidal array at Morlais, as outlined in the OEMMP (MDZ/A10), will provide a unique opportunity to collect information on underwater behaviour (including near field evasion) to be able to generate avoidance rates for different types of tidal devices. There would also be the opportunity to further test and develop technologies to determine if a collision event has occurred.

6.39 This information will be important for not only informing the modelling and assessments for the next phases of the Morlais development, but also other national and international tidal array projects. This has been identified as a key data gap in the APBmer (2020) review of potential collision between tidal stream devices and marine animals, commissioned by NRW (MDZ/F115.2).

Potential Biological Removal (PBR)

6.40 PBR is an approach used to calculate the number of animals that could be removed from a population each year without adversely affecting the long-term growth of the population.

6.41 As outlined in **Section 5** above, since submission of the ES (MDZ/A25.12) and information for the HRA (MDZ/A27.11), additional information was provided by NRW Advisory following a marine mammals meeting on 06/01/20 (MDZ/F14), on the current NRW PBR calculations. These are the current PBR values that NRW Advisory considers to be the limit of additional anthropogenic mortality in the relevant MUs which would be considered a significant adverse effect on the population. Therefore, additional collision risk modelling (MDZ/A28.12 / MDZ/A31.13) was undertaken to take into account the NRW PBR values, specifically the 0.7 PBR for bottlenose dolphin. The PBR of 0.7 for bottlenose dolphin is based on a precautionary recovery factor of 0.2 (e.g. reduces the PBR value by 80%) compared to recovery factor of 0.5 for harbour porpoise and grey seal (e.g. reduces the PBR value by 50%) (MDZ/A28.12 / MDZ/A31.13). Low value recovery factors are used where there are large uncertainties in population size and status and where populations are already known to be in unfavourable status[14].

6.42 This additional collision risk modelling was used to determine the maximum number of devices and MW output that could be possible, for each of the device types, while remaining within the 0.7 limit for bottlenose dolphin collision risk. The bottlenose dolphin collision per MW and per device, was determined, and used to show the rate of collision with increasing MW. This linear model was then used to determine the maximum number of devices for each type that could be deployed within the first phase, within the bottlenose dolphin 0.7 limit. As each of the device type parameters shown are examples only, and the final design (including the MW output) is still to be determined, results are shown as an example for a number of these devices, and for the maximum MW possible for each of the device types.

6.43 The assessments in the ES (MDZ/A25.12 / MDZ/A31.14) were based on predicted collision risk of less than one bottlenose dolphin, as agreed with NRW. The assessments were then updated for the revised less than 0.7 bottlenose dolphin as

[14] Sparling, C.E., Thompson, D. & Booth, C.G. 2017. Guide to Population Models used in Marine Mammal Impact Assessment. JNCC Report No. 607. JNCC, Peterborough.

requested by NRW, based on the PBR of 0.7 for bottlenose dolphin (MDZ/A28.12 / MDZ/A31.13).

6.44 It has been agreed with NRW that further post consent assessments for the EMMP will take into account any updates and changes to the PBR values to ensure the proposed Phase 1 deployment will be less than the PBR for bottlenose dolphin, for the project alone and in-combination effects, to ensure there is no significant adverse effect on the population.

6.45 Given that the PBR for bottlenose dolphin is low (currently calculated as 0.7 animals per year) it follows that if the project risk is minimised for this species, it would also be predicted to be appropriately minimised for most other species. For example, the current NRW PBR values for harbour porpoise and grey seal are 559.5 and 282.9, respectively (MDZ/F14) and the predicted collision risk based on examples of Phase 1 deployment scenarios for less than 0.7 bottlenose dolphin have a worst-case predicted collision risk of up to 25 harbour porpoise and up to 5 grey seal (as outlined in additional collision risk assessments note (MDZ/A28.12 and MDZ/A31.13).

Underwater noise disturbance

6.46 In addition to the potential collision risk to marine mammals, NRW have also raised concerns regarding disturbance, displacement and barrier effects during operation, particularly in relation to underwater noise from operational turbines and the use of ADDs (see **Table A1** in **Appendix 1** which provides responses to points raised in NRW SoC (MDZ/N9).

6.47 **Underwater noise from operational turbines** has been assessed based on the information currently available and worst-case scenarios. It is important to note that the underwater noise modelling is indicative and provided as an example only. Further underwater noise modelling will be conducted once details are known of the types of devices to be deployed, which will address any outstanding concerns from NRW.

6.48 The indicative underwater noise modelling based on the metrics and criteria from Southall *et al*. (2019) for 24-hour continuous exposure and fleeing response model, indicates that for both large and small turbines, the risk of any permanent auditory injury is unlikely with maximum impact ranges of less than 10m.

6.49 Similarly, the maximum impact range for temporary auditory injury is less than 10m for dolphin species, minke whale, grey and harbour seal. For harbour porpoise, the maximum predicted impact range for temporary auditory injury is 50m and 230m for small and large turbines, respectively.

6.50 The potential for disturbance of marine mammals from small and large operational tidal devices is predicted to be 20m and 70m, respectively, based on the unweighted received level of 142 dB (SPL_{RMS}). This indicates that marine mammals will not be significantly disturbed over a wide area around the devices, however, they will be able to detect and therefore avoid the devices up to these distances.

6.51 The types of devices to be deployed are currently unknown, therefore, as outlined above, the underwater noise modelling is indicative and provided as an example only.

Further underwater noise modelling will be conducted once details are known of the types of devices to be deployed.

6.52 However, ES Chapter 12 Section 12.6.4.1 (MDZ/A25.12 / MDZ/A31.14), included a review of all currently available information for different types of devices and the assessments for potential disturbance was based on the worst-case scenario.

6.53 The sound levels are above the maximum ambient noise measured at the site by SEACAMS, therefore would be audible to marine mammals so they will be able to detect and avoid the tidal turbines and therefore avoid any collision risk. However, the underwater noise modelling indicates that that marine mammals will not be significantly disturbed over a wide area around the devices or array.

6.54 The underwater noise from operational turbines will be reviewed as part of the ongoing development of the EMMP when details on the types of devices to be deployed are available post consent.

6.55 The assessments during the development of the EMMP, once information on noise source levels for the types of tidal devices to be deployed is available, will determine the potential for any significant disturbance based on operational tidal device noise levels in different conditions, for individual devices and the array of devices to be deployed, taking into account ambient noise, the different species hearing sensitivities and the latest SNCB Guidance for assessing the significance of noise disturbance against Conservation Objectives of harbour porpoise SACs (JNCC *et al*., 2020[15]). For the purpose of this guidance (JNCC *et al*., 2020), noise disturbance within an SAC from a plan/project, individually or in combination, is considered to be significant if it excludes harbour porpoises from more than:

1. 20% of the relevant area of the site in any given day, or

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

6.56 However, it is predicted that the noise levels from the operational turbines will be sufficient for marine mammals to detect them, but not high enough to result in any auditory injury or significant long-term disturbance.

6.57 **Underwater noise from Acoustic Deterrent Devices (ADDs)** has been based on the worst-case scenario, to provide information on the effectiveness of ADDs and that they will be audible to marine mammals above ambient noise levels. ADDs are included as a potential mitigation method in the Outline EMMP to avoid any marine mammal collision with a tidal device if a marine mammal is in close proximity to the tidal device. The use of ADDs will be considered as the final EMMP is developed post consent, in consultation with NRW. It is important to note that, ADDs would only be activated if marine mammals were in close proximity and there is a potential risk of collision. The type(s) of ADDs to be deployed would be based on the latest technology and information to ensure adequate and effective mitigation. Activation of

[15] JNCC, Department of Agriculture, Environment and Rural Affairs (DAERA) and Natural England (2020). Guidance for assessing the significance of noise disturbance against Conservation Objectives of harbour porpoise SACs (England, Wales & Northern Ireland). June 2020.

the ADDs and range of the ADDs would be determined to ensure the marine mammal is outwith the range of potential collision risk, but without causing any significant disturbance or increased collision risk with other devices. ADDs would only be activated for very short periods and intermittently. There would be no long term ADD activation over a wide area. Examples assessed in the ES were worst-case scenarios, however, any ADD activation is likely to be only for a very short period to make sure the marine mammals are aware of their proximity to the tidal devices. Developing the EMMP pre-construction will allow the latest technology and information to be taken into account, including lessons learned from other projects and how to develop the most effective deployment of ADDs for the Morlais site, the types and layout of the tidal devices for each phased deployment.

6.58 The underwater noise from ADDs will be reviewed as part of the ongoing development of the EMMP when details on the types of ADDs to be deployed are available post consent.

6.59 The assessments during the development of the EMMP, once information on noise source levels for the types of ADDs to be used is available, will determine the potential for any significant disturbance based on individual and multiple ADDs that could be activated across the Morlais site, taking into account ambient noise, the different species hearing sensitivities and the latest SNCB Guidance for assessing the significance of noise disturbance against Conservation Objectives of harbour porpoise SACs (JNCC *et al*., 2020) as outlined above.

6.60 However, it is predicted that the noise levels from ADDs will not result in any significant disturbance, due to the intermittent and short duration of any activation, as outlined above.

Displacement and barrier effects

6.61 Although not included in the NRW SoC, NRW had previously commented on the potential for barrier effects (displacement), as part of the Marine Licence Application ORML1938 (ML001). The following response was provided:

6.62 “The known movements of marine mammals are outlined in section 12.5 of ES Chapter 12 (MDZ/A25.12 / MDZ/A31.14) and relevant information provided in section 8.3 of the HRA (MDZ/A27.11 / MDZ/A31.16).” For bottlenose dolphin, there is a possible seasonal shift in abundance, with movements from Cardigan Bay in the summer, to Anglesey and the north coast of Wales in the winter. The pattern of this potential seasonal shift suggests that individuals would travel past or in the near vicinity of the Morlais project. However, the site-specific surveys sighted very few bottlenose dolphin in the Morlais site.

6.63 The spacings between individual turbines would be a minimum of 70m for seabed mounted devices, and a minimum of 150m for floating devices, leaving a wide space which marine mammals would be able to move between, indicating that the project would not cause a barrier to movement. In addition, as marine mammals are wide-ranging species, and are able to move around any potential barrier, it is not expected that any individuals would have their movements in the area restricted, due to the area that would still remain open to them given the project location in open sea. As such, the impact assessment for barrier effects (provided in Sections 12.6.3.4 and 12.6.4.10

of ES Chapter 12 (MDZ/A25.12 / MDZ/A31.14)) focuses on determining the number of marine mammals that may alter their movements, rather than those that would be affected by any barrier to their movement."

6.64 In relation to the potential barrier effects as a result of underwater noise, the additional underwater noise modelling as outlined above, indicates that there is unlikely to be significant disturbance as a result of underwater noise during construction and from operational turbines, therefore there is unlikely to be any barrier effects or displacement from the site as a result of underwater noise or the physical presence of the turbines.

6.65 However, as outlined above, prior to deployment the array layout will take into account the potential for any barrier effects as a result of underwater noise from operational tidal turbines and the use of any ADDs. This will be developed as part of the EMMP.

Mitigation and Monitoring

6.66 Further information has been provided in the note prepared on the mitigation and monitoring for marine mammals (MDZ/A28.13) and revisions to the OEMMP (MDZ/A10). The final EMMP will be developed post consent and provide more detail, as the project develops, based on the latest information, project requirements and details, latest research, guidance for relevant marine mammal mitigation and monitoring.

6.67 Developing the monitoring and mitigation plan in the pre-construction period will allow for a detailed review and assessment of the most effective and appropriate mitigation methods at that time, based on the latest scientific evidence. This approach has been agreed with NRW and as outlined in NRW advice to Morlais on pre-consent assessment of collision risk and adaptive management (MDZ/F13): NRW "*recommend that an Adaptive Environmental Management Plan (AEMP) is developed to include mechanisms for monitoring and mitigating risk for each phase of the deployment*".

6.68 Following a meeting with NRW on 15 October 2020, NRW provided 'advice on adaptive management of the risk of collision impacts on protected marine mammal species in Welsh waters from the Morlais Project' (MDZ/F15.3). The section on **Adaptive Management** below, outlines this advice and how it will be incorporated into the EMMP.

6.69 All monitoring and mitigation measures proposed for deployment will be determined based on what is most suitable for the site and proven to be effective and adequate based on the most recent technical and scientific understanding prior to agreement by the Advisory Group, with final approval by Regulators / Competent Authorities, prior to deployment. As discussed in the OEMMP (MDZ/A10) and outlined in the mitigation and monitoring for marine mammals note (MDZ/A28.13), a range of monitoring and mitigation methods will be considered including, but not limited to, the use of PAM, active sonar, ADDs, light mitigation, thermal imaging and device sensors.

6.70 Menter Môn is committed to using effective, proven and appropriate mitigation methods based on the latest scientific evidence. Therefore, is confident that the proposed package of measures in the final EMMP would avoid or mitigate the effects and avoid adverse effects on the integrity of European protected sites.

6.71 The OEMMP outlines the proposed adaptive management approach to environmental mitigation and monitoring during the phased deployment of the Morlais Project, including the collision risk and disturbance of marine mammals. The OEMMP is the commitment of Menter Môn to safeguarding of marine mammals through the identification, avoidance and mitigation of potential adverse environmental impacts associated with the construction, operation and decommissioning of the Project, including the agreement that the deployment of tidal devices by the Project will subject to approval of the Regulators. The OEMMP demonstrates how the potential effects of the Project on marine mammals can be mitigated, monitored and managed to allow deployment of tidal devices in compliance with the requirements of the Habitats Directive.

6.72 In order to take into account the current uncertainties, the EMMP will be developed alongside the detailed design of the project, providing a flexible framework, through which further knowledge and understanding of the refined risks presented from the Project can be assessed, mitigated and monitored throughout the project lifespan. The EMMP will be developed in consultation with NRW to meet the requirements prior to construction and during deployment.

6.73 The pre-consent OEMMP has been revised (MDZ/A10) and currently it is proposed that a series of potential mitigation measures will be agreed pre deployment and will form a tiered hierarchy of mitigation available to the Advisory Group. Examples of what such a hierarchy of mitigation could include are:

- Tier 1 – Deployment of tidal devices at magnitude (MW) below levels of predicted effect (using best available data);
- Tier 2 – Active deterrence - deployment of mitigation measures (such as acoustic deterrents for mammals or visual deterrents for seabirds) around operating tidal devices, and monitoring of their efficacy;
- Tier 3 – The slowing or other modification of the operation of installed tidal devices to reduce predicted risk identified by the Advisory Group; and
- Tier 4 – The stopping or removal of tidal devices previously deployed by the Project.

6.74 All mitigation measures proposed for deployment will be reviewed in light of current technical and scientific understanding prior to agreement by the Advisory Group, with final approval by Regulators / Competent Authorities, prior to deployment.

6.75 The Project has worked and will continue to work with NRW to ensure there is no significant risk to marine mammals and no potential for an adverse effect on the integrity of designated sites where marine mammals are a qualifying feature.

6.76 Examples of similar approaches to the Morlais OEMMP for marine mammals, used in consented projects include:

6.77 **Site Integrity Plan (SIP) for the harbour porpoise Southern North Sea SAC**: Offshore wind farms (OWFs) in and around the Southern North Sea have been

developing In Principle SIPs as part of the consenting process, this includes the consented East Anglia THREE and Norfolk Vanguard OWF projects. These In Principle SIPs set out the framework for each project to deliver mitigation measures post consent, to ensure the avoidance of Adverse Effect on Integrity (AEOI) of the designated features of the Southern North Sea SAC. The final SIPs are then developed prior to construction to meet the consent condition requirements, for example:

"*In the event that driven or part-driven pile foundations are proposed to be used, the licenced activities, or any phase of those activities must not commence until a Project Southern North Sea SAC Site Integrity Plan for Piling which accords with the principles set out in the in principle Project Southern North Sea SAC Site Integrity Plan has been submitted to the Regulator and the Regulator is satisfied that the plan provides such mitigation as is necessary to avoid adversely affecting the integrity (within the meaning of the 2017 Regulations) of a relevant site, to the extent that harbour porpoise are a protected feature of that site*."

6.78 The In Principle SIP is the commitment of the project to ensure adequate mitigation is in place so that there is no adverse effect, without having to detail what mitigation will be required prior to consent, as this will be determined in the final SIP prior to construction based on final design of the project, the in-combination effects based on the final programme, and any updated information on management measures, advice or guidance for the Southern North Sea SAC.

6.79 This is a similar approach to the proposed outline EMMP for the Morlais project, where the project is committed to ensure adequate and effective mitigation and monitoring, but the details of what is required will be developed in the final EMMP based on the type, number size and layout of the tidal array.

6.80 **Project Environmental Monitoring Programme (PEMP) for MeyGen Tidal Stream Project**: As outlined in Appendix 1 of the OEMMP (MDZ/A10) the MeyGen PEMP has similar approach to Morlais, with the following condition:

"The Company must, no later than 3 months prior to the Commencement of the Development, submit a Project Environmental Monitoring Programme ("PEMP"), in writing, for the approval of the Scottish Ministers, in consultation with SNH and any other ecological, or such other advisors as required at the discretion of the Scottish Ministers. The PEMP must set out the measures of monitoring the environmental impacts of all stages of the Development, including the pre-construction, construction, and operational stages. The PEMP must be regularly reviewed by the Scottish Ministers, at timescales to be determined by the Scottish Ministers, in consultation with SNH and the Advisory Group referred to in condition 13 of this consent. Following such review the Scottish Ministers may, in consultation with SNH and the Advisory Group, require the Company to amend the PEMP and submit such an amended Programme to them, in writing, for their approval, in consultation with SNH and any other ecological, or such other advisors as required at the discretion of the Scottish Ministers." ……

Adaptive Management

6.81 NRW 'advice on adaptive management of the risk of collision impacts on protected marine mammal species in Welsh waters from the Morlais Project' dated 15/10/20 (MDZ/F15.3), outlines NRW's requirements in relation to adaptive management, monitoring and mitigation.

6.82 As outlined by NRW: "*Adaptive management will be essential in removing or reducing predicted adverse effects. NRW-A advise that mitigation and monitoring must be secured through a comprehensive adaptive management plan, to be agreed pre-consent, which will be fundamental to providing confidence in the conclusions of the HRA*."

6.83 The main requirements are that "*It must be demonstrated that it will be possible to:*

1. Detect marine mammal movements in and around the array and collisions with the devices as they occur, and report accordingly.

2. Determine, in the event of a collision, what species or species groups have collided with the devices.

3. Implement adaptive management measures, following any collision, to ensure that the risk of further collisions is reduced.

4. Ensure that a maximum collision limit for any marine mammal species is not exceeded."

6.84 As such the adaptive management in the EMMP, will provide commitment that:

1. It will be demonstrated prior to any tidal device operation (for Phase 1 and full build) that the real-time monitoring will be able to:

- Detect marine mammal movements in and around the array and collisions with the devices as they occur, in real-time, and report accordingly; and

- Determine, in the event of a collision, what species or species groups have collided with the devices, in real-time.
  If it is not possible to determine species, then a worst-case scenario will be assumed that it was a bottlenose dolphin.
  If it is not possible to determine the severity of the collision, then a worst-case scenario will be assumed that it was a fatal collision.

2. There will be the implementation of adaptive management measures, following any collision, to ensure that the risk of further collisions is reduced, which will be agreed and demonstrated prior to any tidal device operation.

3. The maximum collision limit for any marine mammal species is not exceeded, for example, if a fatal collision does occur for one cetacean species then the mitigation measures will need to be reviewed and further mitigation implemented following the tiered approach, as outlined in the EMMP.

4. Prior to any tidal device operation the mitigation is proven to be effective and will be adapted in response to any increasing risk of causing adverse effect.

6.85 Following the recommendations by NRW, a collision decision framework will be included in the EMMP to demonstrate the decisions that will be made should a suspected collision occur. This will include detail on how monitoring and mitigation measures will be effective in reducing the risk of subsequent collisions to avoid adverse effect.

6.86 Further details will be developed in the EMMP and agreed with the Advisory Group on (i) the tiered approach to mitigation (ranging from no mitigation; active deterrence; device modification; cease operation); (ii) the pre-agreed species triggers in relation to the tiers of mitigation; and (iii) the failsafe.

6.87 It has been agreed, to allow adverse effect to be ruled out for the whole project, that the EMMP will give a reassurance and commitments that if mitigation is not effective in preventing collisions, a failsafe will be included to ultimately prevent an adverse effect from occurring. Such a failsafe is likely to be a ceasing of operations for tidal device.

7. Relevant representations

7.1 The following additional topics have also been raised by NRW, in addition to those outlined in **Section 6** above and in the NRW SoC (SOC008). Responses to the NRW SoC in relation to marine mammals are provided in **Appendix 1**:

- **Changes to Prey Availability**
  Although not included in the NRW SoC (MDZ/N9), NRW has commented on potential changes to prey availability, as part of the Marine Licence Application ORML1938 (ML001 (FEI)).
  NRW requested: "*More detail is needed on separating prey availability from habitat loss (separate pathways). Prey availability will be affected by impacts to fish e.g. additional mortality or changes to prey because of the development; this has not been adequately presented in the ES. Aggregation of fish around structures may lead to increases in prey availability, which has not been considered, and potentially a consequential increase in collision risk*."
  The following response and information was provided to address the comment: "The potential impacts on prey availability have been assessed for marine mammals during construction in section 12.6.3.8 of ES Chapter 12 (MDZ/A25.12 / MDZ/A31.14) and during operation in section 12.6.4.12 of ES Chapter 12 (MDZ/A28.12 / MDZA31.14) and relevant sub-sections in section 8.3 of the Information to Support the HRA (MDZ/A27.11 / MDZ/A31.16) for each of the species and sites.

  Chapter 10 of the ES (MDZ/A25.10) provides assessment on potential impacts on prey species and concluded minor adverse effects for all potential impacts, including collision risk. Further information has also been provided in response to NRW comments on Chapter 10, including effects of particle motion and fish aggregation. As outlined in the response, although tidal devices may act as Fish Aggregating Devices (FADs), and so could

increase the density of fish in the vicinity of the turbine, particularly in the wake and at night (Fraser *et al*., 2018)[16]. Any increases in the density of fish may in turn affect the foraging behaviour of larger predators, however this is currently identified as a research gap (Fraser *et al*., 2018). However, it is considered that the scale of any effect to marine predators would be limited. As indicated by the underwater noise modelling and assessments, marine mammals will be able to detect operational devices. Information has also been provided on the monitoring and mitigation to avoid marine mammals getting close enough to be at risk of collision and will be further developed in consultation with NRW."

In addition, video footage presented during the OES-Environmental and ORJIP Ocean Energy International Forum on MRE Environmental R&D on the latest in research and monitoring around MRE (marine renewable energy) sites (21-23 April 2020), indicated that when current speeds were high and tidal devices were active that fish species remained close to the seabed around the foundations of the devices, outwith rotor sweep areas. Fish species only moved up in the water column during slack tides, when the turbines were not turning. Therefore, indicating no increased risk of collision to prey species, or marine mammals attracted to any prey aggregations around the tidal devices, as they would be outwith areas of increased collision risk.

7.2 Responses from North Wales Wildlife Trust (NWWT) have been addressed in **Section 6** above. **Table A2** in **Appendix 1** provides responses in relation to marine mammal comments in the NWWT SoC (MDZ/N11), previous comments (FEI-OBJ015) and responses have included:

- **NWWT comments on collision risk mitigation and monitoring**
  The following response was provided to address the comments: "The EMMP demonstrates Mentor Môn's commitment to ensure adequate and effective monitoring and mitigation is in place for the first phase, subsequent phases and full deployment.
  The phased approach and the successive phases will be based on information and data from the first and previous phases. The EMMP and phased approach allows adequate time to analyse, learn and adapt from the outcomes of each stage. Data and information will be collected and analysed throughout the first phase, to validated predicted modelling and assess behavioural responses, to ensure there is no significant impact or adverse effect during deployment. This data will also be constantly assessed so it can be used to inform the deployment of the next phase.
  Reducing the potential collision risk and ensuring no significant impacts in relation to bottlenose dolphin has been a key driver in the assessments and how the proposed phases could be deployed. This takes into account that bottlenose dolphin in the area are likely to be from the SACs, the small

[16] Fraser, S., Williamson, B., Nikora, V., Scott, B. (2017). Fish distributions in a tidal channel indicate the behavioural impact of a marine renewable energy installation. Energy Reports, Volume 4, January 2018.

population size, sensitivity and latest information on the SACs and bottlenose dolphin in the area.
The assessments are based on worst-case scenarios, with none of the proposed mitigation and monitoring outlined in the EMMP. Therefore, implementation of the EMMP will allow development of the Project to proceed without significant effects upon marine mammals through collision with tidal devices. It is important to note, that the phasing and EMMP are integral elements of the project and secured through conditions of the Marine Licence and TWAO, to ensure no significant effects on the bottlenose dolphin population."

- **NWWT comments on displacement**
  The following response was provided to address the comments: "The aim of the monitoring outlined in the EMMP is to determine any potential displacement or barrier effects that could restrict access to feeding areas or increase the distance travelled between areas. If a potential impact is implied from the data, then suitable mitigation would be put in place.
  It is understood that headland areas with strong currents are important feeding areas, therefore this has been taken into account in the assessments, for example, potential barrier effect from underwater noise during construction, potential barrier effects during operation and overall potential disturbance during operation were assessed in the ES (MDZ/A25.12 / MDZ/A31.14) and Information to Support HRA (MDZ/A27.11 / MDZ/A31.16). However, based on the assessments in the ES (MDZ/A25.12 / MDZ/A31.14) and Information to Support HRA (MDZ/A27.11 / MDZ/A31.16), there is no indication for the potential of any adverse effects."

- **NWWT comments on in-combination effects**
  The following response was provided to address the comments: "An in-combination assessment has been conducted for the SACs as part of Information to Support HRA (MDZ/A27.11 / MDZ/A31.16). As outlined in the Marine Mammals Additional Collision Risk Modelling note (MDZ/A28.12 / MDZ/A31.13), "the updated cumulative impact assessment, indicates there are no significant changes to the in-combination assessments in the Information to Support HRA" therefore no additional in-combination assessment was required for the Marine Mammals Additional Collision Risk Modelling note.
  However, in-combination effects will be reviewed and further assessed as part of the ongoing development of the EMMP, based on the latest information available."

7.3 Responses from Royal Society for the Protection of Birds (RSPB) in addition to those addressed in **Section 6** above:

- **Increased collision risk and disturbance as a result of displacement of recreational craft from the MDZ**
  RSPB (FEI-OBJ014) raised concerns that "*The ES does not appear to have considered the displacement of recreational craft from the Morlais Demonstration Zone (MDZ). Small recreational craft will be required to*

navigate around the western or eastern boundaries of the MDZ.
The concentration of recreational craft in the Western Offshore and Eastern Inshore Routes has the potential to cause additional disturbance to marine wildlife (seabirds and marine mammals) and could potentially displace marine wildlife into the MDZ. This does not appear to have been factored into the Marine Ornithology Collision Risk Modelling and Marine Mammal Collision Risk Modelling
Furthermore, there is potential for increased disturbance to the seabird colony and shoreline areas used by marine mammals through the concentration of small craft in the Eastern Inshore Route."
The following response was provided to address the comment: "Chapter 15 Shipping and navigation (MDZ/A25.15) indicates that: "*There will still be an inshore passage route available and the NRA does consider the impact of narrowing the available sea space and pinch points particularly for recreational and smaller fishing vessels." the data in Chapter 15 also indicates that "most tracks are concentrated close to shore with small recreational craft, including yachts, primarily utilising the inshore passage to the east of the MDZ*."
As the majority of recreational craft are already using the inshore route, there is unlikely to be significant displacement of recreational craft from the Morlais Demonstration Zone (MDZ) that could lead to a significant increase in collision risk or disturbance of marine mammals."

8. Summary and Conclusions

Introduction

8.1 My name is Dr Jennifer A. Learmonth and I am the Principal Marine Mammal Consultant at Royal HaskoningDHV. I am the marine mammal witness for the Morlais Demonstration Zone. I have a BSc Honours Degree in Biology from the University of Stirling, an MSc in Marine and Fisheries Science and PhD both from the University of Aberdeen in cetacean research.

8.2 I have over 20 years of experience in marine mammal research, including more than 15 years consultancy experience, primarily in marine Environmental Impact Assessments (EIA), preparing Environmental Statements (ES), information for European Protected Species (EPS) licence applications, developing Marine Mammal Mitigation Plans (MMMP), determining monitoring requirements and conducting Habitats Regulation Assessments (HRA) for offshore and coastal developments.

8.3 I am the Lead Marine Mammal Technical Specialist for the Morlais project and have been involved with the project since 2017 including conducting impact assessments and marine mammal collision risk modelling based on different types of tidal devices. I prepared Chapter 12 Marine Mammals of the Morlais ES Volume 1 (MDZ/A25.12 / MDZ/A31.14) and supporting Appendices provided in Volume 3 (MDZ/A27.6 / MDZ/A31.15) and the marine mammal Information to Support HRA (MDZ/A27.11 / MDZ/A31.16). I have also been involved in developing the Morlais Outline Environment Mitigation and Monitoring Plan (OEMMP; MDZ/A10). Post submission I have prepared the marine mammal related responses and additional information

during determination process (including additional collision risk modelling (MDZ/A28.12), underwater noise modelling and assessments (MDZ/A28.10 and MDZ/A28.11), further information for mitigation and monitoring options (MDZ/A28.13)). I have also been involved in the ongoing consultation with Natural Resources Wales (NRW) and development of the Marine Mammal Statement of Common Ground (SoCG; MDZ/L1).

8.4 The topic of evidence is Biodiversity - Marine Mammals.

8.5 This evidence concerns the possible effects on marine mammals (with bottlenose dolphin, harbour porpoise and grey seal being the main species of concern), focusing on the offshore elements of the Morlais Demonstration Zone (MDZ), primarily the potential collision risk for marine mammals with tidal devices; and potential disturbance of marine mammals during operation.

8.6 The evidence addresses the key marine mammal issues regarding collision risk and disturbance from underwater noise, and confirms in support of the project that the methodology employed to estimate theoretical collision risk, using two methods taken from published guidance on the subject, is wholly appropriate, and the best available. The level of precaution that is built into the calculation of theoretical collision risk in both methods is also appropriate, and despite the uncertainty associated with aspects of the models, the modelling and assessments can be considered to represent a worst-case scenario and a highly precautionary approach has been taken.

8.7 The proposed approach of the Morlais EMMP (MDZ/A10) outlines the adaptive management approach to environmental mitigation and monitoring during the phased deployment of the Morlais Project, including the collision risk and disturbance of marine mammals. This approach will ensure that the first phase (Phase 1) of deployment will be defined by the Potential Biological Removal (PBR) for bottlenose dolphin and the species collision limits provided by NRW, as outlined in **Section 5**, to ensure no significant impact on marine mammals or adverse effect on any designated sites with marine mammals as a qualifying feature. The EMMP outlines the commitments of Menter Môn to safeguarding of marine mammals through the identification, avoidance and mitigation of potential adverse environmental impacts associated with the construction, operation and decommissioning of the Project, including the agreement that the deployment of tidal devices by the Project will be subject to approval of the Regulators. The EMMP demonstrates how the potential effects of the Project on marine mammals can be mitigated, monitored and managed to allow deployment of tidal devices in compliance with the requirements of the Habitats Directive. The EMMP also incorporates the recent advice from Natural Resources Wales (NRW) on adaptive management of the risk of collision impacts on protected marine mammal species in Welsh waters from the Morlais Project (MDZ/F15.3).

Main Marine Mammal Constraints

8.8 Since submission of the ES and information for the HRA, additional information was provided by NRW Advisory following a marine mammals meeting on 06/01/20, on the current NRW Potential Biological Removal (PBR) calculations (MDZ/F14). These are the current PBR values that NRW Advisory considers to be the limit of anthropogenic

mortality in the relevant Management Unit (MU) which would be considered a significant adverse effect on the population.

8.9 Therefore, additional collision risk modelling (MDZ/A28.12 / MDZ/A31.13) was undertaken to take into account the NRW PBR values, specifically the 0.7 PBR for bottlenose dolphin, and address other NRW comments on the collision risk assessments in the ES and Information for the HRA.

8.10 Prior to submission of the ES and Information for the HRA it had been agreed with NRW that the collision risk should be less than one bottlenose dolphin (1st TWG meeting 27/11/18 and 2nd TWG meeting 19/02/19; see SoCG (MDZ/L1)).

8.11 Following a meeting with NRW on 15 October 2020, NRW provided 'advice on adaptive management of the risk of collision impacts on protected marine mammal species in Welsh waters from the Morlais Project' (MDZ/F15.3). This advice, in addition to outlining NRW's requirements in relation to adaptive management, monitoring and mitigation, also provides marine mammal species maximum collision limits (harbour porpoise = 3 per year; grey seal = 5 per year; bottlenose dolphin = 2 over 3 years; common dolphin = 5 per year; Risso's dolphin = 1 per year; minke whale = 1 per year and all other cetacean species = 1 per year).

8.12 As outlined by NRW (MDZ/F15.3), '*these limits do not represent the point at which mitigating action should first occur; they represent the point at which any further impact must be fully mitigated to the extent that there should be no further risk to the species from the device'*.

8.13 As such these thresholds will be included in the OEMMP. Development of detailed EMMP will involve updated collision risk assessments prior to deployment, based on the latest information and tidal device parameters, to demonstrate that these thresholds will not be exceeded.

Key Marine Mammal Issues

8.14 The key outstanding issues related to marine mammals are:

- The uncertainty regarding the marine mammal collision risk modelling;
- The potential for population effects as a result of any collisions, particularly for bottlenose dolphin.
- The potential for disturbance, displacement and any barrier effects as a result of underwater noise during operation from the operational tidal devices and the use of Acoustic Deterrent Devices (ADDs); and
- The requirements and implementation of marine mammal mitigation and monitoring.

8.15 This is consistent with the Statement of Case (SoC) from NRW (MDZ/N9) and also takes into account the marine mammal issues raised in the SoCs from NWWT (MDZ/N11), M Llewellyn (MDZ/N8) and RSPB (MDZ/N5).

8.16 Assessments have been undertaken for the ES (MDZ/A25.12 / MDZ/A31.14) and Information to Support HRA (MDZ/A27.11 / MDZ/A31.16), including additional post-submission documents, based on worst-case scenarios and precautionary approach.

Collision Risk

8.17 The greatest theoretical risk to marine mammals from the proposed Morlais development is the collision risk with operational tidal devices. However, there is currently limited understanding and empirical data relating interactions between marine mammals with tidal devices and there have been no recorded incidents with any operational tidal devices.

8.18 It is appreciated that there are uncertainties with any modelling, however, to limit these uncertainties a very precautionary approach has been undertaken, using the worst-case parameters for marine mammal species and the tidal devices and precautionary assumptions at each stage.

8.19 The design of Phase 1 (the number and types of devices, and the maximum MW) will be developed in the pre-construction EMMP based on the types of devices to be deployed, latest information and guidance, including PBR values. The size and scale of Phase 1 will be determined by the PBR for bottlenose dolphin, to ensure no significant adverse effect on the population, for Phase 1, including any in-combination effects. The process to determine and deploy Phase 1 will be undertaken in consultation with NRW and agreed by the Advisory Group, with final approval by Regulators / Competent Authorities, prior to deployment.

8.20 This phased deployment of tidal devices at magnitude (MW) below levels that could adversely affecting the long-term growth of the population (using latest and best available data), will provide a unique opportunity to: (i) address data gaps related to avoidance by marine mammals, which can be used to improve modelling for the next phase; (ii) provide valuable information which could be used to improve the modelling for collision risk from multiple devices; (iii) further test and develop technologies to determine if a collision event occurred; and (iv) further test and develop mitigation and monitoring technologies, to determine the most suitable and effective methods for the next phase and full deployment.

8.21 The next phase of deployment and subsequent phases to maximum deployment of up to 240MW can only proceed if there is no increased risk of an adverse effects on the integrity of European protected sites and that the mitigation and monitoring is proven to be robust and effective. This will be based on the information and data collected during the deployment of the Phase 1 tidal array.

8.22 It is therefore important that the scale of the Morlais first phase is sufficient in order to ensure adequate data is collected to inform the next phase of deployment and other tidal projects.

Underwater noise

8.23 The types of tidal turbine devices to be deployed are currently unknown, therefore, the underwater noise modelling is indicative and provided as an example only. Further

underwater noise modelling will be conducted once details are known of the types of devices to be deployed.

8.24 However, ES Chapter 12 Section 12.6.4.1 (MDZ/A25.12 / MDZ/A31.14), included a review of all currently available information for different types of devices and the assessments for potential disturbance was based on the worst-case scenario.

8.25 The sound levels are above the maximum ambient noise measured at the site by SEACAMS, therefore would be audible to marine mammals so they will be able to detect and avoid the tidal turbines and therefore avoid any collision risk. However, the underwater noise modelling indicates that that marine mammals will not be significantly disturbed over a wide area around the devices or array.

8.26 The underwater noise from operational turbines will be reviewed as part of the ongoing development of the EMMP when details on the types of devices to be deployed are available post consent.

8.27 The assessments during the development of the EMMP, once information on noise source levels for the types of tidal devices to be deployed is available, will determine the potential for any significant disturbance based on operational tidal device noise levels in different conditions, for individual devices and the array of devices to be deployed, taking into account ambient noise, the different species hearing sensitivities and the latest SNCB Guidance for assessing the significance of noise disturbance against Conservation Objectives of harbour porpoise SACs (JNCC *et al*., 2020). For the purpose of this guidance (JNCC *et al*., 2020), noise disturbance within an SAC from a plan/project, individually or in combination, is considered to be significant if it excludes harbour porpoises from more than:

1. 20% of the relevant area of the site in any given day, or

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

8.28 However, it is predicted that the noise levels from the operational turbines will be sufficient for marine mammals to detect them, but not high enough to result in any auditory injury or significant long-term disturbance.

8.29 Similarly, the underwater noise from ADDs will be reviewed as part of the ongoing development of the EMMP when details on the types of ADDs to be deployed are available post consent.

8.30 The assessments during the development of the EMMP, once information on noise source levels for the types of ADDs to be used is available, will determine the potential for any significant disturbance based on individual and multiple ADDs that could be activated across the Morlais site, taking into account ambient noise, the different species hearing sensitivities and the latest SNCB Guidance for assessing the significance of noise disturbance against Conservation Objectives of harbour porpoise SACs (JNCC *et al*., 2020) as outlined above.

8.31 However, it is predicted that the noise levels from ADDs will not result in any significant disturbance, due to the intermittent and short duration of any activation.

8.32 Prior to deployment, the array layout will take into account the potential for any barrier effects as a result of underwater noise from operational tidal turbines and the use of any ADDs. This will be developed as part of the EMMP.

Adaptive Management

8.33 NRW has recently provided 'advice on adaptive management of the risk of collision impacts on protected marine mammal species in Welsh waters from the Morlais Project' dated 15/10/20 (MDZ/F15.3), which will be incorporated into the EMMP.

8.34 As such the adaptive management in the EMMP, will provide commitment that:

1. It will be demonstrated prior to any tidal device operation (for Phase 1 and full build) that the real-time monitoring will be able to:

- Detect marine mammal movements in and around the array and collisions with the devices as they occur, in real-time, and report accordingly; and

- Determine, in the event of a collision, what species or species groups have collided with the devices, in real-time.
  If it is not possible to determine species, then a worst-case scenario will be assumed that it was a bottlenose dolphin.
  If it is not possible to determine the severity of the collision, then a worst-case scenario will be assumed that it was a fatal collision.

2. There will be the implementation of adaptive management measures, following any collision, to ensure that the risk of further collisions is reduced, which will be agreed and demonstrated prior to any tidal device operation.

3. The maximum collision limit for any marine mammal species is not exceeded, for example, if a fatal collision does occur for one cetacean species then the mitigation measures will need to be reviewed and further mitigation implemented following the tiered approach, as outlined in the EMMP.

4. Prior to any tidal device operation the mitigation is proven to be effective and will be adapted in response to any increasing risk of causing adverse effect.

8.35 Following the recommendations by NRW, a collision decision framework will be included in the EMMP to demonstrate the decisions that will be made should a suspected collision occur. This will include detail on how monitoring and mitigation measures will be effective in reducing the risk of subsequent collisions to avoid adverse effect.

8.36 Further details will be developed in the EMMP and agreed with the Advisory Group on (i) the tiered approach to mitigation (ranging from no mitigation; active deterrence; device modification; cease operation); (ii) the pre-agreed species triggers in relation to the tiers of mitigation; and (iii) the failsafe.

8.37 It has been agreed, to allow adverse effect to be ruled out for the whole project, that the EMMP will give a reassurance and commitments that if mitigation is not effective in

preventing collisions, a failsafe will be included to ultimately prevent an adverse effect from occurring. Such a failsafe is likely to be a ceasing of operations for tidal devices.

8.38 There is a commitment from the Project to ensure adequate and effective mitigation and monitoring for marine mammals, which will be implemented through the EMMP and legally secured through a consent condition to ensure no AEOSI for any SAC with harbour porpoise, bottlenose dolphin, grey seal or harbour seal as designated features.

Consultation with NRW

8.39 As outlined in the SoCG (MDZ/L1), the Project has engaged with NRW throughout the assessment process for marine mammals and development of the OEMMP, prior to and after submission. This has included taking into account any advice and suggestions, addressing any concerns, providing further assessments, information and clarification (key points are as summarised in **Table 4**, in addition to information provided in this PoE and responses to NRW SoC (**Appendix 1 Table A1**)). This process will continue post-consent and prior to deployment.

Table 4: Overview of how NRW requirements have been addressed

NRW Requirement	Addressed
To included common dolphin in species to be assessed	Agreed and assessed in ES.
Further data sources to be included	Further information was incorporated into the marine mammal baseline information.
Assessments may need to be considered again post submission should the revised MUs and updated density estimates be published, particularly for harbour porpoise and bottlenose dolphin.	Revised MUs have not been published and no further density estimates are currently available. It is agreed by both parties that the reference populations and density estimates used for the assessments were appropriate and based on relevant information that is currently available. However, the EMMP provides a mechanism to update assessments based on the latest information prior to deployment.
Recommendations for potential impacts to be assessed.	All suggested impacts were agreed and assessed.
Prior to submission of the ES and Information for the HRA it had been agreed with NRW that the collision risk should be less than one bottlenose dolphin (1st TWG meeting 27/11/18 and 2nd TWG meeting 19/02/19). Since submission of the ES and information for the HRA, additional information was provided by NRW Advisory following a marine mammals meeting on 06/01/20, on the current NRW PBR calculations (MDZ/F14).	Additional collision risk modelling (MDZ/A28.12 / MDZ/A31.13) was undertaken to take into account the NRW PBR values, specifically the 0.7 PBR for bottlenose dolphin, and address other NRW comments on the collision risk assessments in the ES and Information for the HRA.
Review of strandings data to inform marine mammal size parameters.	All available information was reviewed and assessed to determine the most appropriate parameters. Appendix 12.2 with ES (MDZ/A27.6 / MDZ/A31.15) presents the rationale for the values used and data sources used, including stranding records.

	An examination of minimum, mean and maximum values was also presented in Appendix 12.2 of the ES (MDZ/A27.6 / MDZ/A31.15).
Range of collision risk avoidance rates.	As agreed, a range of avoidance rates were presented as an appendix to the ES chapter (MDZ/A27.6 / MDZ/A31.15). In addition, further assessments and information were provided with arrange of avoidance rates in the additional collision risk modelling (MDZ/A28.12 / MDZ/A31.13).
Further information requested on relevant impact pathways for all receptor groups in relation to cumulative impacts and in-combination effects.	In response to NRW's position on the cumulative impact assessment (CIA), further details were presented in the information submitted to NRW on 03 July 2020. In addition, the additional collision risk modelling note (MDZ/A28.12 / MDZ/A31.13) also updated the CIA based on latest information available.
Sparling *et al*. (2015) used a matrix to indicate significance of impact and this an accepted approach by regulators.	This approach was taken into account in the assessments.
NRW requested that the assessment clearly link the impact pathway and magnitude back to the population estimate and assessments (possible use of PCoD, Population Viability Analysis (PVA), Potential Biological Removal (PBR).	PVA was been conducted and included as a separate Appendix with the ES chapter (MDZ/A27.6). It was agreed with NRW that further assessments using PCoD were not required. NRW proved PBR values after submission (see above).
Further information on the effects of underwater noise.	Underwater noise modelling was undertaken post submission for the Morlais site (MDZ/A28.10) and note prepared to address the points raised by NRW.
NRW expressed their concern in relying solely on a quantitative approach in assessing mortality rates due to the uncertainties involved. NRW recommend that a risk-minimisation approach is adopted where a reduced first phase is undertaken, and comprehensive monitoring is conducted.	The EMMP will be developed based on this approach, in consultation with NRW.

Appendix 1: Responses to marine mammal comments in the NRW and NWWT Statements of Case

Marine Mammal Responses to NRW Statement of Case

Table A1: Marine Mammal Responses to NRW Statement of Case (SOC008)

Reference	Document	Section	NRW Comment	Response
SOC008	NRW Statement of Case Planning Inspectorate Reference: DNS/3234121	Paragraph 5	"*In this public inquiry, the advisory arm of NRW intends to provide evidence on the effects of the proposed development on the following:* • ***Marine mammals**: mortality resulting from collision with the proposed physical development, and operational disturbance from underwater noise*".	Agreed, the main issues for marine mammals are: • mortality resulting from collision with the proposed physical development; and • operational disturbance from underwater noise. These issues have been addressed in **Section 6** of the marine mammal PoE.
SOC008	NRW Statement of Case Planning Inspectorate Reference: DNS/3234121	Paragraph 14	"*The proposal has the potential to have an adverse impact on marine mammal species listed in Annex II and Annex IV of the Habitats Directive. The proposal would be situated within the North Anglesey Marine Special Area of Conservation (SAC) which is designated for harbour porpoise and it could also affect other species of marine mammals, including those with demonstrated connectivity to other SACs*."	As outlined in the marine mammal PoE and OEMMP PoE, there is a commitment from the Project to ensure adequate and effective mitigation and monitoring for marine mammals, which will be implemented through the EMMP and legally secured through a consent condition, to ensure no AEOSI for any SAC with harbour porpoise, bottlenose dolphin, grey seal or harbour seal as designated features. The adaptive management proposed by NRW-A (MDZ/F15.3) will be essential in removing or reducing predicted adverse effects. It is agreed that mitigation and monitoring will be secured through a comprehensive adaptive management plan, to be agreed pre-consent, which will be fundamental to providing confidence in the conclusions of the HRA As outlined in **Section 3** of the marine mammal PoE, the MDZ was identified and agreed prior to designation of the North Anglesey Marine SAC.

Reference	Document	Section	NRW Comment	Response
SOC008	NRW Statement of Case Planning Inspectorate Reference: DNS/3234121	Paragraph 15	"*NRW considers that the risk of marine mammal mortality from collisions with operational tidal devices is unacceptably high. Due to the existing impact of human activity e.g. bycatch from fishing, uncertain population estimates and small, declining populations, NRW will argue that it is not possible to rule out an adverse effect on site integrity (AEOSI) and/or significant impacts on these populations from the predicted project mortality levels*."	As outlined above, there is a commitment from the Project to ensure adequate and effective mitigation and monitoring for marine mammals, which will be implemented through the EMMP and legally secured through a consent condition, to ensure no AEOSI for any SAC with harbour porpoise, bottlenose dolphin, grey seal or harbour seal as designated features and/or significant impacts on these populations. As outlined in **Section 6** and **Section 8** of the Marine Mammal PoE: Collision risk modelling and assessments in the updated Additional Collision Risk Modelling Note (MDZ/A31.13), based on the worst-case scenario for Phase 1 indicates no potential significant population impacts. The current NRW PBR values for bottlenose dolphin, harbour porpoise and grey seal are 0.7, 559.5 and 282.9, respectively and the predicted collision risk based on examples of Phase 1 deployment scenarios for less than 0.7 bottlenose dolphin have a worst-case predicted collision risk of up to 25 harbour porpoise and up to 4 grey seal (as outlined in additional collision risk assessments note). The deployment of Phase 1 (the number and types of devices, and the maximum MW) will be developed in the pre-construction detailed EMMP based on the types of devices to be deployed, latest information and guidance, including PBR values. The size and scale of Phase 1 will be determined by the PBR for bottlenose dolphin, to ensure no significant adverse effect on the population, for Phase 1, including any in-combination effects. The process to determine and deploy Phase 1 will be undertaken in consultation with NRW and agreed by the Advisory Group, with final approval by Regulators / Competent Authorities, prior to deployment. The next phase of deployment and subsequent phases to maximum deployment of up to 240MW can only proceed if there is no increased risk of an adverse effects on the integrity of European protected sites and that the

Reference	Document	Section	NRW Comment	Response
				mitigation and monitoring is proven to be robust and effective. This will be based on the information and data collected during the deployment of the Phase 1 tidal array. The species collision limits, provided by NRW (MDZ/F15.3), will be used as thresholds in the EMMP. As outlined by NRW (MDZ/F15.3), '*these limits do not represent the point at which mitigating action should first occur; they represent the point at which any further impact must be fully mitigated to the extent that there should be no further risk to the species from the device'*. As such these thresholds will be included in the EMMP. Development of detailed EMMP will involve updated collision risk assessments prior deployment, based on the latest information and tidal device parameters, to demonstrate that these thresholds will not be exceeded.
SOC008	NRW Statement of Case Planning Inspectorate Reference: DNS/3234121	Paragraph 16	"*The applicant has presented an indicative first phase of deployment from calculating the maximum number of devices and megawattage (MW) for each device type that could be deployed with a collision risk below 0.7 bottlenose dolphin[17] per year assuming an avoidance rate of 98%. NRW will argue that the assessment places an over-reliance on the outputs of the quantitative predictive collision risk modelling with very little appreciation of the uncertainties inherent in this approach. There remains a significant risk that unsustainable mortality of Annex II and IV marine mammal species could occur from the first phase alone (and that AEOSI cannot therefore be ruled out), and a precautionary reduction in scale of the first phase would reduce this risk*".	As outlined in **Section 6** of the Marine Mammal PoE: It is appreciated that there are uncertainties associated with modelling, however, to limit these uncertainties a very precautionary approach has been undertaken, using the worst-case parameters for marine mammal species and the tidal devices. The assessments have also been undertaken without the proposed mitigation and monitoring outlined in the EMMP. In order to take into account the current uncertainties, the EMMP will be developed alongside the detailed design of the project, and the proposed approach to the EMMP is that it will provide a flexible framework, through which further knowledge and understanding of the risks presented from the Project can be assessed, mitigated and monitored throughout the project lifespan. The detailed EMMP will be developed in consultation with NRW to ensure no

17 The figure of 0.7 is the maximum sustainable annual mortality of bottlenose dolphin calculated through Potential Biological Removal (PBR). PBR is a formula which predicts how many animals could be removed from a population without adversely reducing it. The population is based on the relevant Management Unit for each species (MU). PBR gives the number of animals that can be sustainably removed from the population, therefore all human take e.g. fisheries bycatch, within the relevant MU must be subtracted from this value.

Reference	Document	Section	NRW Comment	Response
				population level effects or adverse effect on integrity of designated sites where marine mammals are a qualifying feature. An avoidance rate of 98% is considered a precautionary and yet realistic approach. Underwater noise from operational turbines will be detected by marine mammals and has the potential to cause disturbance. Although, to allow for the potential for masking of the devices operational noise due to high background noise levels, 100% avoidance behaviour is not assumed to occur in response to tidal device noise. However, the tidal devices are relatively large with solid structures, which would be detectable by marine mammals. The assessments were undertaken without the proposed mitigation and monitoring outlined in the EMMP. It is also important to note that, to date there have been no recorded incidents of marine mammal collisions for any operational tidal devices. The scale of the first phase needs to be sufficient in order to ensure adequate data is collected to inform the next phase of deployment.
SOC008	NRW Statement of Case Planning Inspectorate Reference: DNS/3234121	Paragraph 17	*"The applicant proposes to implement an Environmental Monitoring and Mitigation Plan (EMMP) as part of an adaptive management approach. Whilst NRW does not object in principle to an adaptive management approach, NRW will argue that further information and commitment is required to demonstrate that adaptive management can be justified in this case and that the proposed monitoring and mitigation will be deliverable and effective in avoiding significant impacts and AEOSI. For example:* *• How would real-time monitoring of marine mammal movements and a rapid response to any detected collisions be achieved? Several monitoring and mitigation options are described, but evidence of their effectiveness for the range of device types proposed, and in relation to all species, is limited.*	There is a commitment from the Project to ensure adequate and effective mitigation and monitoring for marine mammals, which will be implemented through the EMMP and legally secured through a consent condition, to ensure no AEOSI for any SAC with harbour porpoise, bottlenose dolphin, grey seal or harbour seal features. Development of the detailed EMMP post-consent and prior to deployment will allow the latest information and technology to be used to ensure no risk in real time of animals colliding with the devices and an adverse effect occurring. Therefore, it is not possible to include specific details in the OEMMP, however, proposed approaches are provided based on currently available technology to demonstrate that this will be possible. The requirements of the EMMP will be secured in the TWAO and Marine Licence consent conditions, the following outlines the proposed draft condition:

Reference	Document	Section	NRW Comment	Response
			• There needs to be a commitment not to operate devices until it has been demonstrated and agreed in writing that marine mammal movements and collisions can be detected. *• There needs to be a clear commitment to cease operation should collisions reach a pre-agreed limit."*	"*No tidal device(s) may be constructed or repowered until a Detailed Environmental Management and Monitoring Plan (DEMMP) the intention of which is to prevent injury marine mammals and diving birds in the operation of those devices, and which is in accordance with the requirements of the Outline Environmental Management and Monitoring Plan (OEMMP), and which incorporates the following (insofar as relevant to that activity or phase of activity) has been submitted to and approved in writing by NRW".*
SOC008	NRW Statement of Case Planning Inspectorate Reference: DNS/3234121	Paragraph 18	"*The assessment of whether the operational tidal devices would generate underwater noise causing disturbance to marine mammals is deficient. In particular, there are aspects of the underwater noise modelling which are not adequately explained, and which do not appear to consider the full complexity of the project design envelope (PDE). For example:* *The source of the operational noise characteristics for the noise modelling is not identified or adequately explained.* *• The assumption that the sound level of a large rotor device can be obtained by scaling up from a small rotor device has not been demonstrated to be sound.* *• It has not been explained how the sound emanating from a single rotor is extrapolated to an array of 120 or 620 devices for the large and small rotor turbines respectively.* *• It has not been explained how the use of two noise levels from a small and large rotor source adequately considers the multiple different device types within the PDE.* *• No estimate is given of what the maximum noise disturbance range would be for an array of either small or large turbine. However, the noise model plots appear to show that it could range to approximately 17km from the centre of the array. Continuous noise disturbance at this range could*	It is important to note, NRW requested site specific underwater noise modelling, which was provided after submission (MDZ/A28.10). Underwater noise modelling had not been previously included in ES as there was insufficient information on the types of devices and potential sound levels. Therefore, the underwater noise modelling is indicative and provided as an example only. Further underwater noise modelling will be conducted once details are known of the types of devices to be deployed, which will address any outstanding concerns from NRW. However, assessments in the ES and additional underwater noise modelling note include a range of different devices, noise levels, thresholds and criteria, as a precautionary approach and to cover potential worst-case scenarios based on currently available information. All of which indicates that marine mammals will not be significantly disturbed over a wide area around the devices or array. Further underwater noise modelling will be conducted when information is available on types of devices and noise levels, number of devices, array layout, etc. This will be included as part of the development of the EMMP. If assessments indicate the potential for any significant disturbance from device type this will be reviewed as part of the EMMP process.

Reference	Document	Section	NRW Comment	Response
			potentially cause AEOSI on North Anglesey Marine SAC for the duration of the project operation."	
SOC008	NRW Statement of Case Planning Inspectorate Reference: DNS/3234121	Paragraph 19	"*The applicant proposes to use Acoustic Deterrent Devices (ADDs) as possible mitigation to deter marine mammals from colliding with the turbines. NRW will argue that the potential disturbance from ADDs has not been adequately assessed, for example:* *• There is strong evidence to support the use of considerably larger noise ranges.* *• The noise modelling is based on a single ADD, but the applicant has suggested deployment of an array of up to 40 ADDs. There is no assessment of how disturbance from a single device might be extrapolated across the array.* *• There is no information on how the ADDs will be configured in an array, and it is unclear how they might be triggered (and therefore how often and for how long they will cause disturbance on each occasion)."*	ADDs would only be activated if marine mammals were in close proximity and there is a potential risk of collision. The type(s) of ADDs to be deployed would be based on the latest technology and information to ensure adequate and effective mitigation. Activation of the ADDs and range of the ADDs would be determined to ensure the marine mammal is outwith the range of potential collision risk, but without causing any significant disturbance or increased collision risk with other devices. ADDs would only be activated for very short periods and intermittently. There would be no long term ADD activation over a wide area. Examples assessed in the ES were worst-case scenarios, however, any ADD activation is likely to be only for a very short period to make sure the marine mammals are aware of their proximity to the tidal devices. Developing the EMMP pre-construction will allow the latest technology and information to be taken into account, including lessons learned from other projects and how to develop the most effective deployment of ADDs for the Morlais site, the types and layout of the tidal devices for each phased deployment.

Reference	Document	Section	NRW Comment	Response
SOC008	NRW Statement of Case Planning Inspectorate Reference: DNS/3234121	Paragraph 20	"*NRW will argue that the operational noise disturbance assessments do not represent a realistic worst case, and there is insufficient information to allow an adequate assessment of the potential disturbance that would be caused by operational noise.*"	As much detail has been included in the assessments based on currently available information, with no indication of the potential for significant disturbance over a wide area, but adequate noise levels to allow marine mammals to detect operation turbines.

Marine Mammal Responses to NWWT Statement of Case

Table A2: Marine Mammal Responses to NWWT Statement of Case (SOC010)

Reference	Document	Section	NWWT Comment	Response
SOC010	NWWT Statement of Case	Annex 1: Marine Mammals	We raised concerns about the potential impacts on the Cardigan Bay Bottlenose dolphin population (as well as other cetaceans) as the loss of just two Bottlenose dolphins would represent approximately 1% of the population and contravenes the legal obligation to demonstrate there is no adverse impact on the Cardigan Bay SAC. We noted the potential for loss of 1 in 20 of the Bottlenose dolphins passing through the Morlais MDZ.	Menter Mon is working with NRW to establish an approach to phased deployment and adaptive management. Reducing the potential collision risk and ensuring no significant impacts in relation to bottlenose dolphin has been a key driver in the assessments and how the proposed phases could be deployed. This takes into account that bottlenose dolphin in the area are likely to be from the SACs, the small population size, sensitivity and latest information on the SACs and bottlenose dolphin in the area. Discussion are ongoing with NRW and the development of the detailed EMMP (DEMMP) post-consent will ensure no adverse effects on the SACs and bottlenose dolphin population.
SOC010	NWWT Statement of Case	Annex 1: Marine Mammals	With reference to the Additional Information, we welcome the provision of further information in the revised Outline Environmental Mitigation and Monitoring Plan on the proposed phased deployment (Document MOR/RHDHV/DOC/0072). However, we note that many of our concerns have not been addressed and would like to make the following response:	Responses below
SOC010	NWWT Statement of Case	Annex 1: Marine Mammals	We note that no new information has been provided on modelling collision risk for marine mammals, and that the developers have taken the collision rate for Bottlenose dolphin at 0.7 per year as a threshold below which there will be deemed be no significant effect on the population (paragraph 30, Phase 1). Whilst this value is being used as a trigger threshold, in reality, a risk of 0.7 per year means that two deaths in total over three years (i.e. 1% of the Cardigan Bay Bottlenose dolphin population) is an acceptable level of collision. Effectively it means in any one year the trigger is either a death of a Bottlenose dolphin (deployment and use stops) or no death (everything	The assessment conclusions are based on worst-case scenarios, conservative assumptions and without the residual effect of the proposed mitigation and monitoring discussed in the Outline EMMP (MDZ/A10). Therefore, implementation of the EMMP, which proposes an extensive suite of monitoring, will allow development of the Project to proceed without significant effects upon marine mammals. It is important to note, that the phasing and EMMP are integral elements of the project and secured through conditions of the Marine Licence and TWAO, to ensure no significant effects on the bottlenose dolphin population.

Reference	Document	Section	NWWT Comment	Response
			continues as usual). Accuracy of recording will be confounded by the fact that a killed dolphin may washup outside the zone and may not be counted, or an injured dolphin may return to its home area in Cardigan Bay and die prematurely there or elsewhere, and again not be counted. Statistically, this is a very difficult threshold to be confident about and requires 24h visual monitoring to ensure accuracy.	
SOC010	NWWT Statement of Case	Annex 1: Marine Mammals	We note with concern the statement in paragraph 132 'The absence of evidence of collision and / or evidence of avoidance of the array or of devices within the array would be expected to lead to agreement for deployment of a further phase'. With such a finely balanced collision rate as a trigger for Bottlenose dolphin, it is a concern that it will not in reality be possible to provide accurate enough monitoring data, and that the absence of evidence will be used to ensure that the next phase of the project gets the go ahead. For other cetaceans, the suggested response to a collision is to slow the devices (Table 1-1 of the OEMMP) – again we are unclear how much of a difference this would make.	The OEMMP (MDZ/A10) demonstrates Menter Môn's commitment to ensure adequate and effective monitoring and mitigation is in place for the first phase, subsequent phases and full deployment. The phased approach and the successive phases will be based on information and data from the first and previous phases. The EMMP and phased approach allows adequate time to analyse, learn and adapt from the outcomes of each stage. Data and information will be collected and analysed throughout the first phase, to validated predicted modelling and assess behavioural responses, to ensure there is no significant impact or adverse effect during deployment. This data will also be assessed so it can be used to inform the deployment of the next phase.
SOC010	NWWT Statement of Case	Annex 1: Marine Mammals	Suggestions for how monitoring will be conducted are provided in Section 6.1, paragraph 131 and Table 4-1. How will this data be analysed and under what timescale? Will scientists be employed full-time on visual and acoustic monitoring and will data analysis be same-day? Will actions be immediate or only after a quarterly assessment of data? We note that the response to an emergency situation where there is a collision or near collision is described in paragraphs 104 – 106 and that the Advisory Group will meet on an ad hoc basis to discuss such an event. The proposed decision tree needs to have an immediate action of turning the turbines off as a precaution until a decision is made as there could be a time-lag between noting the collision and the Advisory Group	Mitigation and monitoring in the EMMP (MDZ/A10) will be revised and updated as part of the post consent development of the detailed EMMP. All mitigation and monitoring options will be reviewed in light of current technical and scientific understanding prior to agreement by the Advisory Group, with final approval by Regulators / Competent Authorities, prior to deployment. Agreement of an appropriate protocol for the management of incidents will also be agreed by the advisory group during the development of the detailed EMMP post consent. The monitoring in the EMMP will be reviewed and updated as part of the ongoing development of the EMMP. All monitoring proposed for deployment will be determined based on what is most suitable for addressing the risks and uncertainties for the site, and are proven to be

Reference	Document	Section	NWWT Comment	Response
			making a decision, during which time other members of a pod of dolphins may be injured/killed.	effective and adequate based on the most recent technical and scientific understanding.
SOC010	NWWT Statement of Case	Annex 1: Marine Mammals	Concerns about the long-term impacts on the protected Cardigan Bay population of Bottlenose dolphins have not been addressed. As well as the risk of injury or death within the MDZ, should Bottlenose dolphins avoid the MDZ, they would be deprived of one of their main feeding grounds. The consequences of this for the Cardigan Bay population would need monitoring beyond the MDZ. The only new mitigation added in the latest documentation has been to limit the size of phase 1 deployment to 'between 5 and 28 devices potentially installed, and between 6 and 12 MW of capacity installed. These values will vary (i.e. could be higher or lower) depending upon the characteristics of the technology actually used.' (paragraph 30). Here the developers have retained the option of using more devices in phase 1 which remains a concern.	One aim of the monitoring outlined in the OEMMP (MDZ/A10) is to determine any potential displacement or barrier effects that could restrict access to feeding areas or increase the distance travelled between areas. If a potential impact is implied from the data, then suitable mitigation would be put in place. However, based on the assessments in the Environmental Statement (ES) (MDZ/A25.12 / MDZ/A31.14) and Information to Support HRA report (MDZ/A27.11 / MDZ/A31.16), there is no indication for the potential of any adverse effects. As outlined above, the monitoring in the EMMP will be reviewed and updated as part of the ongoing development of the DEMMP. All monitoring proposed for deployment will be determined based on what is most suitable for addressing the risks and uncertainties for the site, and are proven to be effective and adequate based on the most recent technical and scientific understanding.
SOC010	NWWT Statement of Case	Annex 1: Marine Mammals	We also wish to note that the outline monitoring questions in Table 2-2 are confined to monitoring in the MDZ. Given that the whole Cardigan Bay population could be at risk, we think it is essential that population changes are monitored on a wider scale, including further south in the Bay and further around the Anglesey and NW Wales coasts. It is also a concern that if the collision damage monitoring is not accurate enough, fatal or injury-inducing collisions may not actually be picked up and associated changes to the whole Cardigan Bay population may not be detected.	

Reference	Document	Section	NWWT Comment	Response
SOC010	NWWT Statement of Case	Annex 1: Marine Mammals	In summary, we wish to re-state our comment from our previous submission that: 'It has been clearly demonstrated that the development has the potential to adversely impact the integrity of Cardigan Bay SAC and there is therefore a legal requirement to demonstrate ''No adverse impact on Cardigan Bay SAC''. Failure to do so would mean that the development cannot proceed.' Furthermore, we do not believe that the revised OEMMP meets the following requirements of the Marine Licencing Team (letter to Menter Môn, dated 5/6/20): 'It is essential to understand how the monitoring and mitigation is going to be implemented. Thus, sufficient information must be presented in order for us to determine, beyond reasonable scientific doubt, that an adverse effect on these features can be ruled out.'; and 'The OEMMP has stated that the results of monitoring work would be subject to regular review. However, recognising the significance of a single collision event upon a Bottlenose dolphin it is essential that the EMMP makes clear whether the monitoring has a live/real time feedback mechanism or if the intention is only to review monitoring outputs at particular intervals'.	The draft Marine Licence and TWAO condition regarding the EMMP states that the intention of the EMMP is to prevent injury to marine mammals and diving birds during the operation of tidal devices at Morlais. No tidal device(s) may be constructed or repowered until a Detailed EMMP has been submitted to and approved in writing by NRW. NRW must not approve any DEMMP unless it is satisfied that it provides such mitigation as is necessary to avoid adversely affecting the integrity of a European Site (as defined in The Conservation of Habitats and Species Regulations 2017 or The Conservation of Offshore Marine Habitats and Species Regulations 2017) to the extent that marine mammals or diving birds are a protected feature of that European Site.
SOC010	NWWT Statement of Case	Monitoring and Mitigation	We requested that the phased approach would include sufficient time to analyse data, learn and adapt from the outcomes of each stage before the next phase is started. We also raised concerns about the use of Acoustic Deterrent Devices (ADD) as a mitigating option and the monitoring methods described.	Noted, please see responses below
SOC010	NWWT Statement of Case	Monitoring and Mitigation	With reference to the Additional Information, we welcome the inclusion of some further clarification in the Outline Environmental Mitigation and Monitoring Plan on the proposed phased deployment (Document MOR/RHDHV/DOC/0072). We wish to make the following comments:	Response below

Reference	Document	Section	NWWT Comment	Response
SOC010	NWWT Statement of Case	Monitoring and Mitigation	We do not believe that the additional documentation as currently provided meets the following requirements of the Marine Licencing Team request (letter to Menter Môn, dated 5/6/20): 'Certain topics such as offshore archaeology and cultural heritage, summarise mitigation whereas others (e.g. marine ornithology; marine mammals etc.) do not provide any indication of the key mitigation measures.'; and 'Such detail is required to provide certainty that mitigation and monitoring measures are realistic, effective, sufficient, deliverable and follow appropriate due process.'	The adaptive management approach using phased deployment, which will be delivered through the EMMP will ensure that impacts are acceptable for marine ornithology and marine mammals. The Outline EMMP (MDZ/A10) has been updated since submission following ongoing discussions with NRW and will continued to be updated as a working document post consent to ensure impacts on marine mammals are mitigated appropriately
SOC010	NWWT Statement of Case	Monitoring and Mitigation	We remain concerned that the timescale is largely unaltered from the second consultation and that the example of deployment is referred to as 'indicative' in Table 9-1. The use of 'indicative' timescales is at odds with the requirements specified by the Marine Licencing Team in their letter dated 5/6/20 that requests that 'all further information which provides essential evidence in support of your application is provided to enable us to complete our assessment'. Should the Inspectorate give consent for the Morlais development, we request that providing monitoring of impacts on wildlife is adequate, consent is only given at this stage to develop Phase 1 followed by Phase 2 deployments (totalling 14 MW and 40 MW capacity, respectively). We recommend a further consenting process after completion of Phases 1 and 2 that would include a full cost benefits analysis for environmental and economic factors. Only if the benefits outweigh the costs, should permission for deployment to a larger scale of 100 MW (Phase 3) and 240 MW (Phase 4) be sought. At this point, there should be sufficient information on the efficiency and productive power of the generators to consider whether the further associated environmental impacts with a full-scale deployment could be justified, and whether tidal stream energy is a financially viable source of energy compared to wind energy given the	The draft Marine Licence and TWAO conditions, legally securing the EMMP, ensure that no tidal device(s) may be constructed or repowered until a Detailed EMMP has been submitted to and approved in writing by NRW. This allows the full project to be consented now, whilst also securing that appropriate information must be provided at each phase such that NRW is satisfied that it provides such mitigation as is necessary to avoid adversely affecting the integrity of a European Site. As outlined above, the EMMP is Menter Môn's commitment for the Morlais project to ensure adequate and effective monitoring and mitigation. The phased approach and the successive phases will be based on information and data from the first and previous phases. The EMMP and phased approach allows adequate time to analyse, learn and adapt from the outcomes of each stage. Data and information will be collected and analysed throughout the first phase, to validated predicted modelling and assess behavioural responses, to ensure there is no significant impact or adverse effect during deployment. This data will also be assessed so it can be used to inform the deployment of the next phase.

Reference	Document	Section	NWWT Comment	Response
			strike prices at that time, and future projections for these prices. A requisite of an initial consent for Phases 1 and 2 would be appropriate and detailed monitoring of impacts including baseline assessments, assessments during construction and operation of the devices and associated infrastructure. As yet, we are not convinced that the monitoring described in the OEMMP is sufficient, nor is clarity provided on when it will commence (see comments below).	
SOC010	NWWT Statement of Case	Monitoring and Mitigation	We would like to re-state our offer to have a seat on the Advisory Group. We note that whilst RSPB is specifically mentioned in paragraph 95 as a potential member of the Advisory Board, NWWT is not currently listed.	Noted. The Advisory Group members will be agreed with NRW
SOC010	NWWT Statement of Case	Monitoring and Mitigation	We would also welcome further discussion as stated in Paragraph 20 on the development of the OEMMP prior to consent.	Noted
SOC010	NWWT Statement of Case	Monitoring and Mitigation	We remain concerned about the use of acoustic deterrents around operating tidal devices (Tier 2 mitigation response, Paragraph 39 of the OEMMP) adding further marine noise to that generated by the turbines. This appears to be the only effective mitigating option being considered for deployment in relation to marine mammals. Although they are often necessary to avoid injury impacts, they do increase disturbance and anthropogenic noise into the marine environment far beyond the MDZ and therefore we only support their use when absolutely necessary to do so. It is unclear how the slowing of devices mentioned in Tier 3 would make any difference.	Mitigation measures in the OEMMP (MDZ/A10) will be revised and updated as part of the ongoing development of the DEMMP post consent. All mitigation measures proposed for deployment will be reviewed in light of the latest technical and scientific understanding prior to agreement by the Advisory Group, with final approval by the Regulators / Competent Authorities, prior to deployment. Currently it is proposed that a series of potential mitigation measures will be agreed pre deployment and will form a tiered hierarchy of mitigation available to the Advisory Group. ADDs would only be activated if marine mammals were in close proximity and there is a potential risk of collision. The type or types of ADDs to be deployed will be based on the latest technology and information to ensure adequate and effective mitigation. Activation of the ADDs and range of the ADDs would be determined to ensure the marine mammal is outwith the range of potential collision risk, but without causing any significant disturbance or

Reference	Document	Section	NWWT Comment	Response
				increased collision risk with other devices. ADDs would only be activated for very short periods and intermittently. There would be no long term ADD activation over a wide area. Examples assessed in the ES represented highly conservative worst-case scenarios, however, any ADD activation is likely to be only for a very short period to make sure the marine mammals are deterred from the tidal devices. Developing the DEMMP pre-construction will allow the latest technology and information to be taken into account, including lessons learned from other projects and how to develop the most effective deployment of ADDs for the Morlais site, in light of the types and layout of the tidal devices for each phased deployment. Rotor speed is a key parameter in the collision risk model. Studies indicate that the risk of serious injury or mortality increases with blade speed (Thompson et al., 2016; Onoufriou et al., 2019). Therefore, slowing of the devices could reduce the potential impact form any collision.
SOC010	NWWT Statement of Case	Monitoring and Mitigation	We note that Document MOR/RHDH/DOC/0072 states under 2.6 Outline monitoring indicators, para 76 and 77, that monitoring indicators and related questions are agreed prior to consent. What is the mechanism for this decision process, as we are already in that phase? We strongly recommend that monitoring methodology, including visual surveying, is agreed very quickly and commences as soon as possible so that there is sufficient baseline data available for appropriate decision making on impacts once construction is underway and the devices become operational.	This will be reviewed as part of the post consent development of the detailed EMMP and discussed and agreed with the Advisory Group, as to what would be the most appropriate and effective monitoring techniques.
SOC010	NWWT Statement of Case	Monitoring and Mitigation	The only change made to Table 2-1 (Outline Monitoring Indicators) has been to add the phrase ‘mitigation efficacy’ under applicable monitoring subjects for each indicator. No indication of what this means is given. We recommended the inclusion of marine mammals under for indicator I7, but this update has not been made. As mentioned above, all	Noted, this will be reviewed as part of the post consent development of the DEMMP.

Reference	Document	Section	NWWT Comment	Response
			of the indicators in this Table appear to be only being monitoring during and/or post deployment of the devices. We suggest that background data is collected during the period from consent to the end of the proposed post consent and pre-deployment phase in December 2023 (assuming the indicative timescale in Appendix 3 is adhered to).	