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# Morlais Project Environmental Statement

## Chapter 5: EIA Methodology

### Volume I

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## GLOSSARY OF ABBREVIATIONS

CIA	Cumulative Impact Assessment
CIEEM	Chartered Institute of Ecology and Environmental Management
EIA	Environmental Impact Assessment
ES	Environmental Statement
HRA	Habitats Regulations Assessment
IEMA	Institute of Environmental Management and Assessment
IoACC	Isle of Anglesey County Council
MHCLG	Ministry for Housing, Communities and Local Government
MMO	Marine Management Organisation
NRW	Natural Resources Wales
PDE	Project Design Envelope
TWAO	Transport and Works Act Order
UK	United Kingdom
WG	Welsh Government

## 5. EIA METHODOLOGY

### 5.1. INTRODUCTION

1. This chapter of the Environmental Statement (ES) describes the Environmental Impact Assessment (EIA) process and the methodology used throughout the ES assessment chapters for the Morlais Project (the Project).
2. The purpose of the EIA is to inform the decision-maker, stakeholders and all interested parties of any significant environmental issues that may result from the Project during its construction, operation and (where relevant) decommissioning. The EIA provides an independent assessment of the Project to enable interested parties to understand such potential impacts before making decisions on whether consent for the Project should be granted.
3. This section sets out the approach for the assessment of impacts which has been adopted within this ES. In summary, this chapter presents:
  - Details of the guidance followed throughout the EIA;
  - A summary of the EIA process;
  - The approach adopted to define the baseline environment (specific details are provided for each environmental topic considered in the relevant chapter);
  - The generic approach taken to assess potential impacts, including the evaluation of significance (where a different approach has been adopted for a specific topic, this is set out in the relevant chapter);
  - The generic approach taken to the derivation of mitigation measures and the assessment of residual impacts; and
  - The approach taken to the assessment of potential cumulative impacts.
4. This chapter provides an overview of the generic approach taken to impact assessment across all EIA topics. It should be noted that topic specific methodology is covered in each technical chapter (**Chapters 7 to 26**) as the exact methodology for the receptors of each topic need to be relevant to those receptors (e.g. in terms of definitions of sensitivity or magnitude of effect).

### 5.2. EIA GUIDANCE

5. As discussed in **Chapter 2, Policy and Legislation**, the legislative framework for EIA is set by Directive 97/11/EC ("the EIA Directive"). This Directive has been transposed into UK law through a number of regulations applicable to different categories of development, which require an EIA to be undertaken to support the consent application.
6. The following consents are required for the Project:
  - A Marine Licence under the Marine and Coastal Access Act 2009;
  - A Transport and Works Act Order under the Transport and Works Act 1992.
7. The requirement to comply with the EIA Directive is transposed into law by amendments to the Transport and Works Act 1992 and Transport and Works (Applications and Objections

Procedure) (England and Wales) Rules 2006 and the Marine Works (EIA) (Amendment) Regulations 2017. The Project also falls under the Marine and Coastal Access Act (2009).

8. For applications under the Transport and Works Act 1992, including deemed planning permission, the consenting body will be the Welsh Government, while for Marine Licenses under the Marine Coastal and Access Act (2009), Natural Resources Wales (NRW) are the licensing body.
9. This EIA has been undertaken in accordance with the requirements of the above regulations and has taken into account key policies, legislation, guidance and advice, including but not limited to the following:
  - Ministry for Housing, Communities and Local Government (MHCLG) “Guidance: Environmental Impact Assessment” (2017);
  - Chartered Institute of Ecology and Environmental Management (CIEEM) “Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine” (2018);
  - Institute of Environmental Management & Assessment (IEMA) “Guidelines for Environmental Impact Assessment” (2017);
  - Planning Policy Wales (2018);
  - Draft Welsh National Marine Plan (2017); and
  - The Wildlife and Countryside Act 1981.
10. It is noted that this list of guidance is not exhaustive and the relevant guidance adopted for the assessment of each environmental parameter is described in the relevant topic chapter.

### 5.3. THE EIA PROCESS

#### 5.3.1. Process Overview


11. EIA is a systematic process, which identifies the potential effects of proposed works and how these translate into impacts upon the receiving environment. This process includes an assessment of the likely significance of any potential impacts and the identification of a range of suitable mitigation options and management measures. The EIA process is designed to be as transparent as possible incorporating an ongoing consultation process with statutory and non-statutory consultees. The EIA process has a number of distinct stages as follows:
  - **Scoping** – a formal process requesting an opinion on the Project from statutory consultees, coordinated by the Welsh Government (WG). The scoping process also identifies the existing environmental data present and the key issues at the site, thereby identifying any additional studies that are required for their assessment;
  - **Baseline studies** – undertaken to identify the current status of the receiving environment and to identify the requirement to carry out further desk and field studies;
  - **Project definition** – development of the project details under a Rochdale Envelope or Project Design Envelope (see **Chapter 4, Project Description** for more information on

project definition and **Chapter 2, Policy and Legislation** for more information on the Rochdale Envelope approach);

- **Assessment of impacts** – the assessment of the significance of the potential impacts related to the Project, as well as the proposed mitigation and the resulting residual impacts;
- **Environmental reporting** – compilation of the ES and the supporting documentation (e.g. appendices and technical reports); and
- **Submission and consenting** – the submission of the ES, information to support a Habitats Regulations Assessment (HRA), and the appropriate consent applications. These documents go through a determination process with the appropriate consenting body.

12. The EIA is based on the expert judgement of technical specialists, following an appraisal of the parameters included in the Rochdale or Project Design Envelope (PDE) as described in **Chapter 4, Project Description**. The process is outlined in **Table 5-1**.

**Table 5-1 Stages of the ES Preparation**

Stage	Task	Aim/Objective	Work/Output (Examples)
 EIA	Consultation – throughout EIA process	Consult with statutory and non-statutory organisations	Local knowledge and information
	Primary Data Collection	To identify the baseline/ existing environment	Background data including existing literature and specialist studies
	Specialist Studies	To further investigate those environmental parameters which may be subject to potentially significant effects	Specialist reports (e.g. hydrodynamic modelling and archaeological assessment)
	Impact Assessment	To evaluate the baseline environment in terms of sensitivity To evaluate and predict the impact (i.e. magnitude) upon the baseline To assess the resultant effects of the above impacts (i.e. determine significance)	Series of significant adverse and beneficial impacts
	Mitigation Measures and Monitoring Requirements	To identify appropriate and practicable mitigation measures and enhancement measures and outline any recommended monitoring.	The provision of solutions to avoid offset or reduce adverse impacts (e.g. sensitive scheduling to avoid noise and traffic impacts) Feedback into the design process, as applicable.
	Draft ES	Production of the ES in accordance with EIA guidance	ES
	Finalise ES	Submission of the ES to WG	ES

13. EIA is a tool for systematically identifying, examining and assessing the impacts and effects of the construction, operational and, if applicable, decommissioning phases of the proposed scheme on the environment. The process of identifying and assessing the environmental impacts of the proposed Project is iterative, running in parallel with the project design. Where any of the potential impacts are identified as being significantly adverse then, where possible,

the design will be altered to mitigate these impacts. Consultation is ongoing throughout the EIA process and contributes to the identification of both impacts and associated mitigation measures.

14. The formal reporting mechanism for an EIA is the ES. In accordance with regulations, the ES should include such information as is reasonably required to assess the likely significant environmental effects of the proposed scheme and which the applicant can reasonably be required to compile. **Table 5-2** summarises the information requirements and where these can be found within the ES.

**Table 5-2 Information Requirements of an ES**

<b>Information Required for Inclusion in the ES</b>	<b>Reference within the ES</b>
<ul style="list-style-type: none"> <li>A description of the Project and of the regulated activity, including in particular: <ul style="list-style-type: none"> <li>A description of the location of the Project and the regulated activity;</li> <li>A description of the physical characteristics of the whole Project and regulated activity, including where relevant, requisite demolition works, and the land-use requirements during the construction and operational phases;</li> <li>A description of the main characteristics of the operational phase of the Project and the regulated activity (in particular any production process);</li> <li>An estimate, by type and quantity, of expected residues and emissions resulting from the operation of the proposed Project and the regulated activity.</li> </ul> </li> </ul>	<b>Chapter 4, Project Description</b>
<ul style="list-style-type: none"> <li>A description of the reasonable alternatives.</li> </ul>	<b>Chapter 3, Site Selection and Consideration of Alternatives</b>
<ul style="list-style-type: none"> <li>A description of the relevant aspects of the current state of the environment (baseline scenario).</li> </ul>	<b>Chapters 7 to 26</b>
<ul style="list-style-type: none"> <li>A description of the factors likely to be significantly affected by the Project and the regulated activity: population, human health, biodiversity, land, soil, water, air, climate, material assets, cultural heritage, including architectural and archaeological aspects, and landscape.</li> </ul>	<b>Chapters 7 to 26</b>
<ul style="list-style-type: none"> <li>A description of the likely significant effects of the Project and the regulated activity on the environment.</li> </ul>	<b>Chapters 7 to 26</b>
<ul style="list-style-type: none"> <li>The description of the likely significant effects on the factors must cover the direct effects and any indirect, secondary, cumulative, transboundary, short-term, medium-term and long-term, permanent and temporary, positive and negative effects of the Project and the regulated activity. This description must take into account the environmental protection objectives established at Union or member State level which are relevant to the Project and the regulated activity.</li> </ul>	<b>Chapters 7 to 26</b>
<ul style="list-style-type: none"> <li>A description of the forecasting methods or evidence used to identify and assess the significant effects on the environment including details of</li> </ul>	<b>Chapters 7 to 26</b>



Information Required for Inclusion in the ES	Reference within the ES
difficulties encountered compiling the required information and the main uncertainties involved.	
<ul style="list-style-type: none"> <li>A description of the measures envisaged to avoid, prevent, reduce or if possible offset any identified significant adverse effects on the environment and, where appropriate, of any proposed monitoring arrangements.</li> </ul>	<b>Chapters 7 to 26</b> , Outline Construction Environment Management Plan ( <b>Document MOR/RHDHV/DOC/0073</b> ) and Outline Environment Mitigation and Monitoring Plan ( <b>Document MOR/RHDHV/DOC/0072</b> )
<ul style="list-style-type: none"> <li>A description of the expected significant adverse effects of the Project and the regulated activity on the environment deriving from the vulnerability of the Project and the regulated activity to risks of major accidents or disasters which are relevant to the Project and the regulated activity concerned.</li> </ul>	<b>Chapters 7 to 26</b>
<ul style="list-style-type: none"> <li>A non-technical summary.</li> </ul>	<b>Non-Technical Summary</b>
<ul style="list-style-type: none"> <li>A reference list detailing the sources used for the descriptions and assessments included in the report.</li> </ul>	<b>Chapters 7 to 26</b>

15. The approach adopted in the EIA process for the Project is summarised in the following sections. It should be noted that these stages are not necessarily consecutive and may overlap. For example, iterative design changes may be made in light of emerging findings of the EIA process to prevent or reduce the significance of a potential impact. This would then require re-assessment of the potential impact, potentially informed by further survey work to adequately describe the baseline environment.

### 5.3.2. Screening

16. An inception meeting regarding the Project's proposed consenting route was undertaken with the Planning Inspectorate and the Welsh Government on 15th March 2018 at which the need for EIA to support consent applications was confirmed and appropriate consenting requirements for the Project were agreed. Following discussions within this meeting, Menter Môn is seeking to consent via the following legislative mechanisms:
- Transport and Works Act 1992 because the Project has the potential to interfere with rights of navigation in waters up to the limits of the territorial sea); and
  - Marine and Coastal Access Act 2009 as the Project will involve the placement of materials on and above the seabed.
17. A detailed summary of the legal framework for the Project is provided in **Section 2, Policy and Legislation**.

### 5.3.3. Scoping

18. The purpose of the scoping process is to identify the principal environmental issues at the earliest possible stage of the development process through responses from the regulators and their consultees. This assists in the appropriate targeting of the assessment studies and the

identification of which elements of the Project have the potential to cause significant environmental impacts.

19. The consultation process may identify mitigation measures and, where practicable, take account of the view of consultees to alter the project design, thereby avoiding or reducing any environmental or human impacts. Menter Môn regards the consultation process as being important to the success of the Project and have therefore undertaken a significant amount of public and stakeholder engagement, as well as additional consultation with statutory consultees beyond the scoping and submission processes. The consultation undertaken and key topics covered are detailed in **Chapter 6, Consultation**.
20. Regulation 8 of the Transport and Works (Applications and Objections Procedure) (England and Wales) Rules 2006 outlines that before submitting an application in relation to works for which an EIA is or may be required, the applicant may request in writing to the Secretary of State his opinion as to the information to be provided in the ES (a scoping opinion).
21. Two earlier scoping reports have previously been submitted to NRW, the Marine Management Organisation (MMO) and the IoACC; however, these are now superseded as a result of further development in the project design concept. The proposed installed capacity of the Project has been increased in response to industry demand, and the Project is now seeking consent for an array of up to 240 MW capacity and associated supporting infrastructure.
22. As a result, a third Scoping Report (superseding previous Scoping Reports) was produced by Royal HaskoningDHV on behalf of Menter Môn and submitted to the Welsh Government, with a request for screening and scoping opinion, by Menter Môn on 6th April 2018.
23. A version of the Scoping Report was also sent to NRW with a request for Scoping Opinion to inform an EIA as required under The Marine Works (Environmental Impact Assessment) Regulations 2007, as amended by The Marine Works (Environmental Impact Assessment) (Amendment) Regulations 2017.
24. RHDHV and MarineSpace have ensured the ES clearly demonstrates how the comments received from the regulators and their statutory consultees for both key consents (Transport and Works Act Order (TWAo) and Marine Licence) are addressed. This is done via a 'signposting' table outlining the scoping response received and the location within the ES where the comment is addressed.
25. Each technical chapter (**Chapters 7 to 26**) outlines the key issues pertinent to that issue which have been identified through the scoping process.

#### **5.3.4. Environmental Statement**

##### **5.3.4.1. Environmental Baseline**

26. The term 'baseline environment' is used to describe the nature, scale, condition, and other relevant information to provide a detailed description of a given environmental receptor that falls within the scope of the ES.

27. Characterisation (a description) of the baseline environment has been undertaken in order to determine the baseline conditions in the area covered by the Project and relevant study areas. This has been undertaken following the steps below. These steps are also detailed further within each assessment chapter, where relevant:
- Definition of study areas for each receptor, based on the relevant characteristics of the receptor;
  - Review of available information;
  - Review of likely or potential impacts that might be expected to arise from the Project;
  - Review of whether sufficient information is available to make EIA judgements with sufficient confidence;
  - If further data is required, ensure data are gathered, targeted and directed at filling key data gaps; and
  - Review further data to ensure sufficient information is available to make EIA judgements with sufficient confidence.
28. Within this ES, the description of the baseline environment consists of the following aspects:
- the spatial location and extent of the environmental features or receptors;
  - a description of the environmental features or receptors and their character;
  - the context of the environmental features or receptors in terms of rarity, function, and population at the local, regional and national level;
  - the sensitivity of the environmental features or receptors in relation to physical, chemical or biological changes; and
  - the value of the environmental features or receptors (e.g. designated status).
29. A wide range of information has been gathered and activities undertaken to define the baseline environment and likely receptors. These data sources are detailed in each chapter and include, but are not limited to the following:
- Desk-based review of existing published data;
  - Data provided by consultees; and
  - Field survey and site investigation information.
30. The results of the environmental baseline studies are outlined in **Chapters 7 to 26** of this ES.

#### **5.3.4.2. Project Design Envelope**

31. An essential element of any EIA is defining the project description against which impacts will be assessed. Due to the nature of the Project and the evolving nature of the tidal energy sector, full details of the proposed Project are not available at the time of the application. Therefore, the project description and methods upon which this application for consent is based, fall within a range of defined criteria. This Project Design Envelope approach, often referred to as a 'Rochdale Envelope', allows a degree of flexibility in determining the final specific Project details,

while still meeting the requirements of the EIA process. This approach is outlined in more detail in **Chapter 2, Policy and Legislation**.

32. The approach defines a series of realistic maximum extents and magnitudes for the description of a development, so that a realistic 'worst case scenario' is assessed. **Chapter 4, Project Description** sets out the parameters of the Project which form the basis of the ES. Each technical chapter (**Chapters 7 to 26**) provides an outline of the relevant worst case for that receptor. Post consent, a detailed design of the scheme can vary within that envelope, without rendering the EIA inadequate. By adopting this approach, the ES can conclude that the environmental impact of the Project will be no greater than that set out in the ES and may actually be less.

#### **5.3.4.3. Impact Assessment**

33. The approach to making balanced assessments for the Project has been guided by Royal HaskoningDHV, MarineSpace and technical specialists using available data, new data, experience and expert judgement. In order to provide a consistent framework and system of common tools and terminology, a matrix approach has been used to frame and present the judgements made.
34. This section sets out the assigned definitions that are used in the assessment process for a number of topics considered in the ES. For each topic of the EIA, the most relevant and latest guidance or best practice has been used and therefore definitions of sensitivity and magnitude of impact are tailored to each receptor. A description of the approach taken to the specific impact assessment for each environmental receptor is provided (in each relevant chapter) so that it is clear to the reader how impacts have been defined, particularly where such an approach differs to that described within this section.
35. The impact assessment considers the potential for impacts during the construction, operation and maintenance, and decommissioning phases of the Project.
36. EIA provides an assessment of the impacts on sensitive receptors as a result of the effects of a development upon the environment. The terms 'effects' and 'impacts' have, in the past, been used interchangeably, but they are in fact different and one drives the other. Effects are physical changes in the environment that are set in motion as a consequence of a particular development or activity. Effects do not impact all receptors, as some receptors are not always sensitive to them.
37. Effects are measurable physical changes in the prevailing environment (e.g. volume, time and area) arising from construction and operation activities. Effects can be classified as primary (e.g. the physical presence of a built element of the development) or secondary (e.g. increase in erosion due to a change in the rate of discharge of surface water). Impacts consider the possible changes in potentially sensitive receptors as a result of an effect.

38. Impacts can be classified as follows:

- Direct impacts: these may arise from impacts associated with the construction, operation and maintenance, or decommissioning of the Project;
- Indirect impacts: these may be experienced by a receptor that is removed (e.g. in space or time) from the direct impact (e.g. noise impacts upon fish which are a prey resource for fish or mammals).
- Inter-relationships between impacts; or
- Cumulative impacts: these may occur as a result of the Project in conjunction with other existing or planned projects within the study area for each receptor.

39. The EIA framework used herein is based on the 'source-pathway-receptor' conceptual model process used to provide a systematic and auditable approach to understanding the potential for effects to arise, the spatial extents of the effect-receptor interactions, impact pathways, and potential impact significance. The conceptual 'source-pathway-receptor' model is effective in the identification of potential effects and the means by which these can manifest themselves on the receiving environment and its sensitive receptors.

40. The term 'source' describes the origin of potential effects (e.g. construction activities) and the term 'pathway' describes the means (e.g. through air, water, or ground) by which the effect reaches the receiving sensitive 'receptor' (e.g. terrestrial habitats, archaeology and human receptors). If the source, pathway or receptor is absent, no linkage exists and thus there will be no potential for an impact to manifest.

41. For each effect, the assessment identifies receptors within the study area that are sensitive to that effect and implements a systematic approach to understand the impact pathways and the level of impacts on given receptors. The process considers the following:

- The sensitivity of a receptor to the effect;
- The probability that an effect-receptor interaction will occur;
- The magnitude of the effect;
- The determination and (where possible) qualification of the level of impact on a receptor, considering the probability that the effect-receptor interaction will occur, the spatial and temporal extents of the interaction and the significance of the resulting impact; and
- The level of certainty at all stages.

#### 5.3.4.3.1. Receptor Sensitivity

42. All receptors will exhibit a degree of sensitivity to the changes brought about by the Project and defining receptor 'sensitivity' as part of the definition of the baseline environment helps to ensure that the subsequent assessment is transparent and robust. The characterisation of the existing environment helps to determine the receptor sensitivity in order to assess the potential impacts upon it.

43. The ability of a receptor to adapt to change, tolerate, and/or recover from potential impacts is key in assessing its sensitivity to the impact under consideration. For ecological receptors, tolerance could relate to short term changes in the physical environment; for human environment receptors, tolerance could relate to impacts upon socio-economics or health impacts. The time required for recovery is an important consideration in determining receptor sensitivity.
44. The overall receptor sensitivity is determined by considering a combination of value, adaptability, tolerance and recoverability. This is achieved through applying known research and information on the status and sensitivity of the feature under consideration coupled with professional judgement and past experience.
45. In summary, the sensitivity of a receptor is a function of its capacity to accommodate change and reflects its ability to recover if it is affected, and is defined by the following factors:
  - Vulnerability: whether a particular effect has the ability to impact a receptor;
  - Adaptability: the degree to which a receptor can avoid or adapt to an effect;
  - Tolerance: the ability of a receptor to accommodate temporary or permanent change without a significant adverse effect;
  - Recoverability: the temporal scale over, and extent to, which a receptor will recover following an effect; and
  - Value: a measure of the receptor's conservation importance, rarity and worth (see **Section 5.3.4.3.2**).
46. In order to define the sensitivity of a receptor, the guidelines presented in **Table 5-3** have been adopted in this ES.

**Table 5-3 Definitions of the Sensitivity Levels for Environmental Receptors**

Sensitivity	Description
High	Individual receptor has very limited capacity to avoid, adapt to, accommodate or recover from the anticipated impact.
Medium	Individual receptor has limited capacity to avoid, adapt to, accommodate or recover from the anticipated impact.
Low	Individual receptor has some tolerance to avoid, adapt to, accommodate or recover from the anticipated impact.
Negligible	Individual receptor is generally tolerant to and can accommodate or recover from the anticipated impact.

47. It should be noted that the sensitivity criterion is a composite one; combining value (see **Section 5.3.4.3.2**) with sensitivity. In some instances, the inherent value of a receptor is recognised by means of designation, and the 'value' element of the composite criterion recognises and gives weight in the assessment to that designation. However, irrespective of the recognised value, all receptors will exhibit a greater or lesser degree of sensitivity to the potential changes brought about by the proposed scheme. It should be noted that the assessment of sensitivity is a matter of judgement applied by professional experts based on the receptors within the relevant study area.



48. Sensitivity to potential impacts is considered for each species, using available evidence including published data sources. The conclusions reached regarding the sensitivity of receptors have been presented in the baseline sections of each technical chapter (**Chapters 7 to 26**).

#### 5.3.4.3.2. Receptor Value

49. Receptor value considers whether, for example, the receptor is rare, has protected or threatened status, has importance at a local, regional, national or international scale, and in the case of biological receptors whether the receptor has a key role in the ecosystem function.
50. The 'value' of a receptor forms an important element within the assessment, for instance, if the receptor is a protected species or has an economic value its value may be greater than otherwise.
51. It is important to understand that high value and sensitivity are not necessarily linked within a particular impact. A receptor could be of high value (e.g. an Annex II species), but have a low or negligible sensitivity to an effect. Similarly, low value does not equate to low sensitivity and is judged on a receptor by receptor basis. The value of the feature or receptor is a function of a range of factors (e.g. biodiversity value, social/community value and economic value).
52. Value will be considered, where relevant, as a modifier for the sensitivity assigned to the receptor, based on expert judgement. **Table 5-4** provides definitions for the value afforded to a receptor based on its legislative importance.

**Table 5-4 Definitions of the Value Levels**

Value	Definition
High	Internationally or nationally important. Internationally protected species that are listed as a qualifying interest feature of an internationally protected site (i.e. Annex II protected species designated feature of a European designated site) and protected species (including EPS) that are not qualifying features of a European designated site.
Medium	Regionally important or internationally rare. Protected species that are not qualifying features of a European designated site, but are recognised as a Biodiversity Action Plan (BAP) priority species either alone or under a grouped action plan, and are listed on the local action plan relating to the marine mammal study area.
Low	Locally important or nationally rare. Protected species that are not qualifying features of a European designated site and are occasionally recorded within the study area in low numbers compared to other regions.
Negligible	Not considered to be particularly important or rare Species that are not qualifying features of a European designated site and are never or infrequently recorded within the study area in very low numbers compared to other regions.

53. In addition to legislative factors, a range of other characteristics will be considered in the categorisation of importance, for example:
- Species or sub-species that are rare or uncommon, either internationally, nationally or more locally, including those that may be seasonally transient;
  - Endemic species or locally distinct sub-populations of a species;
  - Size of habitat or species population;

- Species in decline;
- Species rich assemblages;
- Large populations of species or concentrations of species considered uncommon or threatened in a wider context; and
- Species on the edge of their range, particularly where their distribution is changing as a result of global trends and climate change.

54. The value or potential value of a receptor or feature can be determined within a defined geographical context, for example, the following hierarchy to describe value is recommended by the Chartered Institute of Ecology and Environmental Management (CIEEM) (2016) with respect to ecological receptors:

- International and European;
- National;
- Regional;
- Metropolitan, County, vice-county or other local authority-wide area; and
- Local (e.g. assessment within a district or borough context or within a 'zone of influence').

55. Value is considered for each receptor, using available evidence including published data sources. The conclusions reached regarding the value of receptors have been presented in the baseline sections of each technical chapter (**Chapters 7 to 26**).

#### 5.3.4.3.3. The Magnitude of Effect

56. In order to predict the significance of an impact, it is fundamental to establish the magnitude and probability of an impact occurring through a consideration of (CIEEM, 2018):

- Scale or spatial extent: the area over which an effect occurs (small scale to large scale or a few individuals to most of the population);
- Duration: the time for which the effect occurs (short term to long term);
- Likelihood of impact occurring;
- Frequency: how often the effect occurs;
- Nature of change relative to the baseline: positive or negative; and
- Reversibility: the degree of change relative to existing environmental conditions.

57. The categorisation of some of these elements is not always appropriate or required, and may rely on expert opinion.

58. The categorisation of duration for topics considered within this ES is presented in **Table 5-5**.



**Table 5-5 Definitions of Temporal Scale of Magnitude**

Temporal Scale	Definition
Permanent	Impacts continuing indefinitely beyond the span of one human generation (taken as approximately 25 years), except where there is likely to be substantial improvement after this period.
Long term	Approximately 15 - 25 years or longer (refer to above).
Medium term	Approximately 5 - 15 years.
Short term	Up to approximately 5 years.

59. In order to help define impact magnitude, the criteria presented in **Table 5-6** have been adopted for the purposes of this EIA. While **Table 5-6** provides guidelines of a generic nature, it should be noted that more specific guidelines in relation to impact magnitude have been adopted for topics (i.e. marine ornithology and marine mammals), where considered necessary.

**Table 5-6 Generic Guidelines used in the Determination of Magnitude of Effect**

Magnitude	Description
Very high	Loss of resource and/or integrity of the resource; severe damage to key characteristics, features or elements (adverse). Permanent / irreplaceable change, which is certain to occur.  Large scale improvement of resource or attribute quality; extensive restoration or enhancement (beneficial).
High	Loss of resource, but not affecting integrity of the resource; partial loss of or damage to key characteristics, features or elements (adverse). Permanent / irreplaceable change, which is likely to occur.  Improvement to, or addition of, key characteristics, features or elements of the resource; improvement of attribute quality (beneficial).
Medium	Minor loss of, or alteration to, one (maybe more) key characteristics, features or elements; measurable change in attributes, quality or vulnerability (adverse). Long-term though reversible change, which is likely to occur.  Minor improvement to, or addition of, one (maybe more) key characteristics, features or elements of the resource; minor improvement to attribute quality (beneficial).
Low	Very minor loss of, or alteration to, one (maybe more) key characteristics, features or elements; noticeable change in attributes, quality or vulnerability (adverse). Short- to medium-term though reversible change, which could possibly occur.  Very minor improvement to, or addition of, one (maybe more) key characteristic, feature or element; very minor improvement to attribute quality (beneficial).
Very low	Temporary or intermittent very minor loss of, or alteration to, one (maybe more) characteristic, feature or element; possible change in attributes, quality or vulnerability (adverse). Short-term, intermittent and reversible change, which is unlikely to occur.  Possible very minor improvement to, or addition of, one (maybe more) characteristic, feature or element; possible improvement to attribute quality (beneficial).

#### 5.3.4.3.4. Impact Significance

60. Subsequent to establishing the sensitivity and magnitude, the impact significance is predicted by using quantitative or qualitative criteria, as appropriate, to ensure a robust assessment. The significance of the potential impacts is assessed on the scale, degree or intensity of disturbance to the baseline conditions. Four levels of magnitude are used: high; medium; low; or negligible, as defined in **Table 5-6**.

61. Impact statements carry a degree of subjectivity, as they are based on expert judgement regarding the effect-receptor interaction that occurs and on available data. As such, impact statements should be qualified appropriately. Where possible the matrix presented in **Table 5-7** has been used to aid assessment of impact significance, combined with the application of expert judgement, to facilitate a consistent approach throughout the EIA. However, for each topic within the EIA, best practice methodology (based on the latest available guidance) has been followed and hence, when more appropriate, an alternative approach to the use of a matrix may be used.
62. By combining the magnitude of the impact and the sensitivity of the receptor in a matrix (see **Table 5-7**), the final significance of the impact (prior to the implementation of mitigation measures) can be obtained.
63. Definitions of impact significance are provided in **Table 5-8**. In the context of EIA, 'significant impacts' are taken to be those of moderate or major significance (as defined in **Table 5-8** below); albeit that appropriate mitigation, where available, should be sought for all impacts. Whilst minor impacts would not be deemed to be significant in their own right, they may contribute to significant impacts through inter-relationships or cumulative impacts.

**Table 5-7 Impact Assessment Matrix**

		Negative Magnitude				Beneficial Magnitude			
		High	Medium	Low	Negligible	Negligible	Low	Medium	High
Sensitivity	High	Major	Major	Moderate	Minor	Minor	Moderate	Major	Major
	Medium	Major	Moderate	Minor	Minor	Minor	Minor	Moderate	Major
	Low	Moderate	Minor	Minor	Negligible	Negligible	Minor	Minor	Moderate
	Negligible	Minor	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Minor

**Table 5-8 Impact Significance Definitions**

Value	Definition
Major	Very large or large change in receptor, either adverse or beneficial, which are important at a population (national or international) level because they contribute to achieving national or regional objectives, or, expected to result in exceedance of statutory objectives and / or breaches of legislation.
Moderate	Intermediate or large change in receptor, which may be important considerations at national or regional population level. Potential to result in exceedance of statutory objectives and / or breaches of legislation.
Minor	Small change in receptor, which may be raised as local issues but are unlikely to be important at a regional population level.
Negligible	No discernible change in receptor.

64. It should be noted that any residual impact (the impact after the implementation of mitigation; see **Section 5.3.4.6** below) which remains at the level of 'moderate' or 'major' is regarded by the EIA Regulations as being significant.
65. It should also be reiterated that, although this section sets out the overall approach adopted for this EIA, individual chapters may take their own approach where industry standard methodologies are appropriate or another approach has been agreed with the relevant regulator. Where a different approach is taken, this is explained in the relevant methodology section.

#### **5.3.4.4. Confidence**

66. Once an assessment of a potential impact has been made, it is necessary to assign a confidence value to the assessment to assist in the understanding of the judgement. This is undertaken on a simple scale of high-medium-low, where high confidence assessments are made on the basis of robust evidence, with lower confidence assessments being based, for example, on extrapolation and use of proxies.

#### **5.3.4.5. Mitigation Measures**

67. Where an impact assessment identifies that an aspect of the Project is likely to give rise to significant environmental impacts, mitigation measures have been proposed, in order to avoid impacts or reduce them to acceptable levels.
68. For the purposes of the EIA, two types of mitigation have been defined:
- Embedded mitigation: mitigation measures that are identified and adopted as part of the evolution of the project design, and are included and assessed in the EIA; and
  - Additional mitigation: mitigation measures that are identified during the EIA process specifically to reduce or eliminate any predicted significant impacts.
69. It is important to note that the mitigation measures applied should be proportionate to the scale of the impact predicted. Appropriate mitigation measures have been discussed and agreed, where possible, with the relevant regulatory authorities and stakeholders. Whilst mitigation for minor or negligible impacts may not be specifically defined as a matter of course, industry standard or 'embedded' mitigation often applies in these cases (and is set out herein). It is also recognised that minor and negligible impacts could become significant when considered cumulatively with other pressures on a receptor and, in this event, mitigation may be required.
70. All mitigation associated with the Project is identified and described in more detail in the relevant chapters of the ES (**Chapters 7 to 26**).

#### **5.3.4.6. Residual Impacts**

71. Where further mitigation measures are identified, the significance of the residual environmental impact (i.e. the post-mitigation impact) has been re-assessed and residual impacts described.
72. Where no mitigation measure is proposed, a discussion explains why the impact cannot be reduced.

#### **5.3.4.7. Monitoring**

73. Appropriate mitigation measures have been identified and recommended in this ES where the EIA process has identified an adverse impact and mitigation is available (see **Section 5.3.4.5** above). In some cases, in order to ensure that the mitigation measures are successful or where there is significant uncertainty with respect to important receptors, monitoring may be appropriate.

74. Monitoring programmes are most commonly required during and shortly after construction, but can also be prior to and during operations. The nature of any monitoring is dependent on the nature of the effect or mitigation measure under inspection and is discussed within the relevant chapters of the ES (**Chapters 7 to 26**). An Outline Construction Environment Management Plan (**Document MOR/RHDHV/DOC/0073**) and Outline Environment Mitigation and Monitoring Plan (**Document MOR/RHDHV/DOC/0072**) are also provided in support of the TWAO and Marine Licence applications for the Project.

### 5.3.5. Cumulative Impact Assessment

#### 5.3.5.1. Impact Inter-Relationships

75. Council Directive 2011/92/EU on the assessment of the effects of certain public and private projects on the environment (the EIA Directive) states (in Annex III) that an ES should include *“A description of the aspects of the environment likely to be significantly affected by the proposed project, including, in particular, population, fauna, flora, soil, water, air, climatic factors, material assets, including the architectural and archaeological heritage, landscape and the inter-relationship between the above factors”*.
76. This ES has given due consideration to the potential for different residual impacts to have a combined impact on key sensitive receptors. For example, a landscape and visual effect and noise impact may cumulatively impact on a receptor.
77. The objective is to identify where the accumulation of impacts on a single receptor, and the relationship between those impacts, potentially gives rise to a need for additional mitigation.
78. Inter-relationships have been assessed within the relevant sections of the topic chapters of the ES.

#### 5.3.5.2. Cumulative Impacts

79. Cumulative Impact Assessment (CIA) is undertaken as part of each technical chapter impact assessment. In line with IEMA's Guidelines for EIA (2004), cumulative impacts are defined as: *“...the impacts on the environment which result from incremental impacts of the action when added to other past, present and reasonably foreseeable future actions ...”*.
80. There is no legislation that outlines how CIAs should be undertaken. However, the EIA and Habitats Directives and their associated regulations require the consideration of direct impacts and any indirect, secondary and cumulative effects of a project. Schedule 4, of Regulation 17 (3), of the Town and Country Planning (Environmental Impact Assessment) (Wales) Regulations 2017 states that the CIA should consider: *“the cumulation of effects with other existing and/or approved projects, taking into account any existing environmental problems relating to areas of particular environmental importance likely to be affected or the use of natural resources”*.
81. Guidance on cumulative effects assessment is provided in a number of good practice documents (e.g. RenewableUK, 2013). This guidance is not prescriptive, but rather suggests various approaches which may be used, depending on their suitability to the Project (for example the use of matrices, expert opinion, consultation, spatial analysis and carrying capacity analysis).

82. A tiered approach has been adopted for the Project, based upon the following definitions:
- Site-specific (or within-development) cumulative impacts - different effects associated with the proposed scheme have the potential to interact and, together, influence common receptors. Where applicable, these inter-relationships are considered in the ES and HRA.
  - Wider cumulative impacts which are the combined impacts (additive or interactive) that may occur between the proposed facilities, and any other relevant development(s) for which information is publicly available.
83. With respect to 'past' projects, a useful ground rule in CIA is that the environmental impacts of schemes that have been completed should be included within the environmental baseline; as such, these impacts will be taken into account in the EIA process and, generally, can be excluded from the scope of CIA. Where projects are already in existence they are therefore deemed to be part of the existing environment, contributing to the baseline conditions and are therefore not considered to provide a further cumulative impact. However, the environmental impacts of recently completed projects may not be fully manifested and, therefore, the potential impacts of such projects should be taken into account in the CIA.
84. The study area for the CIA varies depending on the range and characteristics of the receptor as well as the extent of impacts associated with the Project and therefore each technical chapter provides information on the relevant foreseeable projects for consideration in the CIA.

#### **5.3.5.3. Assumptions and Limitations**

85. The EIA process also requires that an ES is prepared by competent experts. This ES has been compiled by Royal HaskoningDHV and MarineSpace. Royal HaskoningDHV is the UK's leading EIA consultant, successfully leading the EIA and consent process for over 10GW of UK offshore wind projects, including six successful DCO applications, as well as successfully completing the EIA and consenting three significant tidal stream projects, the world's first commercial tidal turbine deployment (SeaGen), the world's first tidal array (Sound of Islay) and the world's first commercial demonstration project (PTEC). MarineSpace is a specialist marine consultancy and has supported a range of projects including providing consultancy support to Tidal Energy Limited (TEL) on its Ramsey and St David's Head projects and consenting support to Tidal Lagoon Power Ltd (TLP) in developing the Adaptive Environmental Management Plan (AEMP) for the Swansea Bay Tidal Lagoon project.
86. Royal HaskoningDHV is a corporate member of the Institute of Environmental Management & Assessment (IEMA) (number 0001189) and also a Corporate Registered Assessor for EIA under IEMA's voluntary EIA Quality Mark scheme, through which EIA activity is independently reviewed, on an annual basis, to ensure it delivers excellence in areas including EIA management, team capabilities, regulatory compliance, content, presentation, and improving practice.
87. All Royal HaskoningDHV's lead authors are senior and chartered professionals with a significant track record in undertaking technical assessment and EIA in their discipline. The team undertaking the EIA for the Project is comprised of a dedicated core team of EIA professionals who take the lead role in the co-ordination and management of the EIA and the preparation of

the ES. The core team is then supported by a wider team of technical specialists taking responsibility of the data collection, data analysis and technical impact assessment.

88. Some of the technical assessment and associated ES chapters are undertaken by specialist consultancies outside Royal HaskoningDHV. These include Shipping and Navigation, Landscape and Visual and Socio-economics. All specialist consultants have been selected by Menter Môn based on stringent quality checks.
89. The EIA process requires an ES to provide an indication of any difficulties (technical deficiencies or lack of know-how) encountered during the assessment process. Any such assumptions or limitations are identified within the relevant topic chapter, where relevant.
90. The information provided by third parties, including publicly available information and databases, is correct at the time of publication. The EIA has been subject to the following limitations:
  - Existing environmental conditions have been assumed to be accurate at the time of the physical surveys; however, due to the dynamic nature of the environment, conditions may change during the various phases of the development; and
  - The assessment of cumulative impacts has been reliant on the availability of accurate information on the proposed developments that may act in combination with the one outlined within this ES.

#### **5.4. SUMMARY**

91. This chapter outlines the approach that has been used to frame and present the expert judgements used in assessing the potential impacts during the construction, operation and decommissioning of the Project.
92. For each topic of the EIA, the most relevant and latest guidance and/or best practice has been used. Therefore, where appropriate, the approach to each impact assessment (including definitions of sensitivity and magnitude of impact) is tailored to each receptor as detailed in **Chapters 7 to 26.**