LLŶR FLOATING OFFSHORE WIND PROJECT

Llŷr 1 Floating Offshore Wind Farm

Environmental Statement

Volume 1: Chapter 5 – Environmental Impact Assessment (EIA) Approach and Methodology

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FLOVENTIS ENERGY

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Acronyms and abbreviations

Acronym or Abbreviation	Definition	Acronym or Abbreviation	Definition
AA	Appropriate Assessment	IEEM	Institute of Ecology and Environmental Management
CEA	Cumulative Effects Assessment	IEMA	Institute of Environmental Management and Assessment
CEFAS	Centre for Environment, Fisheries and Aquaculture Science	LFW	Llŷr Floating Wind Ltd
CIEEM	Chartered Institute of Ecology and Environmental Management	LPA	Local Planning Authority
DBA	Desk Based Assessment	LSE	Likely Significant Effect
EC	European Council	MCAA	Marine and Coastal Access Act
EcIA	Ecological Impact Assessment	NRW	Natural Resources Wales
EEC	European Economic Community	NSIP	Nationally Significant Infrastructure Project
EIA	Environmental Impact Assessment	PEDW	Planning and Environmental Decision Wales
ES	Environmental Statement	PDE	Project Design Envelope
EU	European Union	PINS	The Planning Inspectorate
EU(W)A	European Union (Withdrawal) Act	UK	United Kingdom
FLOW	Floating Offshore Wind	WFD	Water Framework Directive
HDD	Horizontal Directional Drilling	ZOI	Zone of Influence
HRA	Habitats Regulation Assessment		

Glossary of project terms

Glossary of Terms	Definition
Cumulative effect	The combined effect of the Project in combination with the effects from a number of different projects, on the same single receptor/resource.
Cumulative impact	Impacts that result from changes caused by other past, present or reasonably foreseeable actions together with the Project
Design Envelope	A description of the range of possible elements that make up the design options under consideration for the Project, as set out in detail in the project description. This envelope is used to define the Project for Environmental Impact Assessment (EIA) purposes when the exact engineering parameters are not yet known. This is also often referred to as the "Rochdale Envelope" approach.
Effect	Term used to express the consequence of an impact. The significance of an effect is determined by correlating the magnitude of the impact with the importance, or sensitivity, of the receptor or resource in accordance with defined significance criteria.
Environmental Impact Assessment (EIA)	A statutory process by which certain planned projects must be assessed before a formal decision to proceed can be made. It involves the collection and consideration of environmental information, which fulfils the assessment requirements of the EIA Regulations, including the publication of an Environmental Statement.
Habitats Regulations Assessment (HRA)	A process which helps determine likely significant effects and (where appropriate) assesses adverse impacts on the integrity of European conservation sites. The process consists of up to four stages of assessment: screening, appropriate assessment, assessment of alternative solutions and assessment of imperative reasons of over-riding public interest (IROPI).
Impact	Change that is caused by an action; for example, land clearing (action) during construction which results in habitat loss (impact).
Inter-related effects	Multiple effects on the same receptor arising from the Project. These occur either where a series of the same effect acts on a receptor over time to produce a potential additive effect or where a number of separate effects, such as noise and habitat loss, affect a single receptor, for example marine mammals.
Magnitude	A combination of the extent, duration, frequency and reversibility of an impact.
Project	Relates to all aspects of Project Llŷr both onshore and offshore.
Receptor	A component of the natural or man-made environment that is affected by an impact, including people.
Sensitivity	The extent to which a receptor can accept a change of a particular type and scale
Significance	The significance of an effect combines the evaluation of the magnitude of an impact and the sensitivity of the receptor
Transboundary	Crossing into adjacent states. Normally referring to the spatial extent of impacts on receptors or even specific receptors such as migratory species.
The Applicant	The developer of the Project, Llŷr Floating Wind Ltd.

Glossary of Terms	Definition
Array	All wind turbine generators, inter array cables, mooring lines, floating sub-structures and supporting subsea infrastructure within the Array Area, as defined, when considered collectively, excluding the offshore export cable(s).
Array Area	The area within which the wind turbine generators, inter array cables, mooring lines, floating sub-structures and supporting subsea infrastructure will be located
Floventis Energy	A joint venture company between Cierco Ltd and SBM Offshore Ltd of which Llŷr Floating Wind Limited is a wholly owned subsidiary.
Landfall	The location where the offshore export cable(s) from the Array Area, as defined, are brought onshore and connected to the onshore export cables (as defined) via the transition joint bays (TJB).
Llŷr 1	The proposed Project, for which the Applicant is applying for Section 36 and Marine Licence consents. Including all offshore and onshore infrastructure and activities, and all project phases.
Marine Licence	A licence required under the Marine and Coastal Access Act 2009 for marine works which is administered by Natural Resources Wales (NRW) Marine Licensing Team (MLT) on behalf of the Welsh Ministers.
Offshore Development Area	The footprint of the offshore infrastructure and associated temporary works, comprised of the Array Area and the Offshore Export Cable Corridor, as defined, that forms the offshore boundary for the S36 Consent and Marine Licence application
Offshore Export Cable	The cable(s) that transmit electricity produced by the WTGs to landfall.
Offshore Export Cable Corridor (OfECC)	The area within which the offshore export cable circuit(s) will be located, from the Array Area to the Landfall.
Onshore Development Area	The footprint of the onshore infrastructure and associated temporary works, comprised of the Onshore Export Cable Corridor and the Onshore Substation, as defined, and including new access routes and visibility splays, that forms the onshore boundary for the planning application.
Onshore Export Cable(s)	The cable(s) that transmit electricity from the landfall to the onshore substation .
Onshore Export Cable Corridor (OnECC)	The area within which the onshore export cable circuit(s) will be located.
proposed Project	All aspects of the Llŷr 1 development (i.e. the onshore and offshore components).
Onshore Substation	Located within the Onshore Development Area, converts high voltage generated electricity into low voltage electricity that can be used for the grid and domestic consumption.
Section 36 consent	Consent to construct and operate an offshore generating station, under Section 36 (S.36) of the Electricity Act 1989. This includes deemed planning permission for onshore works.

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5. EIA APPROACH AND METHODOLOGY

5.1. Introduction

1. The primary aim of undertaking an Environmental Impact Assessment (EIA) is to ensure that the authority granting consent (the 'Competent Authority') for a proposed development makes its decision in full knowledge of any potentially significant effects on the environment.

2. This chapter of the Environmental Statement (ES) describes the approach to and outlines the scope of the EIA for the Llŷr Floating Offshore Wind project (hereafter referred to as the 'proposed Project'). It also provides general information about the EIA process including the key steps taken, the methodology and the terminology adopted, in line with best practice and in accordance with relevant legislation. Where a technical discipline deviates from this methodology to align with topic specific guidance, this is detailed within the corresponding technical chapter in the ES.

5.2. EIA Legislation and Guidance

5.2.1. Legislation

3. The EIA Directive (2014/52/EU) requires that public and private projects that are likely to have significant effects on the environment, by virtue of their size, location or nature, be made subject to an assessment prior to consent being given. The following regulations transpose the EIA Directive (2014/52/EU) into UK legislation and apply to the proposed Project:

    - The Electricity Works (EIA) (England and Wales) Regulations 2017 – applies to applications for S.36 consent under the Electricity Act 1989; and
    - The Marine Works (EIA) Regulations 2007 (as amended) – applies to applications for a Marine Licence under the Marine and Coastal Access Act 2009.

4. Under both regulations listed above, the proposed Project would be considered a Schedule 2 development requiring screening to identify if EIA is required. Schedule 2 developments require screening to identify if EIA is required whereas Schedule 1 developments always require EIA. A combined EIA Screening and Scoping Request (Llŷr Scoping Report, 2022) was submitted in April 2022, and concluded that due to the proposed Project type, scale and location in relation to sensitive areas, an EIA will be required.

5. The Project falls under the following EIA Regulations:

    - Development to provide a generating station (other than a generating station of a description set out in paragraph 1 of Schedule 1) under Schedule 2 of The Electricity Works (EIA) (England and Wales) Regulations 2017; and
    - Installations for the harnessing of wind power for energy production (wind farms) under Schedule A2 of The Marine Works (EIA) Regulations 2007 (as amended).

6. EIA assessments use a systematic evidence-based approach in order to identify, evaluate and interpret the potential impacts of new developments. It is intended to provide decision-makers with an understanding of the probable environmental consequences of a proposed Project and thereby facilitate the making of more environmentally-sound decision making. This document has been prepared in accordance with the EIA Directive 2014/52/EU and

relevant national legislation, which for the purposes of this proposed Project are the Electricity Works EIA Regulations and the Marine Works EIA Regulations.

Article 1(2)(g) of the EIA Directive describes the EIA process as follows:

'(i) the preparation of an environmental impact assessment report by the developer, as referred to in Article 5(1) and (2);

(ii) the carrying out of consultations as referred to in Article 6 and, where relevant, Article 7;

(iii) the examination by the competent authority of the information presented in the environmental impact assessment report and any supplementary information provided, where necessary, by the developer in accordance with Article 5(3), and any relevant information received through the consultations under Articles 6 and 7;

(iv) the reasoned conclusion by the competent authority on the significant effects of the project on the environment, taking into account the results of the examination referred to in point (iii) and, where appropriate, its own supplementary examination; and

(v) the integration of the competent authority's reasoned conclusion into any of the decisions referred to in Article 8a.'

5.2.2. Guidance and Best Practice

7. As well as legislative requirements (outlined in **Chapter 2: Regulatory and Planning Context** and technical **Chapters 7 to 32 and Appendix 5A: CEA Approach and Methodology**), various guidance documents have been developed by decision makers, developers and professional institutions to guide the EIA process and preparation of the ES. This ES has been prepared in accordance with relevant guidance, including but not limited to the following:

- Planning Inspectorate (PINS) Advice Notes
    - Advice Note Three: EIA Consultation and Notification (PINS, 2017a);
    - Advice Note Seven: Environmental Impact Assessment Process, Preliminary Environmental Information and Environmental Statements (PINS, 2020b);
    - Advice Note Nine: Rochdale Envelope (PINS, 2018);
    - Advice Note Twelve: Transboundary Impacts (PINS, 2020); and
    - Advice Note Seventeen: Cumulative Effects Assessment (PINS, 2019)
- Welsh Guidance
    - Future Wales: The National Plan 2040 (Welsh Government, 2021a.;
    - Planning Policy Wales (PPW) (Welsh Government, 2021b);
    - Welsh National Marine Plan (Welsh Government, 2019);
    - The Planning Series: 10 - Environmental Impact Assessment (National Assembly for Wales), 2017;
    - Marine renewable energy developments (Natural Resources Wales, 2023); and

- Offshore wind developments (Natural Resources Wales).

- Industry EIA Guidance Documents
  - OSPAR Commission (2008) Assessment of the Environmental Impact of Offshore Wind Farms;
  - Offshore Wind Farms: Guidance Note for Environmental Impact Assessment in Respect of Food and Environment Protection Act 1985 and Coastal Protection Act 1949 requirements (Cefas, 2004);
  - RenewableUK Guiding Principles in relation to the Cumulative Effects Assessment (2013)
  - Cumulative Impact Assessment Guidelines - Guiding Principles for Cumulative Impact Assessment in Offshore Wind Farms (RenewableUK, 2013); and
  - Guidelines for data acquisition to support marine environmental assessments of offshore renewable energy projects (Centre for Environment, Fisheries and Aquaculture Science (Cefas), 2012).

- Professional EIA Guidance Documents
  - The Institute of Environmental Management and Assessment (IEMA) Guidelines for Environmental Impact Assessment (2004);
  - IEMA Environmental Impact Assessment Guide to: Delivering Quality Development (2016);
  - Environmental Impact Assessment for Offshore Renewable Energy Projects – Guide, (Innovative UK, 2015);
  - IEMA (2017), Guidance on Delivering Proportionate EIA: A Collaborative Strategy for Enhancing UK Environmental Impact Assessment Practice;
  - IEMA (2020), Impact Assessment Outlook Journal-Volume 7: Demystifying Cumulative Effects;
  - The UK Chartered Institute of Ecology and Environmental Management (CIEEM): Guidelines for Ecological Impact Assessment in UK and Ireland: Terrestrial, Freshwater, Coastal and Marine (2018);
  - Guidelines for Ecological Impact Assessment (EcIA) in the UK and Ireland - Terrestrial, Freshwater, Coastal and Marine, Version 1.2 (CIEEM, 2018); and
  - EIA Guide to Shaping Quality Development (IEMA, 2015).

8. Further details of applicable legislation, plans and policies and other guidance and how it is relevant to the proposed Project is provided in **Chapter 2: Regulatory and Planning Context** and **Appendix 5A: CEA Approach and Methodology**. Legislation, policies and guidance specific to technical chapters are included within the **Chapters 7 to 32**.

5.3. The EIA Process

9. EIA is a process undertaken to identify and evaluate the impact pathways and potential environmental effects of a proposed development, both beneficial and adverse, and throughout all phases of the project, including during construction, operation and maintenance and decommissioning. Early identification of potentially adverse environmental effects also enables appropriate mitigation measures (measures to avoid, reduce, or offset significant adverse effects) to be identified and incorporated into the design of the development, or commitments to be made to implement environmentally sensitive construction methods and practices. The results of the EIA ensure that decision makers, such as Local Planning Authorities (LPA) and statutory consultees as well as other interested parties, including local communities, are aware of a proposed development's potential environmental effects and whether these may be significant, for consideration in the determination of the consent applications.

10. The assessment methodology follows a systematic approach to assess the potential impacts and subsequent effects of the proposed Project on human health, socioeconomics, the natural and physical environments, and material assets where applicable and in an appropriate manner. The environmental assessment has been undertaken in parallel with the development of the design of the proposed Project, thereby maximising opportunities to mitigate any potential environmental effects identified.

11. The key components of the EIA process followed in each technical chapter of this ES are summarised in **Figure 5-1.**

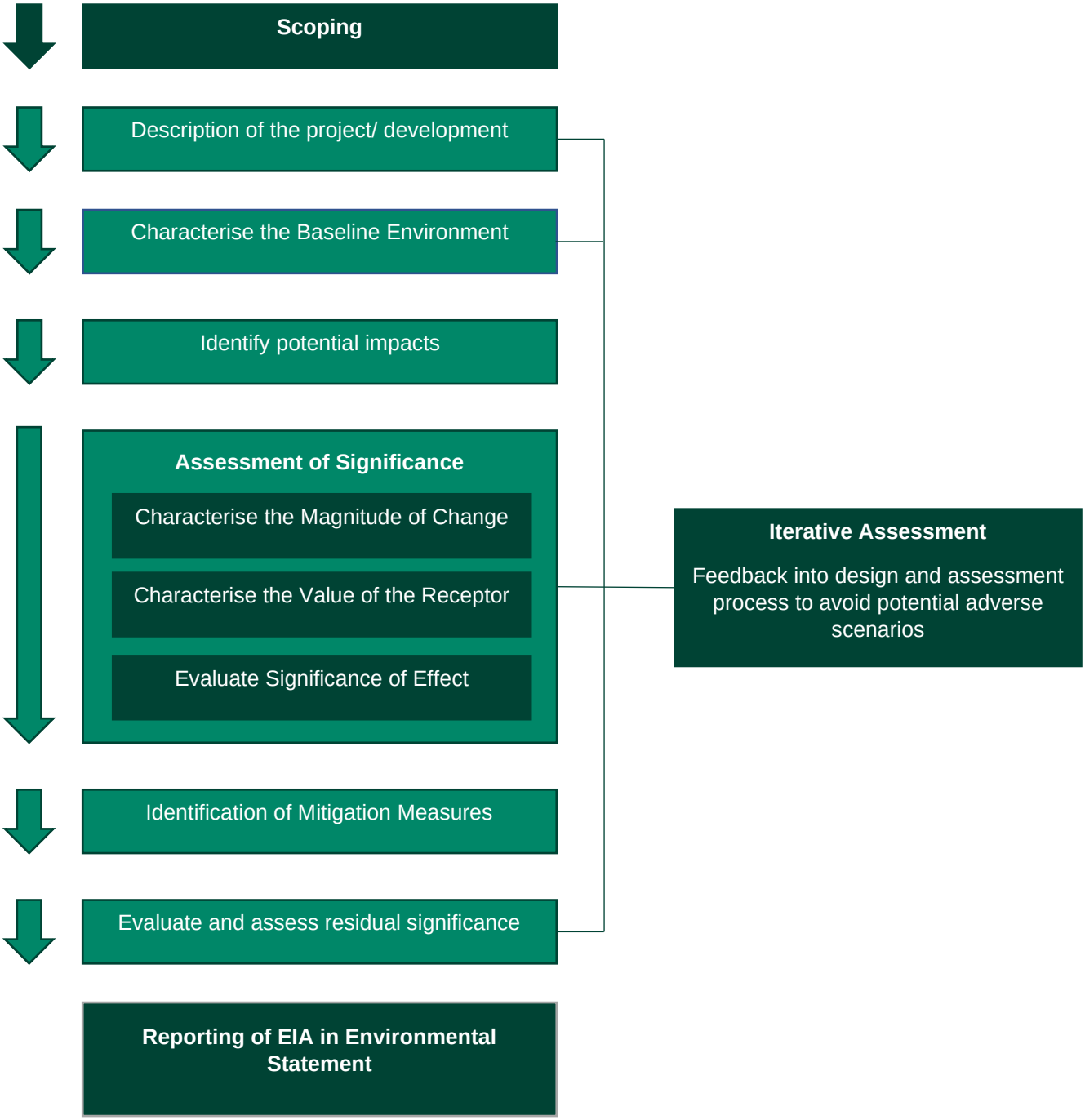

Figure 5-1 An overview of the EIA process

5.3.1. EIA Scoping and Consultation

13. The aim of EIA scoping is to identify key expected environmental issues at an early stage, determine which elements of the proposed Project are likely to result in impacts and consider the subsequent effects of those impacts on the environment. Scoping is a process of deciding what information should be contained in an ES and what methods should be used to gather and assess that information. It is defined in the EC guidance as: '*determining the content and extent of the matters which should be covered in the environmental information to be submitted in the ES*'. In line with the EIA Regulations, a developer may request a Scoping

Opinion from a Competent Authority, which provides an opinion on the scope and level of detail to be included within an EIAR. Where a Scoping Opinion has been adopted, the EIA must be based on the Scoping Opinion.

14. In April 2022 the Applicant submitted an EIA Scoping Report for the proposed Project to planning authorities (Natural Resources Wales (NRW) and Planning and Environment Decisions Wales (PEDW) and other governmental, non-governmental and commercial stakeholders. The Scoping Report identified those aspects of the environment which were considered likely to be significantly affected by the proposed Project and the approach to the identification and assessment of potential environmental effects within the EIA. The report also scoped out those aspects of the environment which were considered unlikely to be significantly affected, based on the baseline characterisation undertaken and expert judgement applied.

15. As outlined in **Chapter 3: Alternatives**, and **Chapter 4: Description of the proposed Project**, following consultation with relevant statutory stakeholders, a Scoping Opinion from NRW was received in June 2022 and is contained within **Appendix 5B: Scoping Opinion** This collated consultation responses from thirteen statutory and non-statutory consultees that had provided comments on a variety of topics and issues.

16. Key issues raised in the Scoping Opinion and how these have been addressed in the ES are contained in **Appendix 5C: Scoping Opinion Responses**.

17. The Scoping Opinion, together with feedback received from stakeholder engagement undertaken throughout the EIA process, has been reviewed and the implications for the proposed Project and EIA considered. Taking this into account, Health and Wellbeing has been scoped out of the ES and is instead considered within the technical discipline assessments.

18. The EIA presented in this ES includes an assessment for the following environmental topics ad illustrated in **Table 5-1**:

Volume 2 – Terrestrial Environment

Table 5-1 Summary of ES chapters

Chapter number	Title
Volume 2 – Terrestrial Environment	
Chapter 7	Landscape and Visual Impact Assessment
Chapter 8	Ecology and Biodiversity
Chapter 9	Historic Environment and Cultural Heritage
Chapter 10	Water Environment
Chapter 11	Geology and Hydrogeology
Chapter 12	Agriculture and Soils
Chapter 13	Traffic and Transport
Chapter 14	Air Quality
Chapter 15	Noise and Vibration
Chapter 16	Socio-economics, Recreation and Tourism
Volume 3 – Marine Environment	
Chapter 17	Physical Environment
Chapter 18	Marine Water and Sediment Quality

Chapter 19	Benthic Ecology
Chapter 20	Fish and Shellfish and Ecology
Chapter 21	Marine Mammals
Chapter 22	Ornithology
Chapter 23	Seascape, Landscape and Visual Impact Assessment
Chapter 24	Marine Archaeology
Chapter 25	Shipping and Navigation
Chapter 26	Commercial Fisheries
Chapter 27	Aviation and Radar
Chapter 28	Other Sea Users
Volume 4 – Project-wide Effects	
Chapter 29	Climate Change
Chapter 30	Major Accidents and Disasters
Chapter 31	Inter Related Effects Assessment
Chapter 32	Residual Effects
Volume 5 – Figures	
Refer to **Chapter 1: Introduction, Table 1-1**	
Volume 6 – Appendices	
Refer to **Chapter 1: Introduction, Table 1-1**	

19. Further details of the Scoping Opinion consultation responses and how these have been considered within the EIA are discussed within each of the relevant technical chapters of this ES.

5.4. EIA Methodology

5.4.1. Proportionate EIA

20. In July 2017, the Institute of Environmental Management and Assessment (IEMA) launched a national strategy on Proportionate EIA (Delivering Proportionate EIA, 2017). The strategy highlights that '*disproportionate EIA, in terms of their length, scope and treatment of risk…can make understanding the key environmental impacts of a proposed development difficult'*.

21. IEMA also state that *'… the drive for improved quality in EIA, combined with the UK's evidence-based and precautionary approach, has led to substantial challenges for the future of the practice. The increased complexity of multi-faceted decisions and wider range of stakeholders who seek transparency and clear audit trails, has further compounded the problems. The combined impact of the above good intentions has often led to individual EIAs being too broadly scoped and their related Environmental Statements to be overly long and cumbersome.'*

22. Additionally, PINS Advice Note Six states: Preparation and Submission of Application Documents (PINS, 2020a) encourages applicants to think about the size of documents submitted with 'duplication and superfluous' content discouraged. ES's are welcomed that are proportionate to the scale and complexity of the EIA undertaken.

5.4.2. Project Design Envelope

23. Where elements of the project have not been fully defined, a project design envelope (PDE) (also sometimes called a Rochdale Envelope) approach has been adopted to provide flexibility in the ES. This approach is standard practice in the UK for large scale-developments where the exact project requirements cannot be confirmed at the pre-application stage; for example, the exact WTG model to be used will not be selected until later in the development process due to technology advances and the need to utilise the most efficient and environmentally sound solution.

24. PINS Advice Note 9 (PINS, 2018) states: 'The 'Rochdale Envelope' approach is employed where the nature of the Proposed Development means that some details of the whole project have not been confirmed (for instance the precise dimensions of structures) when the application is submitted, and flexibility is sought to address uncertainty. Such an approach has been used under other consenting regimes (the Town and Country Planning Act 1990 and the Electricity Act 1989) where an application has been made at a time when the details of a project have not been resolved.'

25. Under the PDE approach, the consent, once granted, includes a number of consent conditions which will ensure that the final design of the proposed Project does not exceed the Design Envelope on which the assessment was based, or lead to a significant effect which has not been assessed. This allows for the detailed design of the proposed Project to be further refined, within the consented PDE, as engineering design details and environmental information become available, without rendering the supporting EIA inadequate.

26. The EIA adopts a precautionary approach and considers realistic 'worst case' scenarios when assessing design envelope parameters and in identifying any relationship between the proposed Project, impact pathways, and sensitive receptors to ensure that the design scenario or parameter that would have the greatest impact is fully assessed for each technical chapter. The worst case scenarios assessed for the proposed Project for each impact are detailed in the relevant technical chapters within this ES (**Chapters 7 to 32**).

5.4.3. Temporal and Spatial Scope: Timescales and Assessment Years

Spatial Scope

27. The technical chapters of this ES describe the spatial scope of the impact assessment, including the rationale for determining the specific area within which the assessment is focussed. This way study areas are defined for each technical chapter of the ES. The study areas are a function of the nature of the impacts and the locations of potentially affected environmental resources or receptors. Justification for the spatial scope considered appropriate is documented in each technical chapter of this ES (**Chapters 7 to 32**).

Temporal Scope and Assessment Years

28. The technical chapters of this ES also consider the environmental impacts of the proposed Project at key stages in its construction and operation and, as far as practicable, its decommissioning.

29. The assessment scenarios that are being considered for the purposes of the EIA (and assessed within this ES) are as follows:

- Existing Baseline (2022 / 2023) – This is the principal baseline against which environmental effects are assessed;
- Construction (2026) – This is the date when construction activity is anticipated to commence;
- Operation (2027 – 2052) – This is the operational life of the proposed Project. The commercial operation of the proposed Project will be 25 years; and
- Decommissioning (commencing 2052 – 2054/2057) – Decommissioning is anticipated to take 2 to 5 years.

5.4.4. Baseline Studies

30. In order to identify potential impacts resulting from the proposed Project and assess the potential subsequent effects of those impacts on receptors, it is necessary to characterise the physical, biological, and human environmental baseline conditions within the vicinity of the proposed Project as well as the likely evolution of that baseline without the proposed Project. This is divided into the 'Existing Baseline' and 'Future Baseline' accounting for changes in environmental conditions that are predicted, with consideration of climate change and other future disturbances.

31. The Study Areas for the proposed Project (defined in each technical chapter) either overlap with or are located in close proximity to study areas considered by other consent and marine licence applications, such as Project Erebus (Blue Gem Wind, 2023), as well as research proposals and studies including the Crown Estate Floating Offshore Wind Programme and Areas of Search (Crown Estate, 2022). Consequently, the baseline studies throughout this ES incorporate a large amount of existing data, in addition to newly collected data, to inform the EIA. This has assisted in advancing the evidence-based approach of the baseline studies and the EIA more widely.

32. Study areas for baseline characterisation are defined for each technical discipline and these are separately described in the technical chapters (**Chapters 7 to 28**). Characterisation of the existing and future baseline for each technical discipline has been developed using some or all of the following information:

    - Review of primary baseline studies (e.g. survey data if applicable);
    - Review of data sources to establish if the information available can be used to make EIA judgements with sufficient confidence;
    - Identification of data gaps, and any requirement for targeted data collection or additional survey methods;
    - Review of additional specialist baseline studies (desk-based technical reviews);
    - Detailed review of all secondary sources (i.e. existing documentation and literature); and
    - Stakeholder consultation.

33. Key data sources used to establish the existing and future baseline for each technical discipline are described in the technical chapters and include a summary of limitations. The following limitations or assumptions should be noted for all technical disciplines:

    - Third party and publicly available information is correct at the time of publication; and
    - Baseline conditions are accurate at the time of physical surveys but due to the dynamic nature of the environment, conditions may change before or during the installation construction and operational phases of the proposed Project (although the effects of the natural variation are included in the assessment).

5.4.5. Embedded Mitigation Measures

34. Throughout the ES, where applicable, the way that likely environmental impacts will be avoided, prevented, reduced or offset through design and/or implementation of management measures are described. Primary mitigation measures that are inherent within the proposed Project design (e.g. the retention of a hedgerow; or careful routing of the Cable Corridor to avoid sensitive marine features) and construction (e.g. implementation of methods to supress dust generation or avoid pollution of water courses and marine environments) of the proposed Project are considered embedded mitigation measures.

35. These measures, which have been identified through the iterative EIA process, and fed into the proposed Project design, are identified in the embedded and good practice measures sections within each of the technical chapters of this ES. Good practice measures include the mitigation measures that have been set out in the Outline Construction Environmental Management Plan (**Appendix 4A: Outline CEMP**). For the operational phase, such embedded measures are integral to the proposals (e.g. siting of buildings, routing of cables).

36. Embedded measures are considered within the ES prior to the assessment of impacts to avoid considering assessment scenarios that are unrealistic in practice (i.e. do not take account of such measures even though they are likely to be standard practice and/or form part of the proposed design) and therefore ensure that realistic likely environmental impacts are identified.

5.4.6. Assessment of Effects

37. The potential effects of the proposed Project on the receptors identified are assessed within the technical chapters of this ES (**Chapters 7 to 32**). All impact assessments have been undertaken by technical experts using available data, experience and expert judgement.

38. IEMA's 'Guidelines for Environmental Impact Assessment' (IEMA, 2004) states that *'The assessment stage of the EIA should follow a clear progression; from the characterisation of 'impact' to the assessment of the significance of the effects taking into account the evaluation of the sensitivity and value of the receptors'*. Consequently, each impact is identified along three key considerations (IEMA, 2004):

    - Specific type and classification of the impact;
    - The tempo- spatial magnitude of the impact; and
    - Sensitivity of the receptor to perturbations associated to the impact.

39. Using this information, the significance of the effects of the proposed Project on receptors is ascertained. This also assists in the development of mitigation measures designed to minimise potential impacts identified.

40. As set out above, impacts are assessed for each phase of the proposed Project including: construction, operation (including maintenance) and decommissioning. The following terminology descriptions provided in **Table 5-2** should be noted:

Table 5-2. A summary of definitions of key terms

Term	Definition
Interaction	The link between an activity and the receptor. There must be an interaction for an effect to occur.
Impact	The action that occurs as a result of an identified interaction. The predicted change in the baseline environment. An impact is considered to result in an effect if a pathway (interaction) to a receptor exists.
Effect	An observable consequence of impacts, usually measurable. Effects only occur when an activity or environmental impact is present within an environment that is sensitive to it.

5.4.7. Zone of Influence

41. For each potential impact identified, the Zone of Influence (ZoI) for that impact has been established. The ZoI is the spatial extent over which the activities are predicted to have an impact on the receiving environment. This varies for different activities and for different stages of the proposed Project (construction, operation and decommissioning), as well as upon the different receptors being considered. This has been undertaken quantitatively where possible and based on professional judgment and literature reviews; where this was not possible the ZoI has been established qualitatively, also based on professional judgment and literature reviews.

5.4.8. Impact Classification

42. Prior to the assessment of potential impacts, the nature of the impact must be classified to understand how to proceed with the subsequent impact assessment. The key terms are summarised in **Table 5-3.,** although it must be noted that an impact classification is not mutually exclusive and can exist in multiple categories.

Table 5-3. A summary of definitions of key impact classifications and terms

Impact Classification	Definition
Direct Impact	Impacts that result from a direct interaction between the proposed Project activities and the receiving environment.
Indirect Impact	Impacts on the environment, which are not a direct result of the proposed Project activities, often produced away from the activity or as a result of a complex pathway.
Adverse Impact	An impact that is considered to represent an adverse change from the baseline condition or introduces a new undesirable factor.
Beneficial Impact	An impact that is considered to represent an improvement on the baseline condition or introduces a new desirable factor.

Impact Classification	Definition
Cumulative Impact	Impacts that result from incremental changes caused by other present or reasonably foreseeable actions together with the proposed Project (European Commission, 1999). Generally considered to be the same impact but from different projects e.g., noise generated from two separate projects combining to affect residential amenity.
Inter-related Impacts	Inter-related effects or interactions between impacts on different environmental factors have been considered in this ES. This includes where an element of the proposed Project described and assessed in a particular discipline (e.g. Noise Assessment) may cause a direct or indirect effect on one or more sensitive receptors (e.g. Population and Human Health, Marine Mammals, Terrestrial Fauna). Additionally, various impacts can interact and present a greater effect on a sensitive receptor than each impact considered separately. Inter-related effects are assessed through consideration of all effects on a receptor by the proposed Project. An assessment of the potential for all effects on that receptor to interact, whether that be spatially or temporally, results in the identification of inter-related effects on a receptor.
Transboundary Impacts	Transboundary impacts are those that may have an impact on the environment in other European Economic Area (EEA) states.

43. Once the nature of an impact is classified using the key definitions outlined above, its significance can be assessed using a combination of magnitude and sensitivity. A defined methodology and matrix have been used to ensure the assessment is objective and to allow the comparison of results.

5.4.9. Magnitude of Impact

44. The magnitude of a given impact must be ascertained to determine its significance. Magnitude of an impact is a combination of three criteria associated with the impact:

    - Scale of the change - The scale of the change initiated by the impact either directly or indirectly relative to the existing baseline environmental condition, and whether an impact is conserved to be reversible;
    - Spatial extent of the change - The spatial area over which the impact effects the baseline environmental conditions; and
    - Duration of the change - The temporal extent an impact is predicted to affect the baseline environmental conditions before the associated receptors recover or are replaced. The frequency of an impact is also considered under the temporal extent.

45. These three criteria inform the magnitude of the impact- which is classified into four criteria detailed in **Table 5-4.**

Table 5-4. A summary of the magnitude criteria that are associated to specific impacts

Magnitude Criteria	Definition
Large	The impact occurs over a large spatial extent resulting in widespread, long-term, or permanent changes in baseline conditions or affects a large proportion of a receptor population. The impact is very likely to occur and/or will occur at a high frequency or intensity. **Adverse:** Loss of resource and / or quality and integrity of resource; severe damage to key characteristics, features or elements **Beneficial:** Large scale or major improvement of resource = quality; extensive restoration; major improvement of attribute quality
Medium	The impact occurs over a medium spatial extent resulting in medium-term, or partial changes in baseline conditions or partially affects a proportion of a receptor population. The impact is likely to occur and/or will occur at a medium frequency or intensity. **Adverse:** Loss of resource, but not adversely affecting the integrity; partial loss of / damage to key characteristics, features or elements **Beneficial:** benefit to, or addition of, key characteristics, features or elements; improvement of attribute quality
Small	The impact occurs over a small spatial extent resulting in short-term, or small changes in baseline conditions or partially affects a small proportion of a receptor population. The impact has a low likelihood of occurring and/or will occur at a low frequency or intensity. **Adverse:** Some measurable change in attributes, quality, minor loss of, or alteration to, one or more key characteristics, features or elements. **Beneficial:** Minor benefit to, or in addition of, one (maybe more) key characteristics, features or elements; some beneficial impact on attribute or a reduced risk or negative impact occurring
Negligible	The impact occurs over a minor spatial extent resulting in very short-term, or minor changes in baseline conditions or partially affects a very small proportion of a receptor population. The impact has a very low likelihood of occurring and/or will occur at a very low frequency or intensity. **Adverse:** Very minor loss of detrimental alteration to one or more characteristics, features or elements. **Beneficial:** Very minor benefit to or positive addition of one or more characteristics, features or elements

5.4.10. Sensitivity of the Receptor

46. Receptor sensitivity is defined as the degree to which a receptor is affected by an impact. The sensitivity of the receptor is the characterised by three factors. All factors interact to determine a receptor's sensitivity and resilience to a given impact.

- Vulnerability – The vulnerability of the receptor relates to its capacity to accommodate change i.e., the tolerance / intolerance of the receptor to change;

- Recoverability – The ability of the receptor to return to the baseline state before the proposed Project impact caused the change; and
- Importance – The importance of the receptor or feature is a measure of the value assigned to that receptor based on biodiversity and ecosystem services, social value, and economic value. Importance of the receptor is also defined within a geographical context, whether it is important internationally, nationally, or locally.

47. Considering the interaction between these variables a receptor's sensitivity can be classified into four criteria summarised in Table 5-5.

Table 5-5. A summary of the criteria determining a receptor's sensitivity

Receptor Sensitivity Criteria	Definitions
Very High	Very high importance and rarity, internationally important receptor with little or no ability to absorb change without fundamentally altering its character. Limited potential for substitution.
High	High importance and rarity, nationally important, limited ability to absorb change and limited potential for substitution.
Medium	Medium or high importance and rarity, regional scale, limited potential for Substitution, with a medium ability to absorb change.
Low	Low or medium importance and rarity, local scale, with some ability to absorb change.
Negligible	Very low importance and rarity, local scale, with good ability to absorb change.

5.4.11. Evaluating the Significance of Effect

48. The significance of an effect is determined within each technical chapter by correlating the magnitude of change of the impact and the sensitivity of the receptor.

49. The identification of significance typically requires the application of professional judgement; however, a significance matrix (Table 5-6) may also be used as a guide to help identify the likely significance of effects to ensure consistent and comparable assessments throughout the ES. It may be necessary for some specialist disciplines undertaking the assessment to use a variation of the table below that better aligns with magnitude and sensitivity criteria relevant to their topic area. Where this is the case, this is detailed in the relevant technical chapters (**Chapters 7 - 28**).

Table 5-6. Significance matrix

		Value / Sensitivity				
		Very High	**High**	**Medium**	**Low**	**Negligible**
Magnitude	**Large**	Major	Major / Moderate	Major / Moderate / Minor	Moderate / Minor	Minor / Negligible
	Medium	Major / Moderate	Major / Moderate	Moderate / Minor	Minor / Negligible	Negligible
	Small	Major / Moderate / Minor	Moderate / Minor	Moderate / Minor	Minor / Negligible	Negligible
	Negligible	Minor / Negligible	Minor / Negligible	Minor / Negligible	Negligible	Negligible

50. The outcome of interpretation of the matrix (**Table 5-6**), in line with the specific approach defined by each discipline for specific receptors, is the assignment of the level of significance of the effect for potential impacts.

51. Assignment of significance is carried out with consideration of embedded mitigation measures **(see Section 5.4.5**). Embedded mitigation measures (including project design measures and best practice) are presented within each of the topic chapters and have been identified to avoid or reduce potential adverse environmental effects identified. Details on secondary and tertiary mitigation measures and associated definitions can be found in **Section 5.6 and Table 5-10** provides typical definitions for significance of effect. In EIA terms, Moderate and Major levels of significance are defined as significant, and additional mitigation measures may be required, whilst Negligible or Minor impacts are defined as not significant.

Table 5-7. A summary of the definitions of each significant of effect criteria

Significance Category	Definitions	Significant Effect
Major	A large and detrimental change to a valuable / sensitive receptor; likely or apparent exceeding of accepted (often legal) threshold. Or A large and beneficial change, resulting in improvements to the baseline result in previously poor conditions being replaced by new legal compliance or a major contribution being made to national targets. These effects may represent key factors in the decision-making process. Potentially associated with sites and features of national importance or likely to be important considerations at a regional or district scale. Major effects may relate to resources or features which are unique and which, if lost, cannot be replaced or relocated.	Yes

Significance Category	Definitions	Significant Effect
Moderate	A medium scale change which, although not beyond an acceptable threshold, is still considered to be generally unacceptable, unless balanced out by other significant positive benefits of a project. Likely to be in breach of planning policy rather than a legal statute. Or A positive moderate effect is a medium scale change that is significant in that the baseline conditions are improved to the extent that guideline targets (e.g. UK BAP targets) are contributed to. These effects, if adverse, are likely to be important at a local scale and on their own could have a material influence on decision making.	Yes, (unless otherwise specified within technical chapters)
Minor	A small change that, whilst adverse, does not exceed legal or guideline standards. Unlikely to breach planning policy. Or A small positive change, but not one that is likely to be a key factor in the overall balance of issues. These effects may be raised as local issues and may be of relevance in the detailed design of a project but are unlikely to be critical in the decision-making process.	No
Negligible	A very small change that is so small and unimportant that it is considered acceptable to disregard. Effects which are beneath levels of perception, within normal bounds of variation or within the margin of forecasting error. These effects are unlikely to influence decision making irrespective of other effects.	No

5.5. Environmental Risk (Accidental and Unplanned Events)

52. The assessment of unplanned events is based on the likelihood of an event occurring. **Table 5-7** presents the criteria for the assessment of the potential likelihood of an unplanned event.

Table 5-8. Likelihood Criteria

Definition	Indicative Description
Remote	Never occurred during Company's activities but has been known to occur in the wider industry.
Unlikely	Has occurred in Company's activities in the past but as an isolated incident under exceptional circumstance.
Occasional	Has occurred on more than one occasion during Company's activities in the past.
Likely	Occurs regularly during Company's activities.
Note these descriptions are for guidance only. Professional judgement may be applied in specific circumstances out within these guide descriptions.	

53. Significance of an unplanned impact (as determined through the matrix shown in **Table 5-6**) was combined where appropriate with the likelihood of the impact occurring (**Table 5-8**) in order to determine overall risk of an impact occurring as shown in **Table 5-9.**

54. Accidental and unplanned events have been assessed in **Chapter 30: Major Accidents and Disasters**. Further information on the approach and methodology can be found within that chapter.

Table 5-9. Risk Matrix

	Likelihood			
	Remote	**Unlikely**	**Occasional**	**Likely**
Major	Negligible / Minor	Moderate	Major	Major
Moderate	Minor	Minor	Moderate	Major
Minor	Negligible	Minor	Minor	Moderate
Negligible	Negligible	Negligible	Minor	Negligible / Minor

5.6. Identification of Additional / Project Specific Mitigation Measures

55. Following the assessment of impacts, potential project specific mitigation measures (in addition to the embedded mitigation already considered, see **Section 5.7**) are identified. These secondary (foreseeable) and tertiary (inexorable) mitigation measures aim to further reduce the impact of the proposed Project on potential effects that are classified as significant - 'Major' or 'Moderate' (see **Table 5-7**) (IEMA, 2016). Project Specific Mitigation measures can follow three approaches each with differing impacts on the significant effect concerned. These are summarised in **Table 5-10.**

Table 5-10. A summary of the three main mitigation approaches within the ES

Mitigation Approach	Description	Relative significance of change of the mitigation measure on the significant effect
Avoidance or Prevention	In the first instance, mitigation should seek to avoid or prevent the adverse effect at source for example, by relocating infrastructure away from a sensitive receptor.	High
Reduce	If the effect is unavoidable, mitigation measures should be implemented which seek to reduce the significance of the effect	Medium
Offset	If the effect can neither be avoided nor reduced, mitigation should seek to offset the effect through the implementation of compensatory mitigation.	Low

56. A summary of all mitigation measures identified throughout the ES is provided in **Appendix 32A: Mitigation Register**. The mitigation and commitments identified within this ES will be applied during construction and operation the proposed Project. A number of consent plans will utilise and adhere to the commitments made within this ES.

5.7. Evaluation and Assessment of Residual Significance

57. After both embedded and project specific mitigation are considered the remaining impact is the residual effect. Residual effects are those that remain once all options for removing, reducing, or managing potentially significant adverse effects have been taken into account. Such measures should result in an effect that is no longer significant (i.e. reduced to an acceptable or insignificant level). However, in some cases, significant residual effects may remain. Where this is the case, further measures such as monitoring may be identified.

58. A significant adverse effect may not be unacceptable, and it is the role of the decision makers, with necessary advice from statutory bodies, to determine how any remaining residual effects influence the determination of the consent application.

59. Residual negative effects which are assessed as Moderate or Major (descriptions of these definitions are in **Table 5-7**) are then analysed further to identify whether further mitigation is possible. Where further mitigation is not possible a negative residual effect may remain, and in some instances potential offset measures may be applied.

60. Where beneficial effects are identified, enhancement measures are suggested in order to further enhance these effects of the proposed Project.

5.8. Evaluation of Inter-related Effects and Cumulative Effects

61. The ES covers the significant effects of the proposed Project alongside other developments in the vicinity as well the interaction of these significant effects on receptors. This is described in the EIA Directive (Annex IV, Article 5) which was transposed into UK law in 2020 (European Council, 2014):

62. '*The description of the likely significant effects on the factors specified in Article 3(1) should 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.'*

63. These cumulative effects hence are classified into two main categories:

- Intra-Project Effects: The combined effects arising of the proposed Project upon a single receptor or resource. For example, a local resident is affected by dust, noise and a loss of visual amenity during the construction of a scheme, with the result being a greater significance of effect than each individual effect alone; and

- Inter-Project Effects or Cumulative effects: The combined effects of the proposed Project with other relevant developments which may, on an individual basis result in no significant effects but, together (i.e., cumulatively), have a significant effect. This is described by the EIA Directive (Annex IV, Article 5e) (European Council, 2014) as:

  'A description of the likely significant effects of the project on the environment resulting from:… 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'.

64. The term 'Inter-related' considers the environmental interactions ('inter-relationships') with other receptors within the proposed Project. These are referred to in the Infrastructure Planning (Environmental Impact Assessment) Regulations 2009 and further described in **Chapter 31: Inter-related Effect Assessment.**

65. Inter-relationship effects comprise Project lifetime effects (effects that have the potential to occur during more than one phase of the proposed Project) and Receptor-led effects (potential for all effects to interact, spatially and temporally, to create inter-related effects on a receptor).

66. **Chapter 31: Inter-related Effects Assessment** details the approach to the inter-related effects assessment and includes a description of the likely inter-related effects that may occur because of the proposed Project.

67. The following Cumulative Effects Assessment (CEA) process has been recommended under both the Planning Inspectorate (PINS) Guidance Note 17 and Renewable Guiding Principles for Cumulative Impacts Assessment in Offshore Wind Farms (**Table 5-11** and **Figure 5-2** and has been adopted for the assessment of cumulative effects within this ES). All legislation, policy and guidance relating to the need for a CEA is included in **Chapter 2: Regulatory and Planning Context**.

Table 5-11. The stages of the CEA as recommended by PINS Guidance Note 17

Stage of CEA	Further Details
Stage 1: Establishing *'other existing developments and approved developments'* and associated Zones of Influence (ZoI).	Define an initial spatial and temporal ZoI for each key identified significant effect in the ES (**Section 5.4.7**). This will inform which developments within the vicinity of the proposed Project should be included in the CEA.
Stage 2: Screening the long list of '*existing and approved development'* into a shortlist	Adopts a pragmatic approach as suggested in the RenewableUK Guiding Principles whereby associated developments with '*significant cumulative effect'* identified in CEA Stage 1 are screened and shortlisted for further assessment and consultation. The shortlist includes developments that have already had consent from NRW and PEDW or in the initial planning application phases whereby there is sufficient detail to undertake comprehensive CEA Stages 3 and 4. Tier 1 and 2 (**Table 5-12**) existing and approved developments must be included in the CEA with requirement for Tier 3 developments to be included in the CEA being less detailed / stringent.
Stage 3: Development data collection	Collect relevant information and data from the list of shortlisted developments from publicly available sources and public consultations. This information should include details on the design, construction, operation, and decommissioning plans of the developments in the shortlist as well as information regarding the significant environment effects of the development.
Stage 4: Cumulative Effects Assessment	After relevant development information is collected for each development included in the shortlist a CEA can be carried out and

Stage of CEA	Further Details
	potentially be updated if any new developments within the vicinity are given consent by NRW and PEDW. Assumptions and limitations regarding the supporting information collected in Stage 3 should be included in the CEA and worst-case scenarios should also be defined. PINS also stress that any CEA should be '*proportionate*' and '*pragmatic*'.

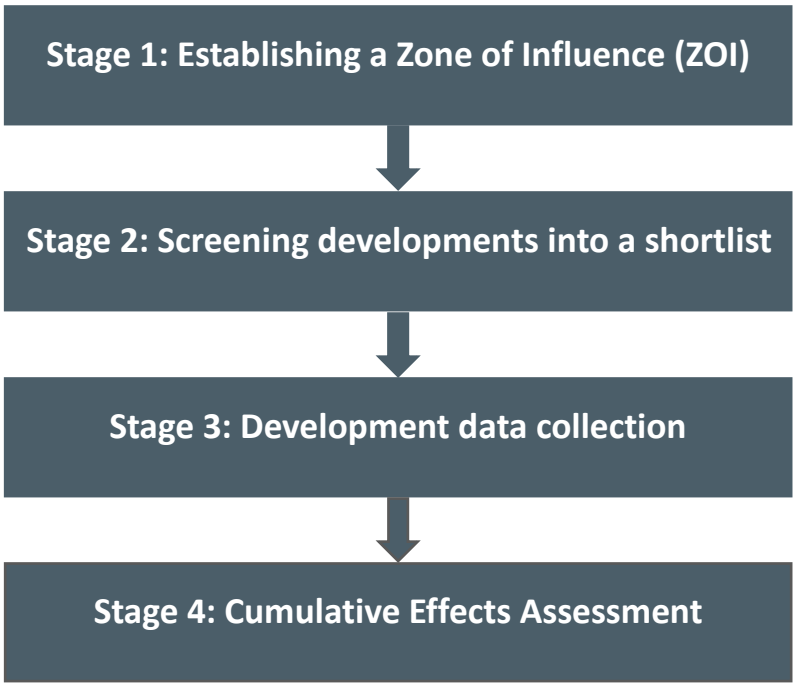

Figure 5-2. Process of a CEA

68. Projects scoped into the CEA will be classed among three tiers of development. Such tiers reflect the licensing and the development status of each project based on PINS Advice Note 17. Projects that were built and operational at the time that survey data was collected are, for the most part, classified as part of the existing baseline environment. Operational projects that are built but have ongoing effects, or projects that are only partially completed at the time of data collection, are also included within the CEA.

69. Further details about the cumulative effects assessment process can be found in **Appendix 5A**: **CEA Approach and Methodology.**

Table 5-12. A summary of project development tier descriptions for use in the CEA. (PINS, 2019)

Project Tier	Description
Tier 1	Under construction (see Note). Permitted application(s), whether under the Planning Act 2008 or other regimes, but not yet implemented.

Project Tier	Description
	submitted application(s) whether under the Planning Act 2008 or other regimes but not yet determined.
Tier 2	Projects on the Planning Inspectorate's Programme of Projects where a scoping report has been submitted.
Tier 3	Projects on the Planning Inspectorate's Programme of Projects where a scoping report has not been submitted. Identified in the relevant Development Plan (and emerging Development Plans – with appropriate weight being given as they move closer to adoption) recognising that there will be limited information available on the relevant proposals. Identified in other plans and programmes (as appropriate) which set the framework for future consents / approvals, where such development is reasonably likely to come forward.

5.9. Evaluation of Transboundary Effects

70. Under the aforementioned EIA Directive (Annex IV, Article 5) an ES should provide an assessment of *'transboundary'* effects of the proposed Project. The Convention on Environmental Impact Assessment in a Transboundary Context (informally called the Espoo Convention 1991) also requires consideration of transboundary environmental effects.

71. Transboundary effects can be defined as any significant effect arising from the proposed Project that is propagated beyond the immediate vicinity of the proposed Project. For example, if a development effects the migratory and movement patterns of certain fauna such as seabirds or cetaceans beyond the immediate vicinity of the development it can be considered as a 'transboundary effect'. The "immediate vicinity" of the proposed Project will vary depending on the receptor and will be defined within each technical chapter as needed.

72. NRW clearly states the need for a transboundary assessment for EIAs for marine activities and developments (NRW, 2022). The assessment process of transboundary effects is detailed in PINS Advice Note 12 (PINS, 2020). The evaluation of transboundary effects is divided into two stages, screening and assessment and follow the same process as the assessment of impacts **(Section 5.4.6**).

5.10. Consultation

73. Stakeholder consultation is important throughout the development of the proposed Project to ensure the environmental data which is collected is validated, and that feedback from consultees is considered by the proposed Project. Consequently, the consultation process is inherently continuous throughout both the scoping and ES phases.

74. Engagement with stakeholders is primarily based on two phases - the public consultation and technical engagement. The public consultation phase aims to provide the local population within the vicinity of the landfall and cable route with the opportunity to comment on the proposals and find out more about the project. As part of this, public consultation was delivered on a hybrid basis. Public consultation took place from 15th January to 11th February and included three in person events held in community venues near to the proposed Project location. These included:

- Pembroke Dock Community Learning Centre, Albion Square, SA72 6XF, Thursday 25 January, 12:00 – 16:00;
- Foundry House, Orange Way, Pembroke, SA71 4DR, Friday 26 January, 11:00-15:00; and
- Hundleton Sports Pavilion, Hundleton, SA71 5RD: Tuesday 30 January, 15:00-19:00.

75. A detailed public consultation delivery plan, outlining the approach to consultation and deliverables, was produced in advance of the consultation launch.

76. Technical engagement is an ongoing process with both statutory and non-statutory stakeholders relevant to each aspect of the ES and to the technical chapters. Each stakeholder will be continually engaged throughout the EIA process and, where appropriate, the proposed Project will conduct thematic workshops to bring together stakeholders with similar interests or responsibilities to facilitate discussion and co-ordination.

77. Further details about the stakeholder engagement process can be found in **Chapter 6: Consultations and Stakeholder Engagement.**

5.11. Habitats Regulation Assessment

78. A Habitats Regulation Assessment (HRA) has been submitted in support of the application for consent, and forms part of a separate legislative regime. The HRA forms part of this ES and has been produced in parallel to the EIA and supports marine licensing applications for the proposed Project to Natural Resources Wales (NRW) Marine Licensing Team under the Marine and Coastal Access Act 2009 (MCAA 2009). The HRA determined the list of European designated sites and Ramsar sites that could be affected by the proposed Project, and which therefore require the more detailed stage of HRA known as Appropriate Assessment.

79. Where there is sufficient evidence that there is no risk that the proposed Project activities will have a Likely Significant Effect (LSE) on specific features of a European or Ramsar site either alone or in-combination with other plans or projects, by undermining its conservation objective(s), these features have been screened out and will not require further assessment. Where such determination has been concluded, the justification is noted within the relevant receptor chapters.

80. If a clear impact pathway for adverse effect is identified, or there is reasonable doubt whether the proposed Project will or will not result in LSE, in view of the conservation objectives, then the respective site and feature has been screened into the HRA, to be taken forward to the next stage, Appropriate Assessment (AA). This is in line with the precautionary principle (CIEEM, 2018).

81. Further details about the HRA process can be found in **Appendix 8D: HRA.**

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