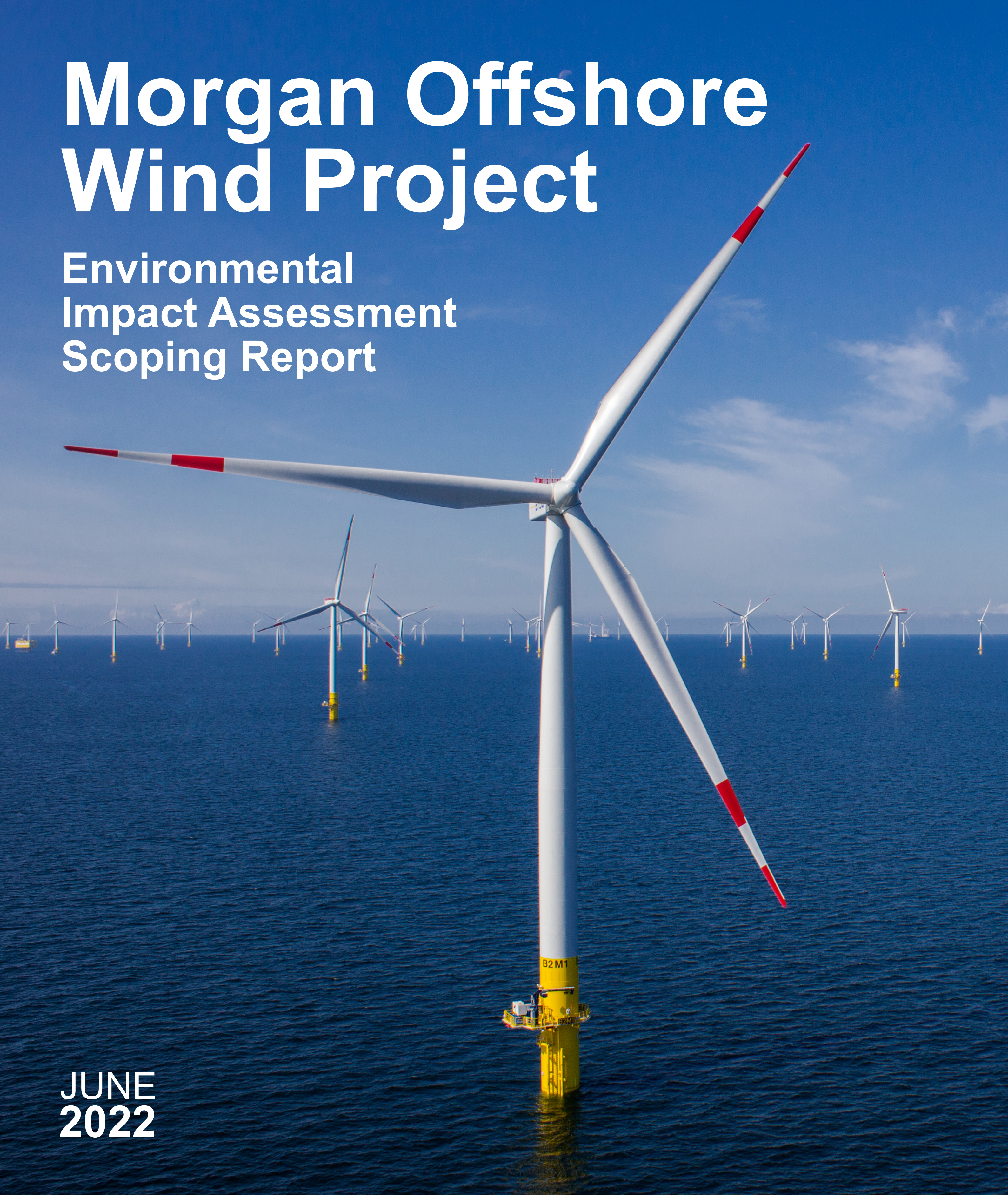

Morgan Offshore Wind Project

Environmental Impact Assessment Scoping Report

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Morgan Offshore Wind Project EIA Scoping Report

Part 1: Introduction

Part 2: Generation assets

Part 3: Annexes

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Part 1: Introduction

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Executive summary

Energie Baden-Württemberg AG (EnBW) and bp are jointly developing the Morgan Offshore Wind Project through their project company Morgan Offshore Wind Limited (the Applicant). The Morgan Array Scoping Boundary (i.e. the area within which the offshore wind turbines will be located) is located in the east Irish sea, 22.3km (12nm) from the Isle of Man and 36.3km (19.6 nautical miles (nm)) from the northwest coast of England (when measured from Mean High Water Springs (MHWS)). In accordance with the Round 4 bid, the proposed capacity of the Morgan Offshore Wind Project is 1.5 Gigawatts (GW).

The Morgan Offshore Wind Project has been scoped into the Pathways to 2030 workstream under the Offshore Transmission Network Review (OTNR). Under the OTNR, the National Grid Electricity System Operator (NGESO) are responsible for conducting a Holistic Network Design Review (HNDR) to assess options to improve the coordination of offshore wind generation connections and transmission networks. The output of the HNDR has concluded that the Morgan Offshore Wind Project will share a grid connection location at Penwortham in Lancashire with the Round 4 Morecambe Offshore Windfarm, also located in the east Irish Sea. Although they are promoted by separate companies, which means it is not feasible for all aspects of both projects to be consented under a single application, the Applicant intends to deliver a coordinated grid connection with the Morecambe Offshore Windfarm, including the sharing of offshore and onshore export cable corridors and grid connection location at Penwortham.

The Applicant, as well as the applicant for the Morecambe Offshore Windfarm, intend to consent their individual generation assets separately and therefore separate scoping reports are being submitted by each applicant for the Morgan Offshore Wind Project generation assets and the Morecambe Offshore Windfarm generation assets respectively. The Applicant is preparing for working together with the applicant for the Morecambe Offshore Windfarm to identify the engineering options for a coordinated transmission assets and to develop a timeline for a transmission assets consent application. An additional EIA Scoping Report for such coordinated transmission assets would be submitted in due course. Note the exact design and delivery model for such transmission assets is still subject to the final Holistic Network Design outcome.

This document supports the Applicant’s request for a Scoping Opinion from the Secretary of State for the development of the Morgan Offshore Wind Project generation assets. The Morgan Offshore Wind Project generation assets is a Nationally Significant Infrastructure Project (NSIP) requiring an application for development consent to be made to The Planning Inspectorate. The application for development consent will comprise full details of the Morgan Offshore Wind Project generation assets and will be accompanied by an Environmental Statement (ES), which will present the results of the Environmental Impact Assessment (EIA) for the Morgan Offshore Wind Project generation assets. The EIA will be prepared in accordance with The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 (the 2017 EIA Regulations).

This EIA Scoping Report is presented in three parts:

- Part 1 (Introduction) provides an introduction to the Morgan Offshore Wind Project generation assets, as well as background in relation to the consenting approach for the transmission assets; sets out the policy and legislative context; provides an indicative project description; sets out the proposed EIA methodology; and details the pre-application consultation process.

- Part 2 (Generation assets) provides an introduction to the generation assets of the Morgan Offshore Wind Project; considerations for site selection and alternatives; and identifies the main aspects of the offshore (and where relevant, onshore) physical, biological and human environment likely to be significantly affected by the generation assets.
- Part 3 (Annexes) contains the transboundary impacts screening and Marine Conservation Zones (MCZs) screening annexes.

This EIA Scoping Report has identified potential topics and impacts to be scoped into the EIA based upon an understanding of the environmental conditions likely to be encountered within the Morgan Offshore Wind Project technical topic study areas for the generation assets. The EIA Scoping Report also identifies those potential topics and impacts that are proposed to be scoped out of the EIA, based on an understanding of the nature of the Morgan Offshore Wind Project generation assets (including measures adopted as part of the project) and the proposed location.

The site selection for all elements of the Morgan Offshore Wind Project infrastructure is ongoing. The generation infrastructure will be located within the Scoping boundaries identified within the EIA Scoping Report, however, the refined locations of the offshore infrastructure have not yet been determined.

Extensive consultation with relevant statutory and non-statutory consultation bodies is required before an application for development consent is submitted to The Planning Inspectorate, which will help to inform the development of the Morgan Offshore Wind Project generation assets.

Consultees are invited to consider the information provided in this EIA Scoping Report and to advise on whether they agree with the conclusions reached. Broad questions have been presented at the end of part 2 of the EIA Scoping Report to encourage reflection on the key elements of the Morgan Offshore Wind Project generation assets.

Following receipt of the Scoping Opinion from the Secretary of State, a PEIR is planned to be produced and consulted on during Q1 2023. The PEIR will provide an initial statement of the environmental information available for the Morgan Offshore Wind Project generation assets, including descriptions of the likely environmental effects, measures adopted as part of the project, and relevant enhancement, mitigation and monitoring commitments. The PEIR is intended to allow those taking part in the consultation to understand the nature, scale, location and likely significant environmental effects of the Morgan Offshore Wind Project generation assets, such that they can make an informed contribution to the process of pre-application consultation under the Planning Act 2008 and to the EIA process. In parallel to the EIA process, the Habitats Regulations Assessment (HRA), including the HRA Screening Report and subsequent Report to Inform Appropriate Assessment (RIAA), will be consulted upon during the pre-application consultation process. A plan level HRA is currently in preparation by The Crown Estate which assesses the potential impact of the Round 4 Preferred Bidding Areas on the UK's National Site Network and protected habitats and species. The plan level HRA is due to be published in spring 2022.

The Applicant expects it will further refine the design of the Morgan Offshore Wind Project generation assets in response to the consultation responses received from the pre-application consultation in addition to environmental constraints identified during the EIA process. The final results of the EIA will be presented in an ES and a summary of all consultation responses received will be presented in a Consultation Report, both of which will accompany the application for development consent which is planned to be submitted in Q1 2024.

Glossary

Term	Meaning
Morgan Array Scoping Boundary	The Morgan Array Scoping Boundary within which the wind turbines, foundations, inter-array cables, interconnector cables and offshore substation platforms (OSPs) will be located.
Morgan Offshore Wind Project generation assets	The Morgan Offshore Wind Project generation assets is comprised of the generation assets and associated activities.
Study Area	For each environmental topic, the baseline environment will be characterized and the potential environmental impacts will be described within a topic-specific study area. The topic-specific study areas are defined for each topic in part 2 of the EIA Scoping Report and are based on the maximum spatial extent across which potential impacts of the Morgan Offshore Wind Project generation assets may be experienced by the relevant receptors (i.e. Zone of Influence).

Acronyms

Acronym	Meaning
AfL	Agreement for Lease
BEIS	Department of Business, Energy and Industrial Strategy
CCC	Committee on Climate Change
CEA	Cumulative Effects Assessment
CfD	Contract for Difference
CIEEM	Chartered Institute of Ecology and Environmental Management
COWRIE	Collaborative Offshore Windfarm Research Into the Environment
CPA	Coast Protection Act
cSAC	Candidate Special Area of Conservation
DCO	Development Consent Order
DECC	Department of Energy and Climate Change (now BEIS)
Defra	Department for Environment, Food and Rural Affairs
EC	European Commission
EIA	Environmental Impact Assessment
EMR	Electricity Market Reform
EPS	European Protected Species
ES	Environmental Statement
EU	European Union
EWG	Expert Working Group
FEPA	Food and Environment Protection Agency
GHG	Greenhouse Gas
HAT	Highest Astronomical Tide
HLV	Heavy Lift Vessel
HNDR	Holistic Network Design Review
HRA	Habitats Regulations Assessment
IEEM	Institute of Ecology and Environmental Management
IEMA	Institute of Environmental Management and Assessment
IEP	Industry Evidence Programme

Acronym	Meaning
JNCC	Joint Nature Conservation Committee
LAT	Lowest Astronomical Tide
LCCC	Low Carbon Contracts Company
MCAA	Marine and Coastal Access Act
MCZ	Marine Conservation Zone
MHWS	Mean High Water Springs
MLWS	Mean Low Water Springs
MMO	Marine Management Organisation
MOD	Ministry of Defence
MPS	Marine Policy Statement
MSR	Mean Spring Tidal Range
NGESO	National Grid Electricity System Operator
NPS	National Policy Statement
NRW	Natural Resources Wales
NSIP	Nationally Significant Infrastructure Project
OFGEM	Office of Gas and Electricity Markets
OSP	Offshore Substation Platform
OTNR	Offshore Transmission Network Review
PDE	Project Design Envelope
PEI	Preliminary Environmental Information
PEIR	Preliminary Environmental Information Report
pSPA	Potential Special Protection Area
RED	Renewable Energy Directive
RIAA	Report to Inform an Appropriate Assessment
ROC	Renewables Obligation Certificate
SAC	Special Area of Conservation
SCI	Site of Community Importance
SNCB	Statutory Nature Conservation Body
SoCC	Statement of Community Consultation
SPA	Special Protection Area
TCA	Trade and Cooperation Agreement
TCE	The Crown Estate
TP	Transition Piece
UK	United Kingdom
UKCP	UK Climate Projections
UXO	Unexploded Ordnance

Units

Unit	Description
GW	Gigawatt
km	Kilometres

Unit	Description
kV	Kilovolt
MW	Megawatt
nm	Nautical miles

1. Introduction

1.1 Background

1.1.1.1 In February 2021, Energie Baden-Württemberg AG (EnBW) and bp Alternative Energy Investments Limited were selected by The Crown Estate (TCE) as Preferred Bidder for two 60-year leases in Offshore Wind Leasing Round 4. The projects to be developed in the two Preferred Bidding Areas, located in the east Irish Sea, have been named as the Morgan Offshore Wind Project and the Mona Offshore Wind Project. In accordance with the Round 4 bid, the proposed capacity of each project is 1.5GW. Separate consent applications will be submitted by Morgan Offshore Wind Limited and Mona Offshore Wind Limited (the 'Applicants') for each project, each supported by a separate Environmental Impact Assessment (EIA) Scoping Report and Environmental Statement (ES). This EIA Scoping Report has been prepared for the Morgan Offshore Wind Project. The EIA Scoping Report for the Mona Offshore Wind Project was submitted to The Planning Inspectorate and Natural Resources Wales in May 2022.

1.1.1.2 The Morgan Offshore Wind Project has been scoped into the Pathways to 2030 workstream under the Offshore Transmission Network Review (OTNR). The OTNR aims to consider, simplify and wherever possible facilitate collaborative approach to offshore wind projects connecting to the UK National Grid. The OTNR is being led by the Department for Business, Energy and Industrial Strategy (BEIS) in conjunction with the Office of Gas and Electricity Markets (OFGEM) and the National Grid Electricity System Operator (NGESO). Under the OTNR, the NGESO are responsible for assess options to improve the coordination of offshore wind generation connections and transmission networks. As part of the OTNR, the NGESO is undertaking a Holistic Network Design Review (HNDR). The output of the HNDR has concluded that the Morgan Offshore Wind Project will share a grid connection location at Penwortham in Lancashire with the Round 4 Morecambe Offshore Windfarm, also located in the east Irish Sea. Although the projects are being developed by separate companies, which means it is not feasible for all aspects of both projects to be consented under a single application, the Applicant intends to deliver a coordinated grid connection with the Morecambe Offshore Windfarm, including the sharing of offshore and onshore export cable corridors and grid connection location at Penwortham.

1.1.1.3 Given the coordinated grid connection arrangements, the proposed consenting strategy for the Morgan Offshore Wind Project and the Morecambe Offshore Windfarm is as follows:

- A stand-alone Development Consent Order (DCO) application to consent the construction, operation and maintenance, and decommissioning of the generation asset of Morgan Offshore Wind Project
- A stand-alone DCO application to consent the construction, operation and maintenance, and decommissioning of the generation asset of Morecambe Offshore Windfarm

- A separate application to consent the construction, operation and maintenance and decommissioning of the transmission assets required to enable the export of electricity from both the Morgan Offshore Wind Project and the Morecambe Offshore Windfarm to the National Grid entry point at Penwortham.

1.1.1.4 In order to achieve this, the Applicant, together with the applicant for the Morecambe Offshore Windfarm, intend to seek a direction from the Secretary of State under section 35 of the Planning Act 2008 to pursue a transmission assets consent (covering both projects' offshore and onshore transmission infrastructure) through the DCO process as a Nationally Significant Infrastructure Project (NSIP). Key reasons for selecting the preferred consenting approach to the projects' transmission assets are:

- A coordinated approach would allow for better consideration of potential impacts (including cumulative impacts)
- A coordinated approach would ensure more efficient use of stakeholder resources
- A coordinated approach would also provide a formal structure for the projects to collaborate and align on transmission design, assessment and mitigation approach
- A coordinated approach will streamline the consenting process with a single permission and approval timeline
- A co-ordinated approach aligns with the National Policy Statements (NPS) for delivering major energy infrastructure (for example 4.9.2 of the current adopted NPS for Overarching Energy (EN-1), and 4.10.3 and 4.10.4 of the draft NPS EN-1).

1.1.1.5 The Applicant, as well as applicant for the Morecambe Offshore Windfarm, intend to consent their individual generation assets separately and therefore separate scoping reports are being submitted by each applicant for the Morgan Offshore Wind Project generation assets and Morecambe Offshore Windfarm generation assets respectively. The Applicant is preparing for working together with the applicant for the Morecambe Offshore Windfarm to identify the engineering options for a coordinated transmission assets and to develop a timeline for a transmission assets consent application. An additional EIA Scoping Report for a coordinated transmission assets would be submitted in due course. Note the exact design and delivery model for such transmission assets is still subject to the final Holistic Network Design outcome. The benefits of the approach described above are as follows:

- A number of the key potential consenting issues for the Morgan Offshore Wind Project and the Morecambe Offshore Windfarm are likely to arise from the construction, operation and maintenance and decommissioning of the generation assets (e.g. in relation to shipping and navigation, commercial fisheries and ornithology). The projects are seeking to maximise the time available to better understand the views of stakeholders and other interested parties on the potential impacts arising from the development of the generation assets
- To present the projects' proposed approach to EIA for the generation and transmission assets and ensure stakeholders have the opportunity to comment on this.

1.1.1.6 This EIA Scoping Report has been prepared for the Morgan Offshore Wind Project generation assets only. The Morgan Array Scoping Boundary (i.e. the area within which the offshore wind turbines will be located) is 322.2km^2 in area and is located 22.3km (12nm) from the Isle of Man and 36.3km (19.6nm) from the northwest coast of England (when measured from Mean High Water Springs (MHWS)). The Morgan Array Scoping Boundary is located wholly within English offshore waters (beyond 12nm from the English coast).

1.1.1.7 As the Morgan Offshore Wind Project is an offshore generating station with a capacity of greater than 100MW located in English waters, it is a Nationally Significant Infrastructure Project (NSIP)[1], requiring a Development Consent Order (DCO) under the Planning Act 2008. The application for development consent for the Morgan Offshore Wind Project generation assets will cover all offshore aspects of the Morgan Offshore Wind Project generation assets included within the Morgan Array Scoping Boundary.

1.1.1.8 The application for development consent will comprise full details of the Morgan Offshore Wind Project generation assets and will be accompanied by an ES, which will present the findings of the EIA process and will be prepared in accordance with The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 (the 2017 EIA Regulations).

1.1.1.9 This EIA Scoping Report is presented in three parts as follows (as further described in section 1.4.3):

- part 1: Introduction
- part 2: Generation assets
- part 3: Annexes.

1.1.1.10 This EIA Scoping Report supports a request for a formal Scoping Opinion from the Secretary of State under the 2017 EIA Regulations in relation to the Morgan Offshore Wind Project generation assets.

1.2 The Applicant and the EIA team

1.2.1.1 The Applicant is a joint venture between two leading energy companies which are working together as partners to deliver offshore wind projects in both Offshore Wind Leasing Round 4 and ScotWind Leasing.

1.2.1.2 EnBW is one of the largest energy supply companies in Germany and supplies electricity, gas, water and energy solutions and energy industry services to around 5.5 million customers with a workforce of more than 23,000 employees. EnBW aims to strengthen its position as a sustainable and innovative infrastructure partner for customers, citizens and local authorities to an even greater extent. The repositioning of EnBW with a focus on renewable energies and smart infrastructure solutions is a key component of its strategy. With a focus on renewable energy and smart infrastructure solutions EnBW's objective is for half of the electricity it

1 As defined by Section 15(3) of the Planning Act 2008, as amended

supplies to be from renewable sources by the end of 2025. This is already having a noticeable effect on the reduction of CO_2 emissions, which EnBW aims to halve by 2030. EnBW is aiming for climate neutrality by 2035. EnBW has been involved in the operation of hydro power plants in the Black Forest for more than 100 years, and has a large and continuously growing number of onshore wind farms and solar PV in Germany, France and Sweden. In addition, EnBW developed, constructed and operates four offshore wind farms in Germany (EnBW Baltic 1, Baltic 2, Hohe See and Albatros) with a total installed capacity of 945MW, commissioned between 2011 and 2020. A further 900MW offshore wind farm is currently under development with commissioning planned for 2025.

1.2.1.3 bp has set out an ambition to be a net zero company by 2050, or sooner. This strategy will see bp transform from an international oil company producing resources, to an integrated energy company providing solutions to customers. bp already has a significant onshore wind business in the US with a gross generating capacity of 1.7GW, operating nine wind assets across the country. Since setting its new strategy in August 2020, bp has already formed a partnership with Equinor to develop offshore wind projects in the US, including the Empire Wind and Beacon Wind projects off the East Coast that have a planned potential 4.4GW generating capacity. To date, these projects have been selected by New York to supply 3.3GW of power to the State, underpinning the commercial attractiveness of the investments.

1.2.1.4 RPS has been contracted by the Applicant to undertake the EIA for the Morgan Offshore Wind Project generation assets. This includes an initial review of the key environmental issues associated with the construction, operation and maintenance and decommissioning of the Morgan Offshore Wind Project generation assets to inform the EIA Scoping Report. The EIA team is comprised of a number of RPS in-house and subcontracted topic specialists, as set out in Table 1.2.

1.2.1.5 In accordance with Regulation 14(4) of the 2017 EIA Regulations, the ES will be prepared by competent experts and will outline the relevant expertise of those experts.

1.3 Project overview

1.3.1 Generation assets

1.3.1.1 Offshore Wind Leasing Round 4 was instigated by TCE in September 2019, and four Bidding Areas were identified for the development of offshore wind. As part of a competitive tender, EnBW and bp were awarded Preferred Bidder status for two 60-year leases within the Northern Wales and Irish Sea Bidding Area (Figure 1.1). The Bidding Areas are areas of the seabed, identified by TCE, that offer the least constrained (most technically favourable) areas for offshore wind development.

1.3.1.2 The site selection process for the Morgan Offshore Wind Project generation assets is presented in part 2, section 2: Site selection and alternatives, of the EIA Scoping Report. The Morgan Array Scoping Boundary is presented in Figure 1.1 and part 2, section 1: Introduction, of the EIA Scoping Report.

1.3.1.3 A description of the Morgan Offshore Wind Project generation assets is presented in part 1, section 3: Project description, of the EIA Scoping Report. Key components of the Morgan Offshore Wind Project generation assets include:

- offshore wind turbines
- foundations and support structures
- scour and cable protection
- inter-array cables
- interconnector cables
- offshore substation platforms.

1.3.1.4 In accordance with the Round 4 bid, the proposed capacity of the Morgan Offshore Wind Project is 1.5GW. The Morgan Offshore Wind Project generation assets will include all associated offshore infrastructure (including up to 107 offshore wind turbines).

1.3.2 Transmission assets

1.3.2.1 As described above, the Applicant prepares for delivering a coordinated grid connection with the Morecambe Offshore Windfarm, including the potential for sharing of offshore and onshore export cable corridors and grid connection location at Penwortham. The scoping search area for such coordinated offshore and onshore transmission assets is currently being defined by the Applicant, together with the applicant for the Morecambe Offshore Windfarm. The indicative extent of the scoping search area will be in English waters connecting to a grid connection location at Penwortham in Lancashire, as shown in Figure 1.1. Further detail would be provided in the EIA Scoping Report for the transmission assets. Note the exact design and delivery model for such transmission assets is still subject to the final Holistic Network Design outcome.

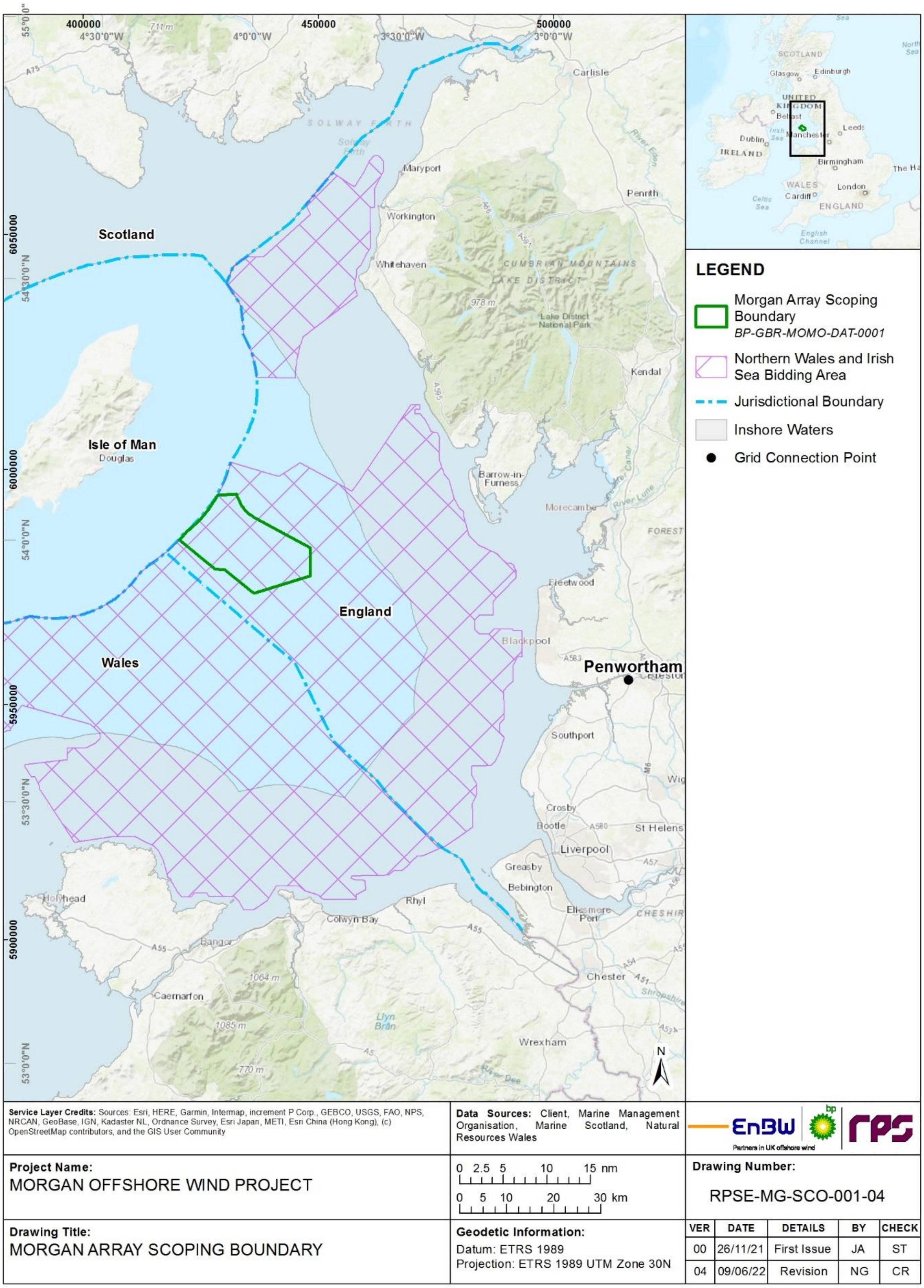


Figure 1.1: Morgan Array Scoping Boundary.

1.4 Purpose, approach and structure of the EIA Scoping Report

1.4.1 Purpose

1.4.1.1 The purpose of the EIA Scoping Report is to provide information on the Morgan Offshore Wind Project generation assets and to allow for engagement with stakeholders on the key topics to be addressed in the EIA. In addition, scoping can be used to present the baseline data sources and assessment methodologies to be used to inform the EIA. Guidance on EIA scoping from the European Commission sets out the following benefits of scoping (EC, 2017):

- Scoping ensures that key environmental issues to be addressed are identified at an early stage.
- Scoping ensures resources are focused on the key environmental issues and further information is not required to be requested after the application for development consent is submitted.
- Scoping ensures consultation with relevant consultees occurs at an early stage.
- Scoping aids effective management and planning of resources and timescales for the production of the EIA.
- Scoping allows identification of initial alternatives and mitigation measures being considered by the developers.

1.4.1.2 The Morgan Offshore Wind Project generation assets EIA Scoping Report has been prepared in support of a request for a Scoping Opinion from the Secretary of State in accordance with Regulation 10 of the 2017 EIA Regulations. In compliance with these regulations, this EIA Scoping Report provides:

- A plan sufficient to identify the land.
- A description of the proposed development, including its location and technical capacity.
- An explanation of the likely significant effects of the development on the environment.
- Such other information or representations as the person making the request may wish to provide or make.

1.4.1.3 Table 1.1 summarises the information requirements set out in the 2017 EIA Regulations and where these can be found in this EIA Scoping Report.

Table 1.1: Scoping requirements of the 2017 EIA Regulations and where the information is included in the EIA Scoping Report.

EIA Regulation requirement	Summary content
A plan sufficient to identify the land	Part 1, section 3: Project description, of the EIA Scoping Report includes a plan/map of the location of the Morgan Offshore Wind Project generation assets.

EIA Regulation requirement	Summary content
A description of the proposed development, including its location and technical capacity	Part 1, section 3: Project description, of the EIA Scoping Report includes a description of the Morgan Offshore Wind Project generation assets.
An explanation of the likely significant effects of the development on the environment	Part 2, Generation assets of the EIA Scoping Report, include a description of the potential likely significant effects on the environment arising from the Morgan Offshore Wind Project generation assets.
Such other information or representations as the person making the request may wish to provide or make	Further information on the Morgan Offshore Wind Project generation assets is provided in part 2, Generation assets and part 3, Annexes, of the EIA Scoping Report.

1.4.2 Approach

1.4.2.1 The approach taken in the preparation of this EIA Scoping Report has aimed to achieve the following objectives:

- To provide an overview of the baseline environment and the data collection and survey methodologies that will be implemented to inform the EIA baseline characterization for each technical assessment.
- To propose topics and impacts to scope into the Morgan Offshore Wind Project generation assets EIA, drawing upon the existing evidence base where appropriate, and presenting topic-specific assessment methodologies where appropriate.
- To propose topics and impacts to be scoped out of the Morgan Offshore Wind Project generation assets EIA, drawing upon the existing evidence base where appropriate, where there is clear justification for doing so.

1.4.2.2 This approach will allow the EIA to focus on those potential impacts which either have the potential to lead to a significant effect, or where uncertainty exists on potential effect, thereby supporting the development of a proportionate ES.

1.4.2.3 The ES, which will present the findings of the EIA for the Morgan Offshore Wind Project generation assets, will be informed by the Scoping Opinion provided by the Secretary of State, including responses from relevant statutory and non-statutory consultation bodies. Details of the proposed approach to stakeholder consultation are outlined in part 1, section 5: Consultation process, of the EIA Scoping Report. The application for development consent, which will be accompanied by the ES, is planned to be submitted to The Planning Inspectorate (on behalf of the Secretary of State) in Q1 2024.

1.4.2.4 The Applicant welcomes the opportunity for engagement with consultees and feedback on the Morgan Offshore Wind Project generation assets and the scope (proposed content) of the ES.

1.4.3 Structure

1.4.3.1 This EIA Scoping Report is presented in three parts:

- Part 1 of the EIA Scoping Report (Introduction) provides an introduction to the Morgan Offshore Wind Project generation assets, sets out the policy and legislative context, provides an indicative project description, sets out the proposed EIA methodology and details the pre-application consultation process.
- Part 2 of the EIA Scoping Report (Generation assets) provides an introduction to the generation assets of the Morgan Offshore Wind Project, considerations for site selection and alternatives, and identifies the main aspects of the offshore physical, biological and human environment likely to be significantly affected by the construction, operation and maintenance, and decommissioning of the generation assets.
- Part 3 of the EIA Scoping Report (Annexes) contains the transboundary impacts screening and Marine Conservation Zone (MCZ) screening annexes.

1.4.3.2 The structure of this EIA Scoping Report is set out in Table 1.2.

Table 1.2: Topics within the EIA Scoping Report.

Topic	Summary of content	Section	Author
Part 1: Introduction			
Introduction	Background to the Morgan Offshore Wind Project generation assets and the consenting approach for the transmission assets; and outlines the purpose and approach of the EIA Scoping Report.	Part 1, section 1	RPS
Policy and legislation	Description of the policy and legislative context relevant to the Morgan Offshore Wind Project generation assets.	Part 1, section 2	RPS
Project description	Description of the design for the Morgan Offshore Wind Project generation assets, based on preliminary conceptual design information and current understanding of the environment from initial site investigation studies.	Part 1, section 3	RPS and bp/EnBW
EIA methodology	Description of the proposed principles of the EIA process and the approach that will be applied in the ES to identify and evaluate the likely impacts and, subsequently, evaluate the significance of effects, associated with the Morgan Offshore Wind Project generation assets.	Part 1, section 4	RPS
Consultation process	Description of the consultation that has been carried out at the time of submission of the EIA Scoping Report and the consultation that will be carried out in the pre-application phase.	Part 1, section 5	RPS
Part 2: Generation assets			
Section 1: Introduction			
Introduction	Background to the generation assets and what is considered within Part 2 of the EIA Scoping Report.	Part 2, section 1	RPS
Section 2: Site selection and alternatives			
Site selection and alternatives	Description of the site selection process relevant to the generation assets, including the approach undertaken by the Applicant to identify the siting of the Morgan Offshore Wind Project generation assets.	Part 2, section 2	RPS and bp/EnBW
Section 3: Offshore physical environment			
Physical processes	Overview of the offshore physical environment (tidal elevations, currents, waves, bathymetry, geology, seabed sediments, suspended sediments and sediment transport) within the Morgan Array Scoping Boundary. Supports assessment of potential impacts to the offshore physical environment from construction, operation and maintenance and decommissioning.	Part 2, section 3.1	RPS
Underwater noise	Overview of approach to the assessment of underwater noise arising from the construction, operation and maintenance and decommissioning of the Morgan Offshore Wind Project generation assets. Required for understanding of potential impact to underwater noise sensitive receptors such as marine mammals and fish.	Part 2, section 3.2	RPS and Seiche
Section 4: Offshore biological environment			

Topic	Summary of content	Section	Author
Benthic subtidal and intertidal ecology	Overview of the ecology of the seabed within the Morgan Array Scoping Boundary. Required for understanding of potential impacts to seabed ecology from construction, operation and maintenance and decommissioning.	Part 2, section 4.1	RPS
Fish and shellfish ecology	Overview of the fish and shellfish ecology of the seabed within the Morgan Array Scoping Boundary. Required for understanding of potential impact to fish and shellfish ecology from construction, operation and maintenance and decommissioning.	Part 2, section 4.2	RPS
Marine mammals	Overview of the marine mammals within the vicinity of the Morgan Array Scoping Boundary. Required for understanding of potential impacts to marine mammals from construction, operation and maintenance and decommissioning.	Part 2, section 4.3	RPS
Offshore ornithology	Overview of the ornithology features within the vicinity of the Morgan Array Scoping Boundary. Required for understanding of potential impacts to ornithology from construction, operation and maintenance and decommissioning.	Part 2, section 4.4	RPS
Section 5: Offshore human environment			
Commercial fisheries	Overview of commercial fisheries within the vicinity of the Morgan Array Scoping Boundary. Required for understanding of potential impacts to commercial fisheries from construction, operation and maintenance and decommissioning.	Part 2, section 5.1	RPS and Marine Space Ltd
Shipping and navigation	Overview of the baseline shipping and navigation within the vicinity of the Morgan Array Scoping Boundary. Required for understanding of potential impacts to shipping and navigation from construction, operation and maintenance and decommissioning.	Part 2, section 5.2	RPS and NASH Maritime
Marine archaeology	Overview of marine archaeology within the vicinity of the Morgan Array Scoping Boundary. Supports understanding of impact to marine archaeology from construction, operation and maintenance and decommissioning.	Part 2, section 5.4	RPS
Other sea users	Overview of other sea users within the vicinity of the Morgan Array Scoping Boundary. Required for understanding of potential impacts to other sea users from construction, operation and maintenance and decommissioning.	Part 2, section 5.5	RPS
Section 6: Offshore and onshore combined topics			
Seascape, landscape and visual resources	Overview of seascape, landscape and visual resources within the vicinity of the Morgan Array Scoping Boundary. Required for understanding of potential impacts to seascape, landscape and visual resources from construction, operation and maintenance and decommissioning.	Part 2, section 6.1	RPS
Socio-economics and community	Overview of socio-economics and community within the vicinity of the Morgan Array Scoping Boundary. Required for understanding of potential impacts to socio-economics and community from construction, operation and maintenance and decommissioning.	Part 2, section 6.2	RPS and Hardisty Jones

Topic	Summary of content	Section	Author
Aviation and radar	Overview of aviation and radar receptors within the vicinity of the Morgan Array Scoping Boundary. Required for understanding of potential impacts to aviation and radar from construction, operation and maintenance and decommissioning.	Part 2, section 6.3	RPS and Osprey
Climate change	Overview of climate change receptors for the Morgan Offshore Wind Project generation assets.	Part 2, section 6.4	RPS
Noise and vibration	Overview of potential impacts of noise and vibration arising from the Morgan Offshore Wind Project generation assets.	Part 2, section 6.5	RPS
Section 7: Other Environmental Topics			
Topics with supporting information	Overview of topics of relevance to the Morgan Offshore Wind Project generation assets where a technical appendix only will be provided to support the relevant technical chapters of the ES.	Part 2, section 7.1	RPS
Topics proposed to be scoped out	Justification for scoping out relevant topics for the Morgan Offshore Wind Project generation assets.	Part 2, section 7.2	RPS
Topics covered elsewhere in the ES	Overview of topics of relevance to the Morgan Offshore Wind Project generation assets that will be covered in other technical chapters of the ES and are not proposed to be subject to standalone chapters or appendices within the ES.	Part 2, section 7.3	RPS
Section 8: Summary			
Summary	Presents an overview of the EIA Scoping Report and a summary of the potential impacts which are proposed to be scoped into and out of the EIA relevant to the generation assets.	Part 2, section 8	RPS
Part 3: Annexes			
Transboundary screening	Includes a screening assessment of potential transboundary impacts arising from the Morgan Offshore Wind Project generation assets.	Annex A	RPS
MCZ screening	Includes a screening assessment of potential impacts on Marine Conservation Zones arising from the Morgan Offshore Wind Project generation assets.	Annex B	RPS

2. Policy and legislation

2.1 Climate change policy and need for the project

2.1.1 International commitments

2.1.1.1 The UK is a signatory to the Kyoto protocol, which committed industrialized countries and economies to limit and reduce greenhouse gas emissions in accordance with agreed individual targets. The protocol came into effect in 2005 and its commitments were transposed into UK law by the Climate Change Act 2008. This placed a duty on the UK to ensure that the net UK carbon account for the year 2050 is 80% lower than the 1990 baseline. This was revised to a “net zero target” of greenhouse gas emissions for the year 2050 to be 100% lower than the 1990 levels by The Climate Change Act 2008 (2050 Target Amendment) Order 2019.

2.1.1.2 In December 2015, 195 countries adopted the first ever universal, legally binding global climate deal at the Paris climate conference (COP21). The Paris Agreement (2016) sets out a global action plan towards climate neutrality with the aims of stopping the increase in global average temperature to below 2°C above pre-industrial levels, and to pursue efforts to limit global warming to 1.5°C. In November 2021, the UN Climate Change Conference (COP26) was held in Glasgow. The Glasgow Climate Pact, agreed by all parties, ensures the 1.5°C warming limit remains achievable but only with accelerated action on climate. Guidelines for how the Paris Agreement will be delivered were also completed at COP26.

2.1.2 European legislation and policy

2.1.2.1 The UK formally left the European Union (EU) on 31 January 2020 after triggering article 50 of the Lisbon Treaty. Subsequently, the UK entered a transition period until 31 December 2020, during which all EU policies and legislation were required to be implemented by the UK.

2.1.2.2 The UK/EU Trade and Cooperation Agreement (TCA) requires "non regression" in the level of environmental protection that was in place on 31 December 2020 by the UK from the end of the transition period. Further, environmental targets through EU environment law will continue to be bound to the UK even where the attainment of the target is envisaged for a later date. On this basis, the existing EU renewable energy targets for the UK, including the EU Renewable Energy Directive 2009/28/EC will remain applicable.

2.1.2.3 The Renewable Energy Directive (Directive 2018/2001/EU) recasts and repeals previous Directives 2009/28/EC, 2015/1513/EU and 2013/18/EU. It set a target that by 2030, at least 32% of energy production should come from renewable sources.

2.1.2.4 The 2030 Energy Strategy framework proposed by the European Commission (EC) in October 2014 builds on the 2020 climate and energy framework. The EC has proposed new climate and energy targets to be achieved by 2030 (European Commission, 2020a), including:

- at least 40% cuts in greenhouse gas (GHG) emissions compared to 1990 levels
- at least 27% of energy used in EC countries to be from renewable sources
- at least 27% improvement in energy efficiency.

2.1.2.5 The EU aims to be climate-neutral by 2050 (i.e. an economy with net-zero GHG emissions). This objective is at the heart of the European Green Deal and in line with the EU's commitment to global climate actions under the Paris Agreement (European Commission, 2020b). In 2011, the EC presented 'The roadmap for transforming the EU into a competitive, low-carbon economy by 2050' (European Commission, 2011). This report sets the following goals for domestic EU action to keep global warming below 2°C:

- reducing GHG emissions by 40% in 2030 when compared to 1990 levels
- by 60% in 2040
- by 80% in 2050.

2.1.2.6 In order to achieve this, the roadmap suggests the need for all economic sectors to contribute to reducing GHG emissions and the need for increased investments in low-carbon energy (European Commission, 2011).

2.1.3 UK energy legislation and policy

The Climate Change Act 2008

2.1.3.1 Under the Climate Change Act 2008, the UK has committed to a net reduction in GHG emissions of 80% by 2050 against the 1990 baseline. In June 2019, secondary legislation was passed that extended that target to at least 100% against the 1990 baseline. The Climate Change Act 2008 also established the Committee on Climate Change (CCC) which advises the UK government on emissions targets, and reports to Parliament on progress made in reducing GHG emissions. The CCC has produced five four-yearly carbon budgets, covering 2008 to 2032. These carbon budgets represent a limitation on the total quantity of GHG emissions to be emitted over the five-year period. The sixth carbon budget advice to government, covering 2033 to 2037, was published in December 2020.

2.1.3.2 The UK has met the target set in the first two carbon budgets, with GHG emissions being lower between 2008 and 2017 (HM Government, 2020a). The Institute for Government states that the UK is on track to meet its third carbon budget (2018 to 2022) but is not on track to meet its fourth (2023 to 2027) and fifth (2028 to 2032) (Institute for Government, 2020).

2.1.3.3 The UK Government subsequently produced two carbon plans (in 2009 and then in 2011) which set out how the UK is planning to achieve decarbonisation within the framework of the energy policy and provide a vision for 2050. The importance of offshore wind generation is noted in the most recent plan published in 2011 (HM Government, 2011a).

The Energy Act 2013

2.1.3.4 The Energy Act 2013 includes provisions to incentivise investment in low carbon electricity generation, ensure security of supply, and help the UK meet its emission reduction and renewables targets.

2.1.3.5 The Energy Act contains provisions for Electricity Market Reform (EMR), which sets out the framework for replacing Renewables Obligation Certificates (ROCs) with Contracts for Difference (CfD) to provide stable financial incentives to encourage investment in low carbon electricity generation.

2.1.3.6 CfDs are private contracts between a low carbon electricity generator and the UK Government owned Low Carbon Contracts Company (LCCC). The aim of the CfDs is to give greater certainty and stability of revenues to electricity generators by reducing exposure to volatile wholesale prices, whilst protecting the consumer from paying for higher generation support costs when electricity prices are high (Business, Energy and Industrial Strategy (BEIS), 2020). CfDs aim to support development of renewable energy in the UK by incentivising development.

National policy statements

2.1.3.7 National Policy Statements (NPSs) were designated under the Planning Act 2008. They describe the national case and establish the need for certain types of infrastructure development including energy, as well as identifying key issues that should be considered by the Examining Authority and decision-maker when considering an application for a DCO.

2.1.3.8 There are six energy NPSs, three of which are relevant to offshore wind development, specifically: The Overarching NPS for Energy (NPS EN-1) which sets out the UK Government’s policy for the delivery of major energy infrastructure; The NPS for Renewable Energy Infrastructure (NPS EN-3); and The NPS for Electricity Networks Infrastructure (NPS EN-5) (DECC, 2011a; DECC, 2011b; DECC, 2011c). These NPSs are currently being updated and draft versions were published for consultation in September 2021 (BEIS, 2021a; BEIS, 2021b; BEIS, 2021c). Until revised NPSs are formally adopted, the existing NPSs continue to provide the proper basis for applications for development consent to be prepared and for decisions to be granted. However, the provisions of the draft NPSs undergoing consultation will be referred to within the Morgan Offshore Wind Project ES where considered relevant.

2.1.3.9 The policy provisions within the NPS relevant to each physical, biological and human environment topic of the EIA will be presented and addressed in the individual technical topic chapters of the ES.

UK Marine Policy Statement

2.1.3.10 The UK-wide Marine Policy Statement (MPS) was published in March 2011, under Section 44 of the Marine and Coastal Access Act (MCAA) 2009, to provide a framework for marine spatial planning, specifically for the preparation of Marine Plans and to ensure that marine resources are used in a sustainable way (HM Government, 2011b). The MPS was jointly adopted by the Secretary of State, Welsh Ministers, Scottish Ministers and the Department of the Environment Northern Ireland.

2.1.3.11 The MPS states that ‘Marine Plans should take into account and identify areas of potential for the deployment of different renewable energy technologies’, and notes that as offshore wind is the most developed offshore renewable energy technology, it has the biggest potential to improve the UK’s medium term energy security.

2.1.3.12 The MCAA 2009 requires all public authorities taking authorisation or enforcement decisions that affect or might affect the UK marine area, to do so in accordance with the MPS and the relevant Marine Plans.

North West Marine Plan

2.1.3.13 The Morgan Offshore Wind Project generation assets is located in English waters, covered by the North West Marine Plan. The North West Marine Plan was published in June 2021 and introduces a strategic approach to marine planning within the marine plan area. It is intended to inform decision-making by marine users and regulators on where, when or how activities may take place within the marine plan area.

2.1.3.14 The North West Marine Plan sets out the following four objectives in relation to achieving a sustainable marine economy:

- Infrastructure is in place to support and promote safe, profitable and efficient marine businesses.
- The marine environment and its resources are used to maximise sustainable activity, prosperity and opportunities for all, now and in the future.
- Marine businesses are taking long-term strategic decisions and managing risks effectively. They are competitive and operating efficiently.
- Marine businesses are acting in a way which respects environmental limits and is socially responsible. This is rewarded in the market place.

2.1.3.15 The policy provisions within the North West Marine Plan relevant to each physical, biological and human environment topic of the EIA will be presented and addressed in the individual technical topic chapters of the ES.

The UK Offshore Wind Sector Deal

2.1.3.16 The UK Government published the Offshore Wind Sector Deal in 2019, which sets the key commitments and actions from the UK Government to support offshore wind energy development (HM Government, 2019). In

2020, the UK Government prepared a policy paper to reflect on the status of the offshore wind industry one year after the publication of the Offshore Wind Sector Deal (HM Government, 2020b). Since the launch of the Sector Deal in 2019, the UK Government and the offshore wind energy sector have made progress on delivering the commitments set out within the Sector Deal.

The Clean Growth Strategy 2017

2.1.3.17 The Clean Growth Strategy (2017) emphasised growing national income while cutting greenhouse gas emissions. It states the aim to achieve clean growth, while ensuring an affordable energy supply for businesses and consumers, is at the heart of the UK's Industrial Strategy.

2.2 The consenting process

2.2.1.1 The Morgan Array Scoping Boundary is located in English offshore waters (beyond 12nm from the English coast). As set out in part 1, section 1: Introduction, of the EIA Scoping Report, the Morgan Offshore Wind Project generation assets is a Nationally Significant Infrastructure Project (NSIP) and requires consent under the Planning Act 2008. This section provides a summary of the consenting process and also describes the legal requirements for EIA.

2.2.2 The Planning Act 2008

2.2.2.1 The Planning Act 2008 (as amended) is the primary legislation that establishes the legal framework for the application, examination and determination of applications for Development Consent Orders (DCOs) for NSIPs. It sets out the consenting system for all NSIPs, including those in the energy sector.

2.2.2.2 Amendments have been made to the planning system that is applicable to the Planning Act 2008. Under the Localism Act 2011, The Planning Inspectorate became the executive agency responsible for the NSIP consenting process. Any developer wishing to construct a project that is classified as an NSIP must apply for a DCO. The Planning Inspectorate will examine the application submissions and make a recommendation to the Secretary of State for Business, Energy and Industrial Strategy (BEIS) (in the case of energy projects) to grant or refuse consent.

2.2.3 The Development Consent Order (DCO)

2.2.3.1 Section 31 of the Planning Act 2008 states that a DCO is required for all NSIPs. The application for development consent for the Morgan Offshore Wind Project generation assets will cover all offshore aspects of the Morgan Offshore Wind Project generation assets located within English waters.

2.2.3.2 An EIA will be required as part of the application for a DCO. As such, an Environmental Statement (ES) will be prepared, which is the report documenting the EIA process. The ES will be prepared in accordance with the Infrastructure Planning (Environmental Impact Assessment)

Regulations 2017. These Regulations implement the EIA Directive (2011/92/EU, as amended by Directive 2014/52/EU) for consent applications made under the Planning Act 2008. The aim of the EIA Directive is to ensure that when a relevant authority giving consent for a particular project makes its decision, it does so in the knowledge of any likely significant effects on the environment.

2.2.3.3 The process for obtaining a DCO is divided into the following phases: pre-application, acceptance, pre-examination, examination, decision and post decision.

2.2.3.4 During the pre-application phase, Part 5 of the Planning Act 2008 requires promoters of a DCO application to engage in pre-application consultation with local communities, local authorities and those who would be directly affected by the proposals. The Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009 make provisions for various matters in connection with making an application for a DCO, including publicising a proposed application and consulting with local and statutory stakeholders. Further details regarding the consultation process are included in part 1, section 5: Consultation process, of the EIA Scoping Report.

2.2.3.5 The Morgan Offshore Wind Project generation assets application will be submitted to The Planning Inspectorate with the prescribed forms and documents as required by the Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009. Regulation 5(2)(a) requires that, where applicable, an application must be accompanied by 'the environmental statement required pursuant to the Infrastructure Planning (Environmental Impact Assessment) Regulations [2017] and any scoping or screening opinions or directions'. Other supporting documents required to be submitted include:

- Consultation Report
- Draft DCO and Explanatory Memorandum
- Habitats Regulations Assessment (HRA) Report.

2.2.4 Marine and Coastal Access Act 2009

2.2.4.1 As well as replacing consents under the Food and Environment Protection Act (FEPA) 1985 and the Coast Protection Act (CPA) 1949, the MCAA 2009 also introduced a new planning system for marine environmental management and a requirement to obtain marine licences for licensable marine activities.

2.2.4.2 Section 149A of the Planning Act 2008 allows an applicant for a DCO to apply for 'deemed marine licences' as part of the DCO process. The Marine Management Organisation (MMO) is the responsible authority for deemed marine licences in English waters and works with The Planning Inspectorate to ensure that deemed marine licences are transposed into the DCO. The MMO remains the monitoring and enforcement body in respect of the conditions and restrictions contained within the deemed marine licences.

2.2.4.3 This EIA Scoping Report has been prepared in support of both the DCO and deemed marine licence application for the Morgan Offshore Wind Project generation assets.

2.2.5 The Environmental Impact Assessment (EIA) process

2.2.5.1 The EIA Directive has directed the assessment of effects of certain public and private projects on the environment in the UK. Following the UK's departure from the EU, the UK has no direct obligations under the Directive. However, through The Environmental Assessments and Miscellaneous Planning (Amendment) (EU Exit) Regulations 2018 and The Environment, Food and Rural Affairs (Environmental Impact Assessment) (Amendment) (EU Exit) Regulations 2019, the requirements established under the Directive (as transposed into UK law) continue to apply subject only to minor changes. In the UK, the Directive is applied to offshore wind farm projects and associated onshore infrastructure through the Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 (as amended) for NSIP projects.

2.2.5.2 The EIA process can be broadly summarised as consisting of three main elements that take place prior to the submission of applications for development consent:

- Scoping: project promoters can request a formal Scoping Opinion from the Secretary of State.
- Consultation: the project promoter is required to conduct pre-application consultation in accordance with the Planning Act 2008 and associated guidance and regulations. The Statement of Community Consultation (SoCC) identifies the proposed consultation activities (see part 1, section 5: Consultation process, of the EIA Scoping Report for further information).
- ES preparation: the ES is prepared taking account of the responses to the consultation process, responses on the Preliminary Environmental Information Report (PEIR) and the outcomes of the assessment of the likely significant effects of the proposed development on the environment.

2.2.5.3 The EIA process for the Morgan Offshore Wind Project generation assets will be carried out to support the DCO application.

2.3 Other consents and legislation

2.3.1.1 In addition to the principal consents for the Morgan Offshore Wind Project generation assets, any supplementary consents and licences that are required will be identified during the development stage and through consultations with statutory bodies.

2.3.2 Habitats Regulations Assessment

2.3.2.1 Council Directive 92/43/EEC (the Habitats Directive) was adopted in 1992 and provided a means for the EU to meet its obligations under the Bern Convention. The aim of the Directive is to maintain or restore natural habitats and wild species listed on the Annexes at a favourable conservation status. This protection was granted through the designation of European Sites (Special Areas of Conservation (SAC)) and measures to protect European Protected Species (EPS). European Directive (2009/147/EC) on the conservation of wild birds (The Birds Directive) affords rare and vulnerable species listed under Annex I of the Directive, and regularly occurring migratory species, protection through the identification and designation of Special Protection Areas (SPAs). Following the UK's Exit from the EU, the UK has no direct obligations under the Habitats Directive. However, The Conservation of Habitats and Species (Amendment) (EU Exit) Regulations 2019 ensure that the UK is legally obliged to continue to maintain the standards required by the EU Habitats and Wild Birds Directives, subject to only minor (non-material) changes. As such, the Habitats and Birds Directive continue to provide the framework for the conservation and management of rare and vulnerable habitats and species and wild birds within Europe and the UK.

2.3.2.2 The Conservation of Habitats and Species Regulations 2017 (as amended) (the Habitats Regulations) and the Conservation of Offshore Marine Habitats and Species Regulations 2017 (as amended) require the assessment of any significant effects on qualifying features of internationally important nature conservation sites that are likely to arise as a result of a proposed project. These internationally important sites include SACs, or candidate SACs (cSACs), SPAs or potential SPAs (pSPAs), sites of community importance (SCI) and Ramsar sites. These have been traditionally referred to as European Sites or Natura 2000 sites; following the UK's departure from the EU they are now referred to as the National Site Network. The assessment is to be undertaken by the 'competent authority', which in the case of the Morgan Offshore Wind Project generation assets is the Secretary of State for BEIS.

2.3.2.3 In order to carry out the HRA the competent authority, under Regulation 5(2)(g) of the Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009, requires a report to be submitted alongside the ES. As such, the Report to Inform an Appropriate Assessment (RIAA) does not form part of the ES, although the baseline presented contains some of the same information.

2.3.2.4 In parallel to the EIA process, the HRA, including the HRA Screening Report and subsequent RIAA, will be consulted upon during the pre-application consultation process.

2.3.3 European protected species (EPS) licencing

2.3.3.1 EPS are animals and plants (species listed in Annex IV of the Habitats Directive) that are afforded protection under the Habitats Regulations. For example, all cetacean species (whales, dolphins and porpoise) are EPS. If any activity is likely to cause disturbance or injury to an EPS (for example, subsea noise disturbance due to piling activities) a licence is required to undertake the activity legally.

3. Project description

3.1 Introduction

3.1.1.1 This section of the Scoping Report provides a description of the potential design of the Morgan Offshore Wind Project generation assets. The design has been informed by conceptual design information and current understanding of the environment from initial survey work. This section also sets out the activities associated with the construction, operation and maintenance, and decommissioning of the Morgan Offshore Wind Project generation assets.

3.1.1.2 At this stage in the EIA process, the project description is indicative and the project design envelope has been designed to include sufficient flexibility to accommodate further project refinement. This section therefore sets out a series of options and parameters for which maximum (and where relevant, minimum) values are shown. These values constitute the realistic worst case scenario in relation to the Morgan Offshore Wind Project generation assets. The final design may be refined later in the project development process. The Applicant will also, throughout the EIA process, seek to refine the proposed values and to provide more detailed realistic worst case scenarios where possible. The Preliminary Environmental Information Report (PEIR) and Environmental Statement (ES) will present a detailed project description, including a further refinement of the parameters where possible, on which the assessment will be based.

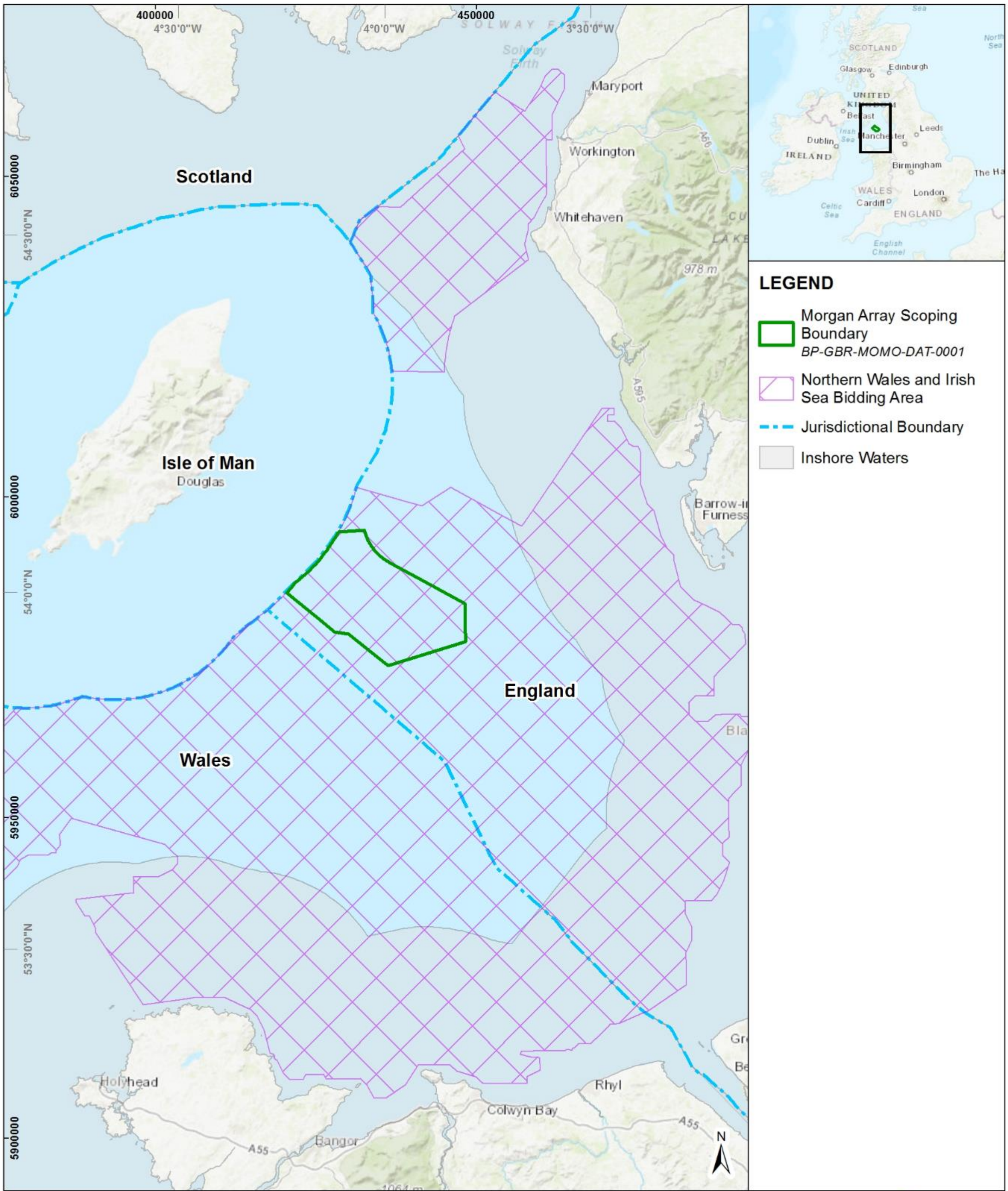
3.2 Project location

3.2.1.1 In September 2019, The Crown Estate (TCE) invited developers to bid for rights to be granted to develop offshore wind farms as part of Offshore Wind Leasing Round 4. The rights would be granted through Agreements for Lease (AfL). The AfLs awarded under Offshore Wind Leasing Round 4 will grant the rights to the respective developer to carry out investigations, such as survey activities, to inform the potential design of the offshore wind farm by understanding environmental and technical constraints in advance of submitting a consent application.

3.2.1.2 EnBW and bp were awarded Preferred Bidder status for two 60-year leases within the Northern Wales and Irish Sea Bidding Area. The application for the area to be leased provided flexibility and was sufficiently large to achieve the proposed capacity for the offshore wind farm. The AfL for the Morgan Array Scoping Boundary is anticipated to be signed in 2022 following the conclusion of the TCE Plan Level Habitats Regulations Assessment (HRA) process. The detail of the final AfL area will be included within the ES.

3.2.1.3 The boundary of the Morgan Offshore Wind Project generation assets encompasses the following area, as shown in Figure 3.1:

- Morgan Array Scoping Boundary: This is the area within which the wind turbines, foundations, inter-array cables, interconnector cables, and offshore substation platforms (OSPs) will be located.



Service Layer Credits: Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community

Data Sources: Client, Marine Management Organisation, Marine Scotland, Natural Resources Wales

EnBW bp rps — Partners in UK offshore wind

Project Name:
MORGAN OFFSHORE WIND PROJECT

Scale: 0 2.5 5 10 nm; 0 5 10 20 km

Drawing Number:
RPSE-MG-SCO-001-03

Drawing Title:
MORGAN ARRAY SCOPING BOUNDARY

Geodetic Information:
Datum: ETRS 1989
Projection: ETRS 1989 UTM Zone 30N

VER	DATE	DETAILS	BY	CHECK
00	26/11/21	First Issue	JA	ST
03	16/03/22	Revision	NA	LD

Figure 3.1: Morgan Offshore Wind Project generation assets location.

3.2.1.5 The Morgan Array Scoping Boundary is 322.2km^2 in area and is located in the east Irish Sea, 22.3km (12nm) from the Isle of Man and 36.3km (19.6nm) from the northwest coast of England (when measured from Mean High Water Springs (MHWS) (see Figure 3.1). In accordance with the Round 4 bid the proposed capacity of the Morgan Offshore Wind Project is 1,500MW.

3.2.1.6 Initial data for the Morgan Array Scoping Boundary identifies the water depth range from approximately 49m to 27m below Lowest Astronomical Tide (LAT). The Applicant has completed a geophysical survey across the Morgan Array Scoping Boundary, which provides greater accuracy of the water depths in this area, and site-specific geophysical and bathymetric data for the Morgan Array Scoping Boundary will be presented in the PEIR.

3.2.1.7 The tidal range within the Morgan Array Scoping Boundary is estimated at approximately 8m from LAT to Highest Astronomical Tide (HAT). The estimated water level variation is presented in Table 3.1.

Table 3.1: Tidal levels within the Morgan Array Scoping Boundary.

Water level	Value (m)	Reference datum
LAT	+0.0	LAT
HAT	+8.0	LAT
MSR (Mean Spring Tidal Range)	6.7	-
MLWS	+0.7	LAT
MSL (Mean Sea Level)	+4.0	LAT
MHWS	+7.4	LAT

3.3 Project design envelope approach

3.3.1.1 The Project Design Envelope (PDE) approach (also known as the Rochdale Envelope approach) will be adopted for the assessment of the Morgan Offshore Wind Project generation assets, in accordance with current industry good practice. This approach allows for a project to be assessed on the basis of maximum project design parameters (i.e. the worst case scenario) in order to provide flexibility, while ensuring all potentially significant effects are assessed within the EIA process and reported in the ES. Those parameters include a range of potential values. The PDE concept allows for some flexibility in project design options, particularly for foundations and wind turbine type, where the full details of a project are not known at DCO application submission.

3.3.1.2 This approach will be taken for the EIA because it is not possible to provide precise final design details of the Morgan Offshore Wind Project generation assets a number of years ahead of the time it will be constructed. Additionally, the Applicant has yet to undertake its consultation process and receive feedback from statutory and non-statutory stakeholders. This will allow the Applicant to fully understand any potential significant impacts that need to be mitigated/managed, which will aid the refinement of the final application. Offshore wind is a constantly evolving industry with a constant focus on cost reduction, therefore improvements in technology and construction methodologies occur frequently and an unnecessarily prescriptive approach could preclude the adoption of new technology and methods.

3.3.1.3 The use of the PDE approach has been recognised in the Overarching National Policy Statement (NPS) for Energy (NPS EN-1) (DECC, 2011a) and the NPS for Renewable Energy Infrastructure (NPS EN-3) (DECC, 2011b), and within the draft NPS EN-1 and EN-3 (BEIS, 2021a; BEIS, 2021b). The PDE approach is also consistent with The Planning Inspectorate's Advice Note Nine: Rochdale Envelope (The Planning Inspectorate, 2018).

3.3.1.4 For each of the impacts to be assessed in the topic-specific EIA chapters, the maximum design scenario will be identified from the range of potential options for each parameter in the PDE. The maximum design scenario assessed is therefore the scenario which would give rise to the greatest potential impact. For example, where several wind turbine options are included in the design, then the assessment of the Morgan Offshore Wind Project generation assets would be based on the wind turbine option predicted to have the greatest impact. This may be the wind turbine option with the largest footprint, the greatest tip height or the largest area of seabed disturbance during construction, depending on the topic under consideration. By identifying the maximum design scenario for any given impact, it can therefore be concluded that the impact (and therefore the effect) will be no greater for any other design scenario than that assessed for the maximum design scenario. By employing the maximum design scenario approach, the Applicant retains some flexibility in the final design of the Morgan Offshore Wind Project generation assets, but within certain maximum parameters, which are assessed in the ES.

3.3.1.5 All assumptions regarding the PDE will be clearly set out within the project description chapter of the PEIR and ES and within the topic chapters. The draft DCO will be prepared in conjunction with the ES in order to ensure that the key parameters applied for are consistent with those assessed through the EIA process.

3.3.1.6 Throughout this EIA Scoping Report (and subsequent PEIR and ES), the PDE approach is applied to allow meaningful assessments of the Morgan Offshore Wind Project generation assets to proceed, whilst still allowing reasonable flexibility for future project design decisions.

3.4 Offshore infrastructure

3.4.1.1 The key offshore components of the Morgan Offshore Wind Project generation assets are likely to include:

- Offshore wind turbines
- Foundations and support structures
- Scour protection and cable protection
- Inter-array cables
- Interconnector cables
- Offshore substation platforms.

3.4.1.2 These key offshore components are briefly described in the following sections. Realistic worst case parameters (dimensions and numbers where appropriate) are provided to indicate the potential scale of the Morgan Offshore Wind Project generation assets. A further refined and detailed project description will be provided in the PEIR and ES.

3.4.2 Wind turbines

3.4.2.1 The Morgan Offshore Wind Project generation assets will be comprised of up to 107 wind turbines. The final number of wind turbines will be dependent on the capacity of individual wind turbines used and also environmental and pre-construction site investigation (geophysical and geotechnical) survey results. A range of wind turbine models will be considered, and it is possible that more than one may be selected, however, they will all follow the traditional offshore wind turbine design with three blades and a horizontal rotor axis. An illustration of this design is presented in Figure 3.2.

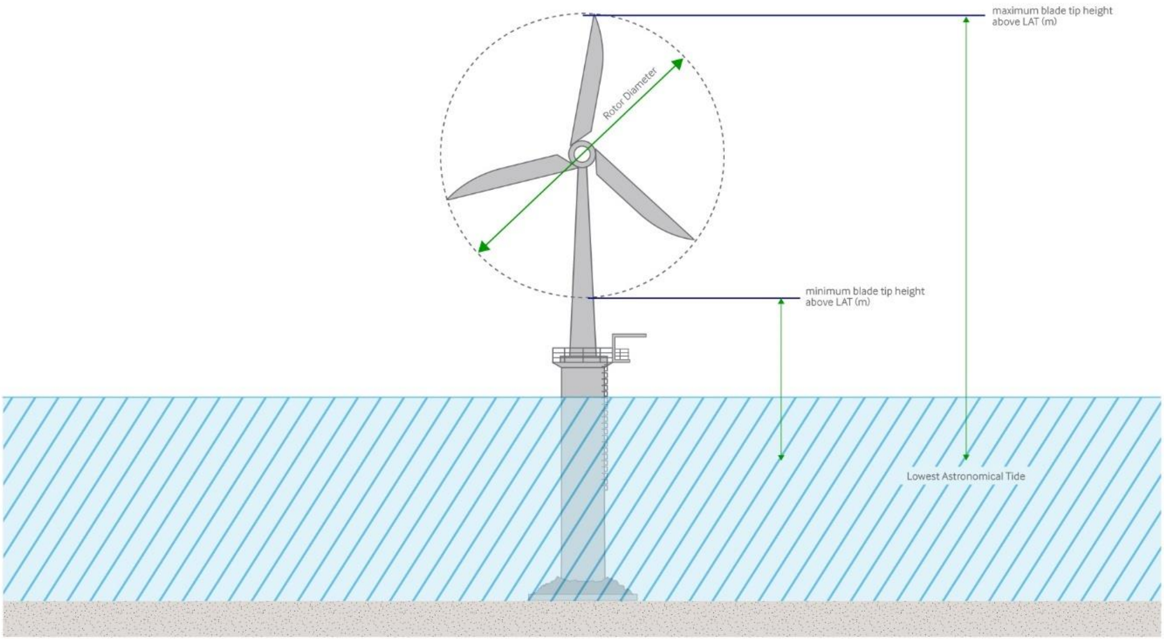


Figure 3.2: Illustrative wind turbine design.

3.4.2.2 The design envelope for the Morgan Offshore Wind Project wind turbines is presented in Table 3.2. The wind turbines will have a maximum rotor diameter of up to 280m and a maximum blade tip height of up to 324m above LAT (highest point of the structure; 320m above MSL[2]). The minimum distance between the bottom of the blade and the sea surface (the 'air gap' or 'air draught') will be 34m above LAT (this exceeds the best practice requirement for a minimum air draught of 22m above MHWS, which is 29.4m

2 Parameters previously submitted as part of the Round 4 bidding process in MSL remain unchanged and have been converted to LAT for the purpose of this Scoping Report.

above LAT at this location). The wind turbines will be lit and marked as required for aviation and navigation purposes.

3.4.2.3 The layout of the wind turbines will be developed to best utilise both the available wind resource and suitability of seabed conditions, while ensuring environmental effects and impacts on other marine users (such as shipping routes and fisheries) are minimised. Indicative layouts will be provided in the PEIR and ES to inform the assessment. The final layout of the wind turbines will be confirmed at the final design stage (post-application) informed by environmental and pre-construction site investigation survey results.

Table 3.2: Design envelope: key parameters for wind turbines.

Parameter	Maximum Design Envelope
Maximum number of turbines	107
Minimum lower blade tip height (air gap or air draught) above LAT (m)	34
Maximum upper blade tip height above LAT (m)	324
Maximum rotor diameter (m)	280

3.4.3 Foundations and support structures

3.4.3.1 A number of foundation types are being considered for the Morgan Offshore Wind Project generation assets. The final selection of foundation type will depend on factors including wind turbine type, and environmental and pre-construction site investigation survey results.

3.4.3.2 The wind turbines and offshore substation platforms will be fixed to the seabed by foundation structures. There are a number of foundation types that can be used, and the types used will not be confirmed until the final design, post-consent. Consequently, the EIA will consider a range of foundation types, including monopile foundations, pin-piled jacket foundations and suction bucket jacket foundations. This section sets out the proposed foundation types and maximum parameters for the wind turbine and offshore substation platform foundations.

3.4.3.3 The foundations will be fabricated offsite, stored at a suitable port facility and transported to site as needed. Specialist vessels will be needed to transport and install foundations. A filter layer and/or scour protection layer (typically rock) may be needed on the seabed and will be installed either before and/or after foundation installation.

3.4.3.4 Further details on the foundation types that will be considered in the EIA are described in the following sections.

Monopile foundations

3.4.3.5 Monopile foundations typically consist of a single steel tubular section and a transition piece (TP) which may include boat landing features, ladders, a crane, and other ancillary components as well as a flange for connection to the wind turbine tower (Figure 3.3). The TP is usually painted yellow and marked according to relevant regulatory guidance and may be installed separately following the monopile installation. Instead of monopiles with a separate TP, so called TP-less monopiles (with the TP part being an integral section of the monopile) could also be used.

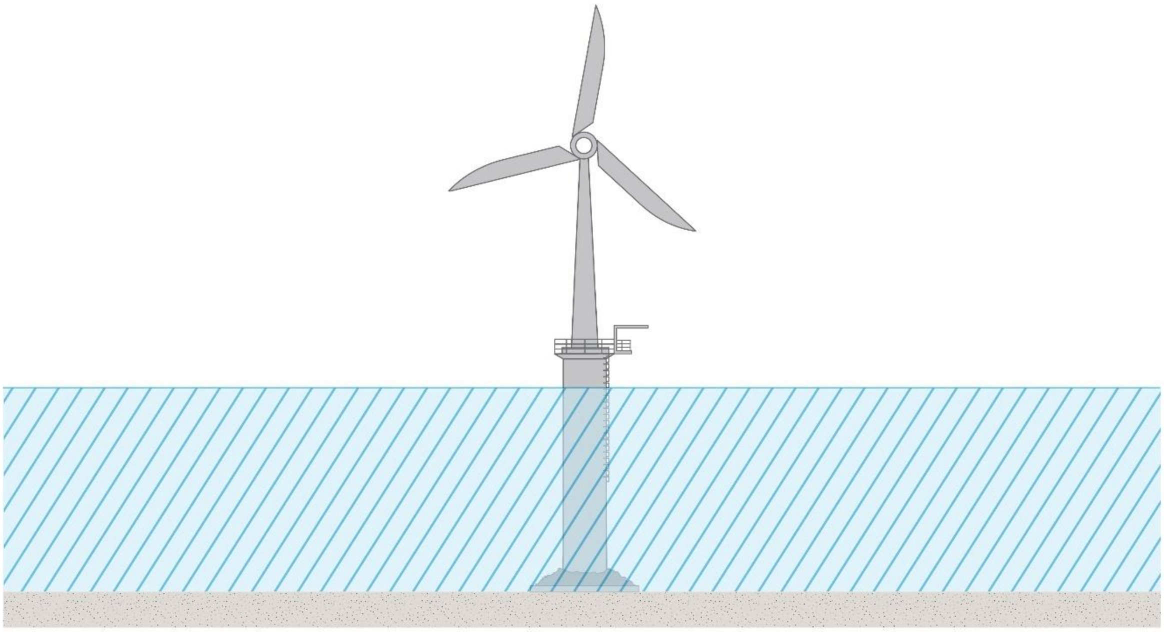


Figure 3.3: Illustrative monopile foundation design.

3.4.3.6 Monopiles can be used to support wind turbines and offshore substation platforms. Monopiles may be driven or 'piled' into the seabed using hydraulic hammers either above or below the sea surface, operated from a jack-up vessel or floating vessel/barge. The Applicant is also considering use of emerging alternative installation technologies, such as blue hammer, however hydraulic piling is considered to represent the maximum design envelope; further detail on any alternative technologies will be provided in the PEIR or ES if and when available. In areas of hard soil or bedrock close to the seabed surface, where piling is challenging, drilling may be used either instead of or in combination with piling. Drilling operations produce spoil which is typically disposed of at the drill site. Within the drilled hole, the monopiles may be secured in place using a cement-based grout.

3.4.3.7 During the construction phase of the Morgan Offshore Wind Project generation assets there may be up to two monopiles being installed at the same time. Piling will commence with low hammer energies ('soft start') and maximum hammer energies (if required) will be attained after a predefined 'ramp up' and typically only used where ground conditions require. Subject to the findings of the impact assessment, the Applicant may consider the use of noise mitigation technology such as bubble curtains, which would be further explored in the PEIR.

3.4.3.8 The design envelope for monopile foundations is shown in Table 3.3.

Table 3.3: Design envelope: key parameters for monopile foundations.

Parameter	Maximum Design Envelope (wind turbines)	Maximum Design Envelope (OSPs)
Number of monopiles	107	8
Pile diameter (m)	16	16
Seabed footprint per pile (without scour protection) (m^2)	201.1	201.1
Maximum hammer energy (kJ)	5,500	5,500
Number of concurrent piling events	Up to two monopiles installed at the same time.	

Jacket foundations on pin-piles

3.4.3.9 Piled jacket foundations are formed of a steel lattice construction (comprising steel tubular members and welded joints) secured to the seabed by pin piles attached to the jacket feet. Jacket structures can be used to support wind turbines and offshore substation platforms. Typically, the steel tubular pin piles are driven, drilled or vibrated into the seabed (and potentially grouted in place) relying on the frictional and end bearing properties of the seabed for support. There is no separate TP, as the TP and ancillary structure is fabricated as an integrated part of the jacket structure. Pin piles are typically narrower than monopiles (see Figure 3.4).

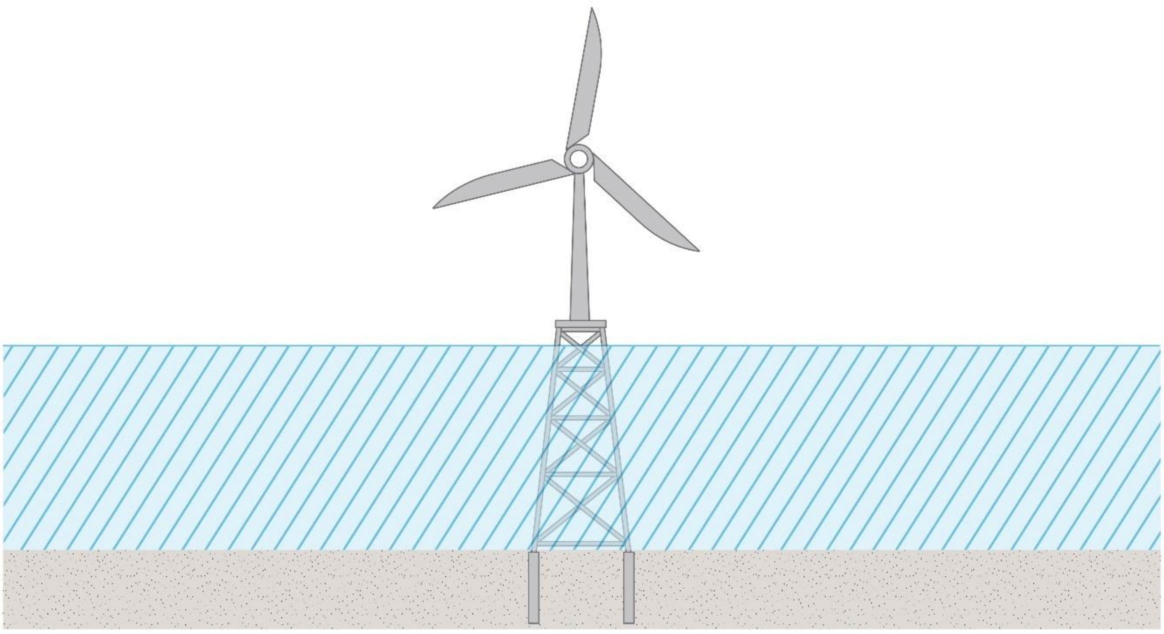


Figure 3.4: Illustrative jacket (pin pile) foundation design.

3.4.3.10 During the construction phase of the Morgan Offshore Wind Project generation assets there may be pin piles being installed at up to two locations at the same time. Piling will commence with low hammer energies (‘soft start’) and maximum hammer energies (if required) will be attained after a predefined ‘ramp up’ and typically only used where ground conditions require.

3.4.3.11 The Applicant has proposed up to 4-legged jacket foundation options in the design envelope for wind turbine foundations, as shown in Table 3.4. For offshore substation platform foundations the design envelope is shown in Table 3.5.

Table 3.4: Design envelope: key parameters for jacket foundations (wind turbines).

Parameter	Maximum Design Envelope
Number of jacket foundations	107
Number of legs per foundation	4
Number of piles per leg	3
Diameter of jacket leg (m)	5
Jacket leg spacing (at seabed) (m)	50
Jacket leg spacing (at surface) (m)	40
Pin pile diameter (m)	5.5
Seabed footprint per jacket foundation (without scour protection) (m^2)	255
Maximum hammer energy (kJ)	3,700
Number of concurrent piling events	Up to two locations installed at the same time.

Table 3.5: Design envelope: key parameters for jacket foundations (OSPs).

Parameter	Maximum Design Envelope
Number of jacket foundations	4
Number of legs per foundation	6
Number of piles per leg	3
Diameter of jacket leg (m)	5
Jacket leg spacing (at seabed) (length x width (m))	70x50
Jacket leg spacing (at surface) (length x width (m))	50x40
Pin pile diameter (m)	5.5
Seabed footprint per jacket foundation (without scour protection) (m^2)	428
Maximum Hammer Energy (kJ)	3,700
Number of concurrent piling events	Up to two locations installed at the same time.

Jacket foundations on suction buckets

3.4.3.12 Jacket foundations on suction buckets are formed with a steel lattice construction (comprising tubular steel members and welded joints) fixed to the seabed by suction buckets installed below each leg of the jacket. The suction buckets are typically hollow steel cylinders, capped at the upper end. They do not require a hammer or drill for installation. As with piled jacket foundations, there is no separate TP as the TP and ancillary structure is fabricated as an integrated part of the jacket structure. An example of a suction bucket jacket foundation is provided in Figure 3.5.

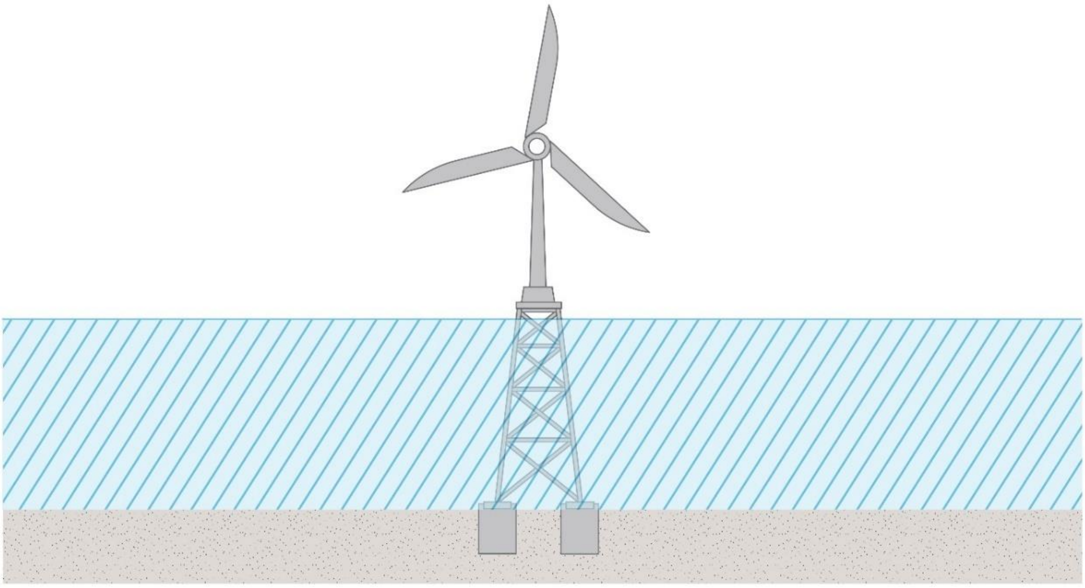


Figure 3.5: Illustrative jacket (suction bucket) foundation design.

3.4.3.13 Once at the installation site, the jacket foundation will be lifted by a crane onboard the installation vessel and lowered towards the seabed in a controlled manner. When the steel suction bucket reaches the seabed, a pipe running up through the stem above each suction bucket will begin to suck water out of each bucket. The buckets are pressed down into the seabed by the resulting suction force. When the bucket has penetrated the seabed to the desired depth, the pump is turned off. A thin layer of grout is then injected under the top side of the bucket to fill the void and ensure contact between the soil within the bucket, and the top of the bucket itself.

3.4.3.14 The Applicant has proposed up to 4-legged suction bucket jacket foundation options in the design envelope for wind turbine foundations, as shown in Table 3.6. For offshore substation platform foundations, the design envelope is shown in Table 3.7.

Table 3.6: Design envelope: key parameters for suction bucket jacket foundations (wind turbines).

Parameter	Maximum Design Envelope
Number of suction bucket jacket foundations	107
Number of legs per foundation	4
Diameter of jacket leg (m)	5
Jacket leg spacing (at seabed) (m)	50
Jacket leg spacing (at surface) (m)	35
Bucket diameter (m)	18
Seabed footprint per jacket foundation (without scour protection) (m^2)	804

Table 3.7: Design envelope: key parameters for suction bucket jacket foundations (OSPs).

Parameter	Maximum Design Envelope
Number of suction bucket jacket foundations	4
Number of legs per foundation	6
Diameter of jacket leg (m)	5
Jacket leg spacing (at seabed) (length x width (m))	70x50
Jacket leg spacing (at surface) (length x width (m))	50x40
Bucket diameter (m)	18
Seabed footprint per jacket foundation (without scour protection) (m^2)	1,527

3.4.4 Seabed preparation

3.4.4.1 Seabed preparation may be required prior to foundation and cable installation. Seabed preparation may include seabed levelling, and removing surface and subsurface debris such as boulders, fishing nets or lost anchors. If debris is present below the seabed surface, then excavation may be required for access and removal.

3.4.4.2 Any unexploded ordnance (UXO) found with a potential to contain live ammunition may be detonated on site, with any remaining debris of sufficient size to present a snagging risk to commercial fishing activities removed. This will be carried out following consultation with the Marine Management Organisation (MMO) and the Ministry of Defence (MOD). The UXO risk mitigation strategy will be based on procedures following industry best practice (currently mainly according to CIRIA C754 guidelines). For future site investigation activities, mitigation measurements according to a respective UXO desktop analysis will be conducted for avoidance of encountering potential UXO by such activities. For the installation and construction phase of the Morgan Offshore Wind Project generation assets, a dedicated UXO survey with subsequent identification and clearance campaign will be conducted prior to the construction works, taking into account potential seabed changes. As techniques for survey, identification and clearance operations are continuously evolving, respective assessments to select the optimum appropriate strategy and technology (e.g. low order deflagration or high order disposal) based on best industry practice and applicable stipulations and guidelines will be carried out at the given time, at the earliest one year ahead of the start of offshore construction works. The maximum design envelope for UXO removal will be included in the PEIR on the basis of a number of informed assumptions. As such, UXO removal is included as an activity in the PDE and is considered in the EIA Scoping Report.

3.4.5 Scour protection for foundations

3.4.5.1 Foundation structures for wind turbines and offshore substation platforms are susceptible to seabed erosion and 'scour hole' formation due to natural hydrodynamic and sedimentary processes. The development of scour holes is influenced by the shape of the foundation structure, seabed sedimentology and site-specific metocean conditions such as waves, currents, and storms. Scour protection may be deployed to mitigate scour around foundations. Commonly used scour protection types are illustrated in Figure 3.6 and described below:

- rock: either layers of graded stones placed on and/or around structures to inhibit erosion or rock filled mesh fibre bags which adopt the shape of the seabed/structure as they are lowered on to it
- concrete mattresses: several metres wide and long, cast of articulated concrete blocks which are linked by a polypropylene rope lattice which are placed on and/or around structures to stabilise the seabed and inhibit erosion
- artificial fronds: mats typically several metres wide and long, composed of continuous lines of overlapping buoyant polypropylene fronds that create a drag barrier which prevents sediment in their vicinity being transported away. The frond lines are secured to a polyester webbing mesh base that is itself secured to the seabed by a weighted perimeter or anchors pre-attached to the mesh base.

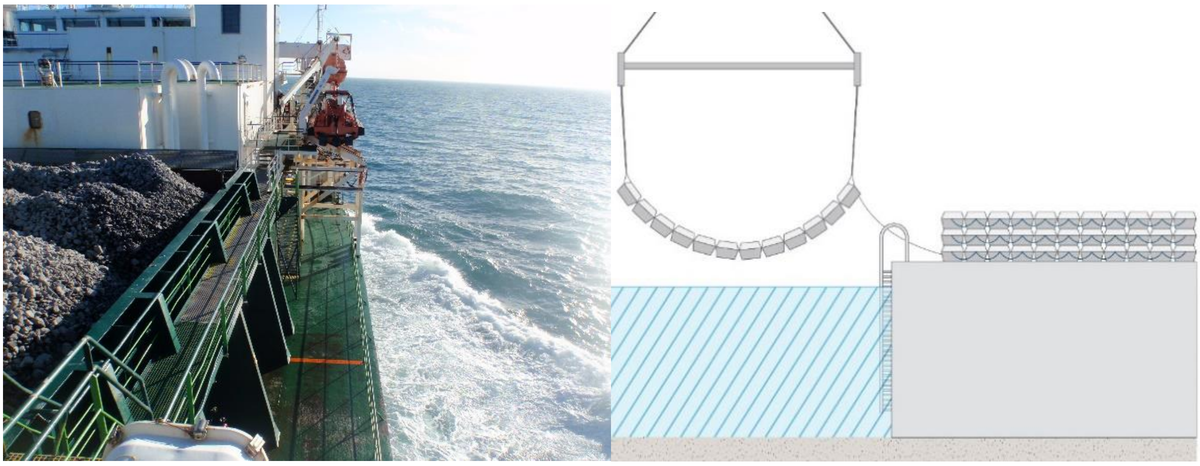


Figure 3.6: Illustrative scour protection types (Left: delivery of rock to EnBW's Hohe See offshore wind farm; Right: concrete mattresses).

3.4.5.2 The most frequently used scour protection method is 'rock placement', which entails the placement of crushed rock around the base of the foundation structure.

3.4.5.3 The amount of scour protection required will vary for the different foundation types being considered for the Morgan Offshore Wind Project generation assets and the maximum design envelope will be presented in the PEIR and ES. The final choice and detailed design of a scour protection solution will be made after detailed design of the foundation structure, and informed by pre-construction site investigation survey data, meteorological and oceanographical data, and maintenance strategy.

3.4.6 Offshore substation platforms (OSPs)

Offshore substation platforms

3.4.6.1 The Morgan Offshore Wind Project generation assets may require up to four offshore substation platforms within the Morgan Array Scoping Boundary. The offshore substation platforms will transform electricity generated by the wind turbines to a higher voltage allowing the power to be efficiently transmitted to shore. The size of the platform topsides will depend on the final electrical set up for the wind farm. Figure 3.7 shows a typical design of an offshore substation platform with the topside placed on a jacket foundation. Alternatively, the offshore substation platform topside could be placed on a monopile foundation.

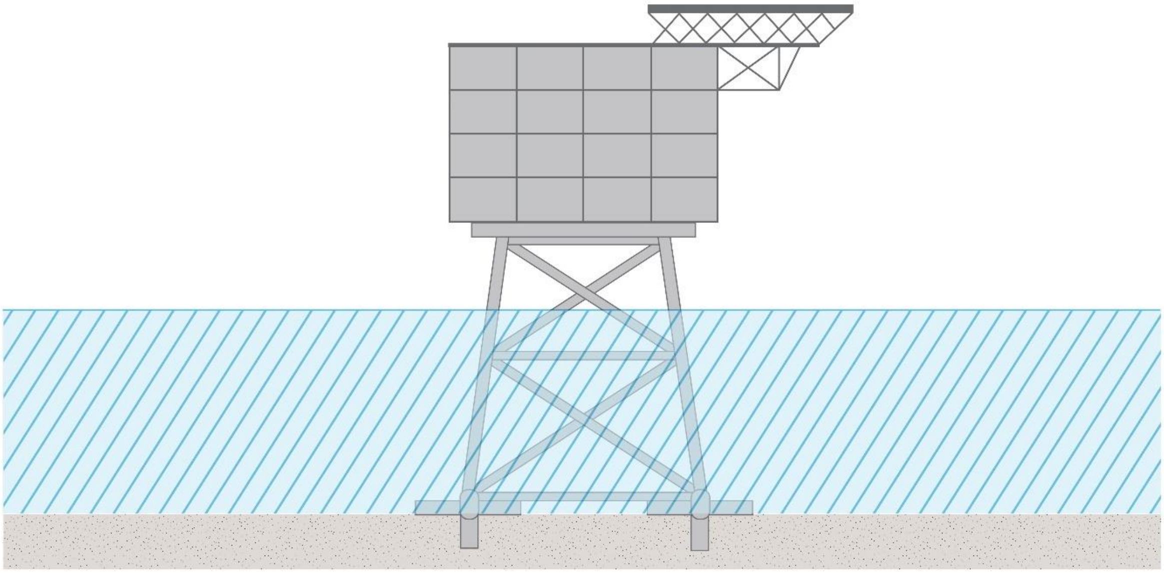


Figure 3.7: Illustrative offshore substation platform.

3.4.6.2 The exact location of the offshore substation platforms will be determined during the design phase (typically post-consent), informed by pre-construction site investigation data and cable routing among other considerations. All offshore substation platforms will be marked for aviation and navigation purposes.

3.4.6.3 The design envelope for offshore substation platforms is presented in Table 3.8.

Table 3.8: Design envelope: key parameters for offshore substation platforms.

Parameter	Maximum Design Envelope
Number of offshore substation platforms (OSPs)	4
Height of main structure (above LAT) (m)	70
Height of lightning protection (above LAT) (m)	85
Height of helideck (if applicable, above LAT) (m)	80
Height of crane (above LAT) (m)	80
Height of top of antenna structure (above LAT) (m)	95
Topside length (m)	80
Topside width (m)	60

3.4.7 Inter-array cables

3.4.7.1 Inter-array cables will be installed to carry the electrical current produced by the wind turbines to the offshore substation platforms. A small number of wind turbines will typically be grouped together on the same cable 'string' connecting those wind turbines to an offshore substation platform, and multiple cable 'strings' will connect back to each offshore substation platform.

3.4.7.2 The inter-array cables will be buried wherever possible and protected with cable protection (such as rock or concrete mattresses) where burial is not achievable (for example, where crossing existing cables, pipelines or exposed bedrock). This will ensure that the cable remains secure, is not a hazard to other sea users and does not risk becoming exposed and damaged by tidal currents. If cable protection is required, the protection measure will be dependent on several factors such as seabed conditions.

3.4.7.3 Inter-array cables may be installed using methods such as ploughing, trenching or jetting. Each technique involves displacing seabed sediment using either mechanical tools or water jets deployed from remotely operated vehicles on or above the seabed to enable the cable to be lowered into a trench below the seabed. The inter-array cable installation methodology and potential cable protection measures will be described in the PEIR and ES and finalised at the final design stage (post-consent), informed by environmental and pre-construction site investigation survey results.

3.4.7.4 The design envelope for inter-array cables is shown in Table 3.9.

Table 3.9: Design envelope: key parameters for inter-array cables.

Parameter	Maximum Design Envelope
Total inter-array cable length (km)	500
Maximum external cable diameter (mm)	230
Burial technique	Prelay plough, plough, trenching, jetting
Target burial depth (m)	1 m (minimum 0.5 m)
Cable protection material type	Steel armour wire, rock, mattressing

3.4.8 Interconnector cables

3.4.8.1 Interconnector cables connect the offshore substation platforms (if more than one is required) to each other in order to provide redundancy in the case of cable failure elsewhere. The design envelope for interconnector cables is provided in Table 3.10.

Table 3.10: Design envelope: key parameters for interconnector cables.

Parameter	Maximum Design Envelope
Number of interconnector cables	3
Maximum external cable diameter (mm)	350
Maximum total length of interconnector cables (km)	60
Burial technique	Prelay plough, plough, trenching, jetting
Target burial depth (m)	1 m (minimum 0.5 m)
Cable protection material type	Steel armour wire, rock, mattressing

3.4.8.2 Interconnector cables will be buried wherever possible and protected with cable protection (such as cable armouring, additional rock or concrete mattresses) where burial is not achievable (for example, where crossing existing cables, pipelines or exposed bedrock). This will ensure that the cable remains secure, is not a hazard to other sea users and does not risk becoming exposed and damaged by tidal currents. If cable protection is required, the protection measure will be dependent on several factors such as seabed conditions.

3.4.8.3 Interconnector cables may be installed using methods such as ploughing, trenching or jetting. The interconnector cable installation methodology and potential cable protection measures will be described in the PEIR and ES and finalised at the final design stage (post-consent), informed by environmental and pre-construction site investigation survey results.

3.5 Construction

3.5.1 Offshore construction

3.5.1.1 The Morgan Offshore Wind Project generation assets components are likely to be fabricated offsite at manufacturing sites in the UK and/or abroad. A construction base (port facility) may be used to stockpile some components, such as foundations and wind turbine components, before delivery to the Morgan Array Scoping Boundary site for installation. Other components, such as pre-fabricated offshore substation platforms, may be delivered directly to the Morgan Array Scoping Boundary site.

3.5.1.2 The Morgan Offshore Wind Project generation assets are likely to be installed over a period of up to four years. The general construction sequence is likely to include the following:

- pre-construction site investigation surveys
- seabed preparation activities
- foundation installation
- offshore substation installation and commissioning
- interconnector cable installation
- inter-array cable installation
- wind turbine installation
- wind turbine commissioning.

3.5.1.3 The offshore construction phase will be supported by various vessels including jack-up vessels or floating Heavy Lift Vessels (HLV), support vessels, tug/anchor handlers, cable lay vessels, guard vessels, survey vessels, seabed preparation vessels, crew transfer vessels, scour protection installation vessels and cable protection installation vessels. Helicopters may also be used during the construction phase for equipment and personnel transfer.

3.5.1.4 Foundation structures, offshore substation topsides, cabling and wind turbines will be transported to the installation site by vessel from the construction base (port facility). Foundations will be installed first in line with the methodology outlined in section 3.4.3. The offshore substation platform topsides will then be placed on top of each offshore substation platform foundation structure and undergo commissioning. Inter-array and interconnector cables will be installed, as described in sections 3.4.7 to 3.4.8. Finally, each individual wind turbine tower, nacelle and blades will be installed on top of the wind turbine foundations. The blades are likely to be installed one at a time, or may be pre-assembled. Following installation of the wind turbines and connection to the necessary cabling, a process of testing and commissioning will be undertaken.

3.6 Operation and maintenance

3.6.1.1 The operational lifetime of the Morgan Offshore Wind Project generation assets is expected to be up to 35 years[3]. The Morgan Offshore Wind Project generation assets will require operation and maintenance activities to take place over the lifetime of the wind farm.

3.6.1.2 Routine maintenance activities offshore may include inspections, removal of marine growth build up, minor repairs, cleaning activities, and replacement of consumables and corrosion protection systems. Non-routine major maintenance activities may include component exchanges (e.g. wind turbine blades, gearboxes), cable reburial and cable repair activities. Routine operation and maintenance activities may be carried out from Crew Transfer Vessels or Service Operation Vessels, with major maintenance activities (such as component exchanges) requiring jack-up vessels, HLV or specialist vessels such as cable repair and cable laying vessels. Occasionally, helicopters may also be used to transport personnel and equipment. Full details of the proposed operation and maintenance activities will be set out in the PEIR and assessed in the EIA.

3.6.1.3 An onshore operations and maintenance base will support the operational phase of the Morgan Offshore Wind Project generation assets. The requirements for and location of the onshore operations and maintenance base will be informed by the final project design closer to the time of construction and will be subject to a separate consent application process.

3.7 Decommissioning and repowering

3.7.1.1 It is anticipated that the Morgan Offshore Wind Project generation assets will have an operational lifetime of up to 35 years. As part of Offshore Wind Leasing Round 4, the Applicant will enter into a seabed lease for 60 years. At the end of the operational lifetime, the Morgan Offshore Wind Project generation assets will be decommissioned or repowered in line with the regulations, requirements, guidance and best practice relevant at that time.

3.7.1.2 If decommissioning takes place, it is anticipated that all structures above the seabed will be completely removed. Following general UK practice, and as noted above, subject to regulations, requirements, guidance and best practice relevant at that time, it is anticipated that offshore cables and any offshore cable protection would be left in-situ. The decommissioning

3 'Operational lifetime' means the cumulative period of time over which the Morgan Offshore Wind Project generation assets is expected to be in operation. For the avoidance of doubt, the term 'operational lifetime' does not refer to the expected useful economic life of individual assets installed as part of the Morgan Offshore Wind Project generation assets.

sequence will generally be the reverse of the construction sequence and involve similar types and numbers of vessels and equipment. The Energy Act 2004 requires that a decommissioning plan must be submitted to the Secretary of State for BEIS prior to the construction of an offshore wind project, and is typically prepared post-consent. The decommissioning plan and programme for the Morgan Offshore Wind Project generation assets will be updated during the lifetime of the Morgan Offshore Wind Project generation assets to take account of changes in regulations, best practice and new technologies.

3.7.1.3 It is also possible that the lifetime of the Morgan Offshore Wind Project generation assets is extended through repowering. NPS EN-3 states at paragraph 2.6.49 (and paragraph 2.23.13 in the draft NPS EN-3) that "given the likely change in technology over the intervening time period, any repowering of sites is likely to involve wind turbines of a different scale and nature. This could result in significantly different impacts as well as a different electricity generating capacity and a new consent application would be required" (DECC, 2011b; BEIS, 2021b).

3.8 Measures adopted as part of the project

3.8.1.1 Measures adopted as part of the project may include those developed as part of the project design, industry standard measures committed to by the Applicant, or measures which are required by law. These include modifications to location or design, industry standard measures committed to by the Applicant including lighting and marking, use of 'soft-starts' for piling operations etc, and commitment to implementing post-consent management plans, to avoid, prevent, reduce or, if possible, offset significant adverse environmental effects. Measures adopted as part of the project are referred to in the relevant topic-specific sections within part 2: Generation assets, of the EIA Scoping Report.

4. EIA methodology

4.1 Proposed approach to the EIA process

4.1.1.1 This section presents an outline of the Environmental Impact Assessment (EIA) methodology to be employed for the Morgan Offshore Wind Project generation assets. It outlines the methodology for the identification and evaluation of potential likely significant environmental effects and also presents the methodology for the identification and evaluation of potential cumulative and inter-related effects, and consideration of potential transboundary effects.

4.1.1.2 A systematic and auditable evidence-based approach is proposed to evaluate and interpret potential effects on physical, biological and human environment receptors.

4.1.1.3 As described in part 1, section 2: Policy and legislation, of the EIA Scoping Report, the EIA process can be broadly summarised as consisting of three main elements that take place prior to the submission of the application, namely scoping, consultation and ES preparation.

4.2 Scoping

4.2.1.1 Scoping is the process of identifying the issues to consider within an ES (establishing the scope of the assessment). As set out in part 1, section 1: Introduction, of the EIA Scoping Report, scoping is therefore an important preliminary procedure, which sets the context for the EIA process. Through scoping, the key environmental issues are identified at an early stage, which permits subsequent work to concentrate on those environmental topics for which significant effects may arise as a result of a proposed development.

4.2.1.2 The scoping process is informed by increasing knowledge acquired through the EIA process. Figure 4.1 highlights some of the key inputs to the scoping process. These inputs include the identification of an initial project description, including the key components of the Morgan Offshore Wind Project generation assets and their likely maximum parameters. Taking this into account, alongside the characteristics of the environment in the vicinity of a project, the requirements of the relevant EIA regulations can be reviewed to provide an initial indication of the topics likely to be relevant to the project. From this point, the scope of assessment can be refined through the use of consultation and the findings of initial assessment by topic specialists.

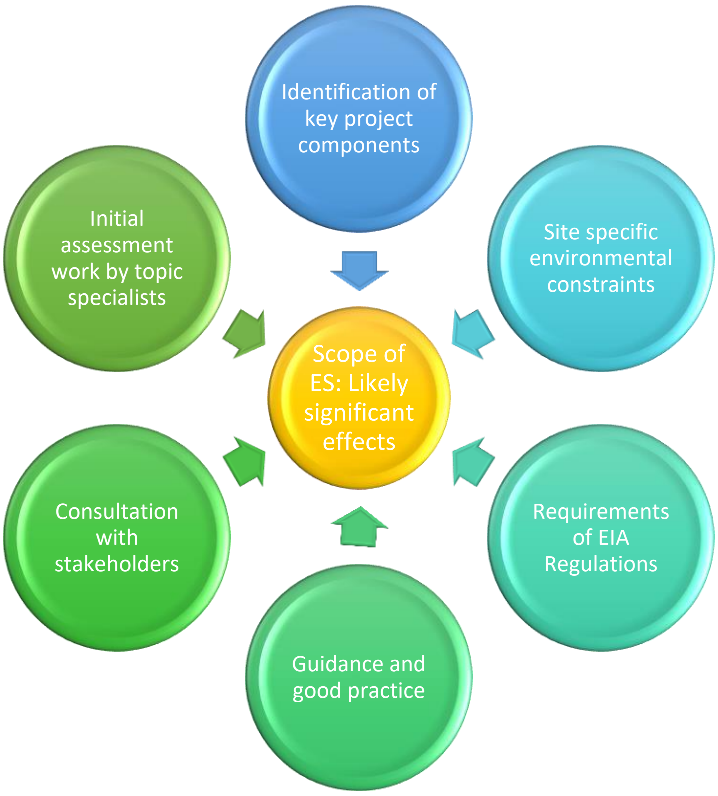


Figure 4.1: Overview of the scoping process.

4.2.1.3 This EIA Scoping Report presents the findings of the scoping process undertaken to date and sets out the proposed methodology for carrying out the EIA. Taking into account the work undertaken to date, it identifies the potential impacts that are proposed to be considered within the EIA process for the Morgan Offshore Wind Project generation assets. Each topic area is considered, setting out the proposed scope of assessment and identifying any sub-topics that are proposed to be scoped out of the assessment (where no significant effects are considered likely).

4.2.1.4 A Scoping Opinion is requested from the Secretary of State, which will inform the scope of the EIA, to be reported in the ES. The ES must be based on the most recent Scoping Opinion adopted.

4.2.1.5 As assessment work continues and surveys are completed, new issues may arise, or it may become apparent that some potential impacts are not likely to result in significant effects. Where this is the case, the findings of the assessment process will be discussed with consultees in order that the scope of the assessment may be refined as appropriate throughout the EIA process.

4.3 Legislation and guidance

4.3.1.1 The impact assessment methodology will draw upon a number of EIA principles, regulations and guidance documents, including:

- Legislation

- The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 (as amended) (the 2017 EIA Regulations).
- The Planning Act 2008 (as amended).
- Policy
- Overarching NPS for Energy (NPS EN-1) (including draft NPS EN-1) (DECC, 2011a; BEIS, 2021a).
- NPS for Renewable Energy Infrastructure (NPS EN-3) (including draft NPS EN-3) (DECC, 2011b; BEIS, 2021b).
- NPS for Electricity Networks Infrastructure (NPS EN-5) (including draft NPS EN-5) (DECC, 2011c; BEIS, 2021c).
- Guidance
- The Planning Inspectorate Advice Note Seven: Environmental Impact Assessment: Preliminary Environmental Information, Screening and Scoping (The Planning Inspectorate, 2020a).
- The Planning Inspectorate Advice Note Nine: Rochdale Envelope (The Planning Inspectorate, 2018).
- The Planning Inspectorate Advice Note Twelve: Transboundary Impacts and Process (The Planning Inspectorate, 2020b).
- The Planning Inspectorate Advice Note Seventeen: Cumulative effects assessment (The Planning Inspectorate, 2019).
- Guidelines for Ecological Impact Assessment (EcIA) in the UK and Ireland (CIEEM, 2019).
- Environmental Impact Assessment Guide to: Delivering Quality Development (IEMA, 2016).
- Delivering Proportionate EIA, A Collaborative Strategy for Enhancing UK Environmental Impact Assessment Practice (IEMA, 2017).
- Cumulative Impact Assessment Guidelines, Guiding Principles for Cumulative Impact Assessment in Offshore Wind Farms (RenewableUK, 2013).
- Guidelines for data acquisition to support marine environmental assessments of offshore renewable energy projects (Cefas, 2012).

4.3.1.2 Other topic-specific specialist methodologies and good practice guidelines will be drawn on as necessary. These are set out and described within the relevant topic sections of the EIA Scoping Report.

4.3.1.3 A full account of applicable legislation and guidance taken into account within the EIA methodology will be documented within the PEIR and ES.

4.4 Key principles of the assessment

4.4.1 Overview

4.4.1.1 The EIA will assess the potential impacts arising from the construction, operation and maintenance and decommissioning phases of the Morgan Offshore Wind Project generation assets. The assessment of each environmental topic (as listed in part 1, section 1: Introduction, of the EIA Scoping Report) will form a separate chapter of the ES. For each environmental topic, the following will be addressed:

- Identification of the study area4 for the topic-specific assessments.
- Description of the planning policy and guidance context.
- Summary of consultation activity.
- Description of the environmental baseline conditions.
- Presentation of the impact assessment, including:
  - Identification of the maximum design scenario (see section 4.4.4) for each impact assessment.
  - A description of the measures adopted as part of the project, including design measures which seek to prevent, reduce or offset environmental effects.
  - Identification of likely impacts and assessment of the significance of identified effects.
  - Identification of any further mitigation measures required in respect of likely significant effects, together with consideration of any residual effects.
  - Identification of any future monitoring required.
  - Assessment of any cumulative effects with other major developments, including those that are proposed, consented and under construction (including, where applicable, those projects, plans or activities that are currently operational that were not operational when baseline data was collected or that have an ongoing effect).
  - Assessment of any transboundary effects (i.e. effects on other states).

4.4.1.2 Inter-related effects (i.e. inter-relationships between environmental topic areas) will be assessed in a separate standalone section.

4.4.1.3 Within each topic section a number of key principles will be applied, and these are detailed in the following sections.

4.4.2 Proportionate EIA

4.4.2.1 The aim of undertaking a proportionate EIA (as per IEMA, 2017; and the Industry Evidence Programme (IEP) (The Crown Estate *et al.,* 2018)) has been a key consideration in the development of this EIA Scoping Report. A number of tools and processes will be used to aid the proportionality of the Morgan Offshore Wind Project generation assets ES. This includes:

- development of consultation Evidence Plans, where applicable (see part 1, section 5: Consultation process, of the EIA Scoping Report)
- application of the existing evidence-base
- commitment to measures adopted as part of the project.

4 For each environmental topic, the baseline environment will be characterised and the potential environmental impacts will be described within a topic-specific study area. The topic-specific study areas are defined for each topic in part 2 of the EIA Scoping Report and are based on the maximum spatial extent across which potential impacts of the Morgan Offshore Wind Project generation assets may be experienced by the relevant receptors (i.e. Zone of Influence).

4.4.3 Evidence-based approach

4.4.3.1 The Morgan Offshore Wind Project generation assets is located in the east Irish sea, a region where there exists significant data and knowledge regarding the baseline environment. This data/knowledge has been acquired through surveys, assessments and post-construction monitoring programmes undertaken for other proposed and existing offshore wind projects, much of which is available in the public domain. It is therefore the Applicant's intention to maximise, where possible, the use of this data and assessments to supplement the site-specific survey data acquired for the Morgan Offshore Wind Project generation assets, in order to:

- characterise the baseline environment to inform the EIA where data is sufficient and appropriate to do so
- scope out impacts where there is a clear evidence-base
- where impacts are scoped in, to draw upon the pre-existing evidence-base where appropriate.

4.4.4 Maximum design scenario approach

4.4.4.1 As described in part 1, section 3: Project description, of the EIA Scoping Report, the Morgan Offshore Wind Project generation assets EIA will use the Project Design Envelope (PDE) approach, also known as the Rochdale Envelope approach. This approach allows for a project to be assessed on the basis of maximum project design parameters (i.e. the worst case scenario) in order to provide flexibility, while ensuring all potentially significant effects are assessed within the EIA process and reported in the ES. Those parameters include a range of potential values.

4.4.4.2 This approach will be taken for the EIA because it is not possible to provide precise final design details of the Morgan Offshore Wind Project generation assets a number of years ahead of the time it will be constructed. Additionally, the Applicant has yet to undertake its consultation process and receive feedback from statutory and non-statutory stakeholders. This will allow the Applicant to fully understand any potential significant impacts that need to be mitigated/managed, which will aid the refinement of the final application. Offshore wind is a constantly evolving industry with a constant focus on cost reduction, therefore improvements in technology and construction methodologies occur frequently and an unnecessarily prescriptive approach could preclude the adoption of new technology and methods.

4.4.4.3 For each of the impacts to be assessed in the topic-specific EIA chapters, the maximum design scenario will be identified from the range of potential options for each parameter in the PDE. The maximum design scenario assessed is therefore the scenario which would give rise to the greatest potential impact. For example, where several wind turbine options are included in the design, then the assessment of the Morgan Offshore Wind Project generation assets would be based on the wind turbine option predicted to have the greatest impact. This may be the wind turbine option with the largest footprint, the greatest tip height or the largest area of seabed disturbance during construction, depending on the topic under consideration. By identifying the maximum design scenario for any given impact, it can therefore be concluded that the impact (and therefore the effect) will be no greater for any other design scenario than that assessed for the maximum design scenario. By employing the maximum design scenario approach, the Applicant retains some flexibility in the final design of the Morgan Offshore Wind Project generation assets, but within certain maximum parameters, which are assessed in the ES.

4.4.4.4 All assumptions regarding the PDE will be clearly set out within the project description chapter of the PEIR/ES and within the topic chapters. The draft DCO will be prepared in conjunction with the ES in order to ensure that the key parameters applied for are consistent with those assessed through the EIA process.

4.5 Identification of impacts and assessment of significance

4.5.1 Definitions of impact and effect

4.5.1.1 The Morgan Offshore Wind Project generation assets has the potential to create a range of impacts and effects with regard to the physical, biological and human environment. For the purposes of the EIA, ‘impact’ is used to define a change that is caused by an action. For example, the piling of wind turbine foundations (action) will result in increased levels of underwater noise (impact). Impacts can be defined as direct, indirect, secondary, cumulative and inter-related. They can also be either adverse or beneficial. In addition, for certain impacts, the reversibility of an impact is relevant to its overall effect. An irreversible (permanent) impact may occur when recovery is not possible, or not possible within a reasonable timescale. In contrast, a reversible (temporary) impact is one where natural recovery is possible over a short time period, or where mitigation measures can be effective at reversing the impact.

4.5.1.2 The term ‘effect’ will be used in the EIA to express the consequence of an impact. Considering the foundation piling example, the piling of wind turbine foundations (action) results in increased levels of subsea noise (impact), with the potential to disturb marine mammals (effect).

4.5.1.3 Each topic chapter will consider the magnitude of the impact alongside both the sensitivity of the receptor in determining the significance of the effect, in accordance with defined significance criteria.

4.5.2 Defining magnitude of impact

4.5.2.1 For each of the impacts assessed in the EIA, a magnitude will be assigned. In assigning magnitude, the spatial extent, duration, frequency and reversibility of the impact will be considered (in line with Schedule 3, section 3, of the 2017 EIA Regulations). For each topic, the magnitude of impact will be categorised according to the below scale:

- no change
- negligible
- low

- medium
- high.

4.5.2.2 Topic-specific definitions for each of these categories will be based on relevant guidance and specialist knowledge and will be provided in each of the topic chapters of the EIA.

4.5.3 Defining sensitivity of receptor

4.5.3.1 Receptors are defined as the physical or biological resource or human user group that would be affected by the impacts of a proposed development. Identification of receptors will be informed by available data and the baseline studies completed in the preparation of the EIA.

4.5.3.2 In defining the sensitivity of each receptor, the vulnerability, recoverability and value/importance will be taken into account. The determination of these factors will be specific to each environmental topic and defined within the corresponding chapters of the ES.

4.5.3.3 The sensitivity of each receptor to each impact will then be defined for each topic according to the below scale:

- negligible
- low
- medium
- high
- very high.

4.5.4 Evaluation of significance of effect

4.5.4.1 Effect is the term used to express the consequence of an impact (expressed as the 'significance of effect'). The significance of an effect will be determined by the consideration of the magnitude of impact alongside the sensitivity of the receptor. In order to ensure a consistent approach throughout the EIA, a matrix approach will be adopted to guide topic-specific assessments. An example of such an EIA matrix is given below in Table 4.1.

Table 4.1: Matrix used for assessment of significance, showing the combinations of receptor sensitivity and the magnitude of impact.

Sensitivity of Receptor	Magnitude of impact				
	No Change	Negligible	Low	Medium	High
Negligible	No change	Negligible	Negligible or Minor	Negligible or Minor	Minor
Low	No change	Negligible or Minor	Negligible or Minor	Minor	Minor or Moderate
Medium	No change	Negligible or Minor	Minor	Moderate	Moderate or Major

Sensitivity of Receptor	Magnitude of impact				
	No Change	Negligible	Low	Medium	High
High	No change	Minor	Minor or Moderate	Moderate or Major	Major
Very High	No change	Minor	Moderate or Major	Major	Major

4.5.4.2 By cross-referencing the magnitude of impact with the sensitivity of the receptor, a significance of effect may be assigned for all potential impacts. The significance of effect may be one, or a range of:

- no change
- negligible
- minor
- moderate
- major.

4.5.4.3 These significance levels are defined in Table 4.2.

Table 4.2: Definition of significance levels.

Term	Definition (adapted from Highways England *et al.,* 2019)
No change	No loss or alteration of characteristics, features or elements; no observable impact in either direction.
Negligible	No effects or those that are beneath levels of perception, within normal bounds of variation or within the margin of forecasting error.
Minor	These beneficial or adverse effects are generally, but not exclusively, raised as local factors. They are unlikely to be critical in the decision-making process but are important in enhancing the subsequent design of the project.
Moderate	These beneficial or adverse effects have the potential to be important and may influence the key decision-making process. The cumulative effects of such factors may influence decision-making if they lead to an increase in the overall adverse or beneficial effect on a particular resource or receptor.
Major	These beneficial or adverse effects are considered to be very important considerations and are likely to be material in the decision-making process. These effects are generally, but not exclusively, associated with sites or features of international, national or regional importance that are likely to suffer a most damaging impact and loss of resource integrity. However, a major change in a site or feature of local importance may also enter this category. Effects upon human receptors may also be attributed this level of significance.

4.5.4.4 In general, a significance level of moderate or greater is considered to be a 'significant effect' in the context of the 2017 EIA Regulations. However, this will be topic-specific and dependent on relevant practitioner guidance, and therefore for each topic chapter of the ES, what is considered 'significant' will be clearly defined. In cases where a range is suggested for the significance of effect, there remains the possibility that this may span the significance threshold (for example, if the range is given as minor to moderate). In such cases the final significance is based upon expert opinion as to which outcome delineates the most likely effect, with an explanation as to why this is the case.

4.6 Mitigation and enhancement measures

4.6.1.1 The 2017 EIA Regulations require that where potential significant effects are identified 'a description of any features of the proposed development, or measures envisaged in order to avoid, prevent or reduce and, if possible, offset likely significant adverse effects on the environment' should be included in the ES.

4.6.1.2 Mitigation measures are measures developed to avoid, prevent, reduce or, if possible, offset significant adverse environmental effects. In some cases, measures are proposed that would create or enhance beneficial environmental or social effects; these are referred to as enhancement measures.

4.6.2 Measures adopted as part of the project

4.6.2.1 Measures adopted as part of the project may include those developed as part of the project design, industry standard measures committed to by the Applicant, or measures which are required by law. For the purposes of the EIA process, the term ‘measures adopted as part of the project’ is used to include the following measures (adapted from IEMA, 2016):

- Measures included as part of the project design. These include modifications to location or design, integrated into the application for consent. These measures are implemented through the consent itself (through the requirements of the DCO or the conditions within the deemed marine licences) (referred to as primary mitigation in IEMA, 2016).
- Industry standard measures committed to by the Applicant. These include commitment to implementing post-consent management plans to reduce the significance or likelihood of adverse environmental effects, integrated into the application for consent. These measures are also implemented through the consent itself (through the requirements of the DCO or the conditions within the deemed marine licences) (referred to as secondary mitigation in IEMA, 2016).
- Measures required to meet legislative requirements (referred to as tertiary mitigation in IEMA, 2016).
- Enhancement measures designed to provide an improvement or net gain, compared to existing baseline conditions.

4.6.2.2 The development of mitigation and enhancement measures is part of an iterative EIA process, whereby measures are developed throughout the EIA process in response to the findings of initial assessments. The proposed methodology involves a ’feedback loop’ as illustrated in Figure 4.2. Impacts are initially assessed for significance of potential environmental effects. If the effect is significant adverse, changes are made where practicable to the project design to reduce or offset the impact magnitude (i.e. primary mitigation). This process is repeated (as per Figure 4.2) until the EIA practitioner is satisfied that either:

- The effect is reduced to a level that is not significant in EIA terms, or

- No further primary or secondary mitigation can be applied to reduce the impact magnitude (and hence the significance of the effect). In these cases, an overall effect that is still significant in EIA terms may be presented.

4.6.2.3 Where appropriate, opportunities are explored within the EIA process to develop enhancement measures and to create beneficial effects.

4.6.2.4 The application for development consent for the Morgan Offshore Wind Project generation assets will include a range of measures adopted as part of the project. The assessment of effects presented within each topic-specific chapter of the ES will take into account all measures adopted as part of the project to which the Applicant is committed.

4.6.2.5 All measures adopted as part of the project, together with the means of securing them (e.g. through submission of post-consent management plans), will ultimately form part of the requirements included in the DCO or the conditions within the deemed marine licence.

4.6.3 Further mitigation

4.6.3.1 Where required, further mitigation will be identified within the topic-specific chapters of the ES. These are measures that could further prevent, reduce and, where possible, offset any significant residual adverse effects on the environment. This category of further mitigation is used, for example, where measures may not be industry standard, or where there is less certainty regarding the proven effectiveness of an emerging mitigation technique. For such measures, the significance of effect is assessed both with and without these measures in place.

4.6.4 Monitoring

4.6.4.1 In some cases, monitoring measures may be appropriate. Where appropriate, monitoring measures will be set out in the topic-specific chapters of the ES.

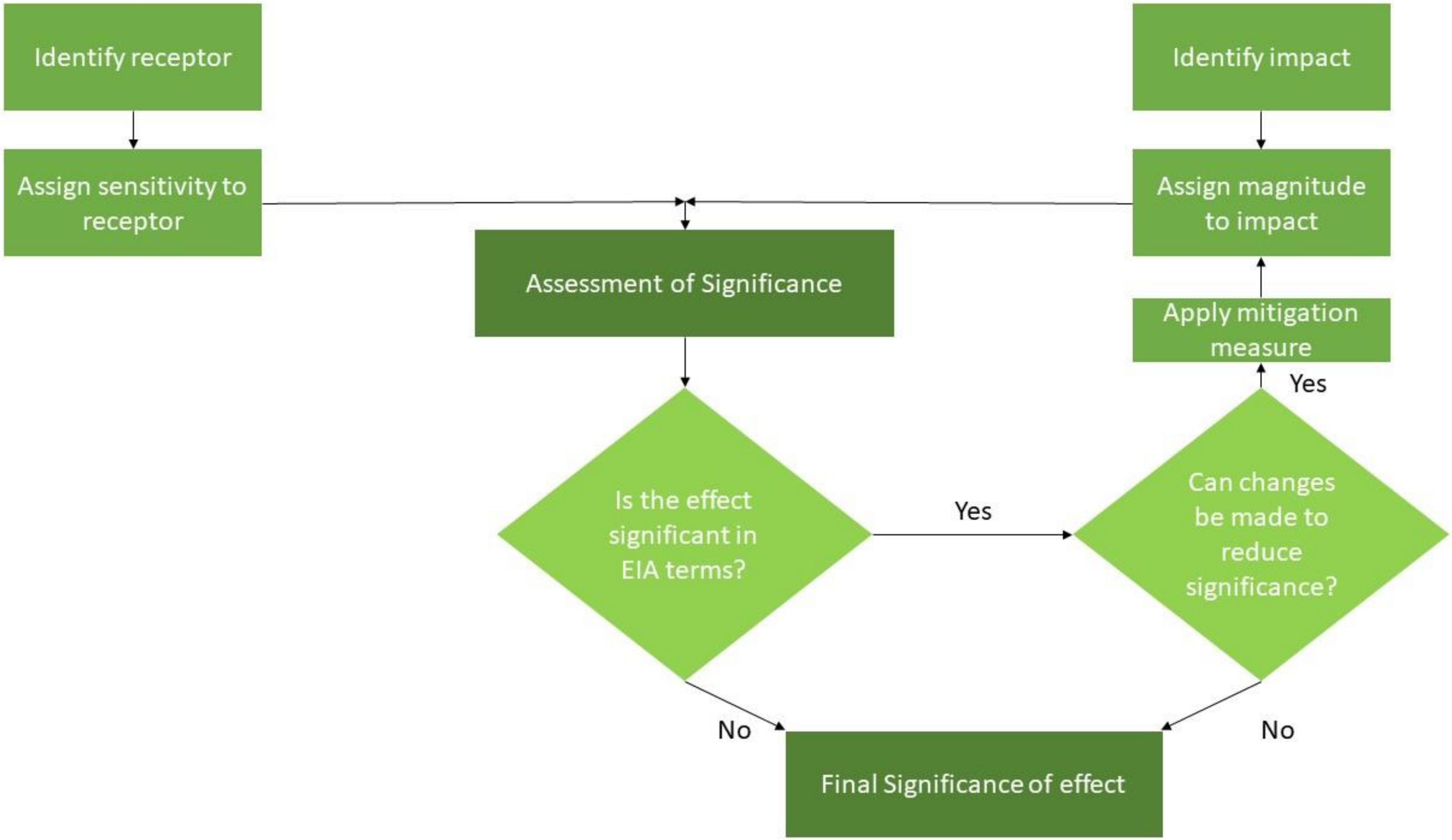


Figure 4.2: Proposed iterative approach to mitigation within the Morgan Offshore Wind Project generation assets EIA.

4.7 Addressing uncertainty

4.7.1.1 There is some degree of inherent uncertainty within the EIA process. There is uncertainty in relation to future improvements to construction and design (see section 4.4.4). In addition, there is uncertainty in relation to future baseline conditions, such as the potential effects of climate change on existing receptors. There is also a degree of uncertainty in terms of the margin of error within forecasting or modelling tools. The following sections set out the proposed approach to addressing uncertainty. In all cases, where uncertainty exists, this will be identified (and quantified where possible) within the relevant chapter of the PEIR/ES, together with details of the measures that have been taken to reduce uncertainty as far as reasonably practicable.

4.7.2 Future baseline and assessment years

4.7.2.1 The baseline for the assessment of environmental effects will primarily be drawn from evidence collated during review of desktop data and any site-specific environmental surveys. Consideration will also be given to any likely changes between the time of data collection/survey and the future baseline for the construction and operation of the Morgan Offshore Wind Project generation assets. In some cases, these changes may include the construction or operation of other planned developments in the area. Where such developments are built and operational at the time of writing and data collection, these will be considered to form part of the baseline environment (unless they have an ongoing effect). Where sufficient and robust information is available, such as expected traffic growth figures, other future developments will be considered as part of the future baseline conditions. In all other cases, planned future developments will be considered within the assessment of cumulative effects.

4.7.2.2 The consideration of future baseline conditions will also take into account the likely effects of climate change, as far as these are known at the time of writing. It is recognised that there will be some element of uncertainty regarding future trends in environmental conditions and climate. Where accepted methodologies for identifying the likely effects of climate change are available, these will be considered in the assessment. For example, information available from the UK Climate Projections project (UKCP18), which provides information on plausible changes in climate for the UK (Environment Agency and Met Office, 2018) and in published documents such as the UK Climate Change Risk Assessment 2017 (HM Government, 2017b) and subsequent updates. Recent published research will also be reviewed to inform judgements on whether specific receptors are susceptible to the effects of climate change.

4.7.3 Forecasting and modelling

4.7.3.1 Where forecasting and modelling tools are used, care will be taken to ensure that the tool selected is appropriate for the assessment, taking into account topic-specific good practice and guidance. Model assumptions will be described, and calibration will be used to ensure a reasonable degree of accuracy in measurements. In addition, uncertainty will be addressed by undertaking modelling for a number of scenarios and at representative points across the Morgan Offshore Wind Project generation assets, where applicable. Topic chapters within the PEIR/ES will set out measures taken to address any uncertainty with regard to modelling inputs and outputs.

4.8 Cumulative effects assessment

4.8.1.1 This section describes the proposed approach to the Cumulative Effects Assessment (CEA) for the Morgan Offshore Wind Project generation assets. Cumulative effects are defined as those that result from incremental changes caused by other reasonably foreseeable actions or other major developments alongside the assessed project. Cumulative effects are therefore the combined effect of the assessed project cumulatively with the effects from a number of different projects, on the same single receptor/resource. A fundamental requirement of undertaking the CEA is to identify those foreseeable developments or activities with which the assessed project may interact to produce a cumulative effect. Interactions have the potential to arise during the construction, operation and maintenance, and decommissioning phases.

4.8.1.2 The Planning Inspectorate's Advice Note Seventeen: Cumulative Effects Assessment Relevant to Nationally Significant Infrastructure Projects (The Planning Inspectorate, 2019) recommends that, through consultation with local authorities and other relevant consenting bodies, other major developments in the area should be taken into account when conducting CEA, including those which are:

- under construction
- permitted application(s), but not yet implemented
- submitted application(s) not yet determined
- projects on the National Infrastructure Planning Portal's Programme of Projects
- projects identified in relevant development plans
- projects identified in other plans and programmes as may be relevant.

4.8.1.3 For the Morgan Offshore Wind Project generation assets CEA, other proposed major developments in the area will be taken into account within the CEA, including but not limited to the coordinated transmission assets for the Morgan Offshore Wind Project and the Morecambe Offshore Windfarm, the Morecambe Offshore Windfarm generation assets, and the Mona Offshore Wind Project, in line with the methodology outlined below.

4.8.2 Screening stage

4.8.2.1 The CEA process is divided into a screening stage and an assessment stage. The proposed process is broadly illustrated in Figure 4.3.

4.8.2.2 An extensive list of plans, projects and activities will be prepared to inform the CEA, known as the CEA long list. A process will be followed to methodically and transparently screen the large number of projects and plans that may be considered cumulatively alongside the Morgan Offshore

Wind Project generation assets. This involves a stepwise process that considers the level of detail available for projects/plans, as well as the potential for interactions to occur on the following basis:

- Data confidence: data confidence is taken into account when screening projects, plans and activities into or out of the CEA. The premise here is that projects, plans and activities with a low level of detail publicly available cannot meaningfully contribute to a CEA and, as such, are screened out. The application of this screening step is consistent with Guiding Principle 7 of the RenewableUK Cumulative Impact Assessment Guidelines (RenewableUK, 2013).
- Conceptual overlap: for a conceptual overlap to occur it must be established that such an impact has the potential to directly or indirectly affect the receptor(s) in question. In EIA terms this is described as an impact-receptor pathway and is defined here as a conceptual overlap.
- Physical overlap: a physical overlap refers to the ability for impacts arising from the Morgan Offshore Wind Project generation assets to overlap with those from other projects/plans on a receptor basis. This means that, in most examples, an overlap of the physical extents of the impacts arising from the two (or more) projects/plans must be established for a cumulative effect to arise. Exceptions to this exist for certain mobile receptors that may move between, and be subject to, two or more separate physical extents of impact from two or more projects.
- Temporal overlap: in order for a cumulative effect to arise from two or more projects, a temporal overlap of impacts arising from each must be established. It should be noted that some impacts are active only during certain phases of development, such as piling noise during construction. In these cases, it is important to establish the extent to which an overlap may occur between the specific phase of the Morgan Offshore Wind Project generation assets and other projects/plans. The absence of a strict overlap however may not necessarily preclude a cumulative effect, as receptors may become further affected by additional, non-temporally overlapping projects.

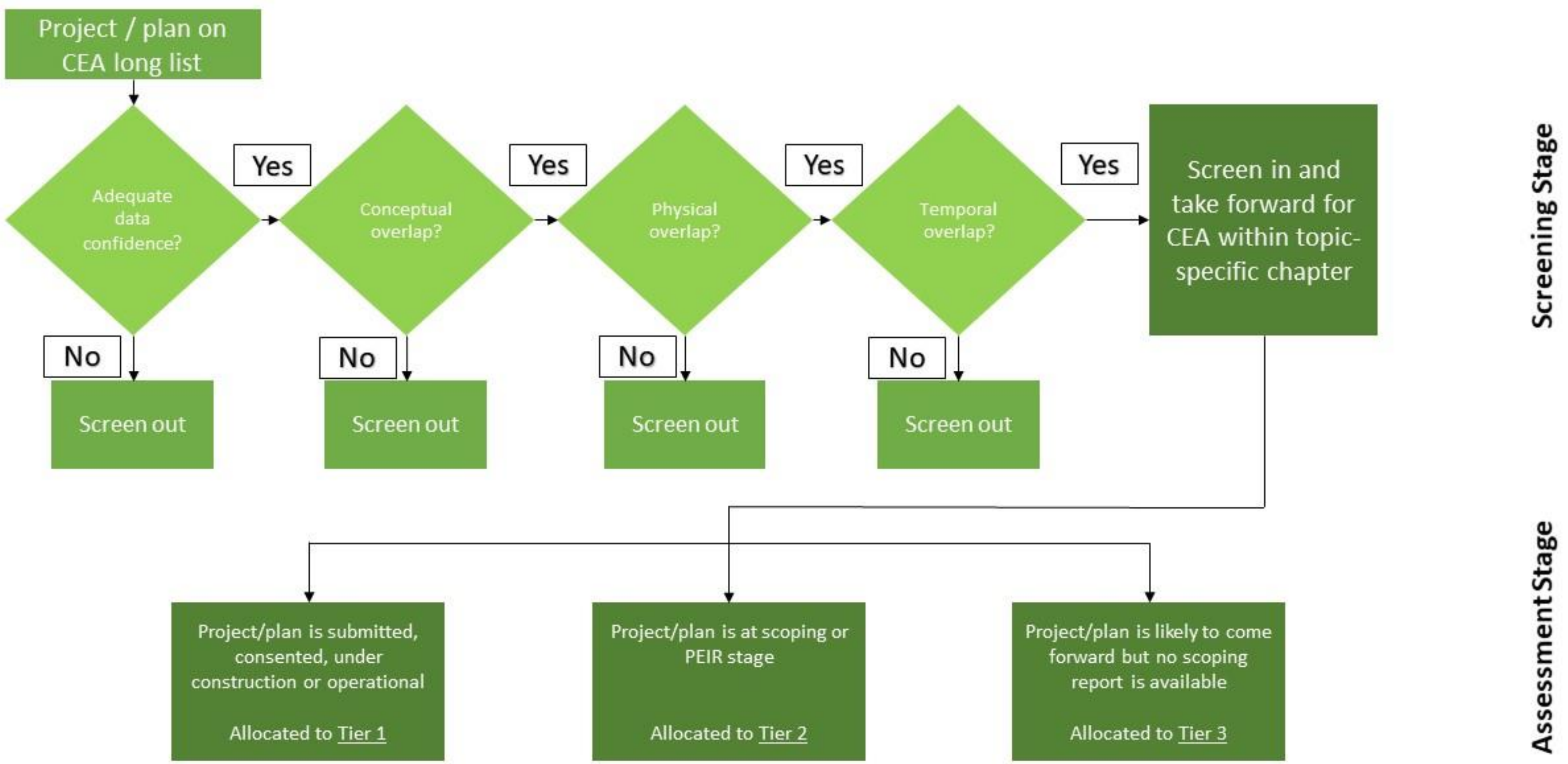


Figure 4.3: Proposed methodology for the Morgan Offshore Wind Project generation assets for the screening of potential projects/plans to provide cumulative effects.

4.8.3 Assessment stage

4.8.3.1 Once a project has been taken forward to the assessment stage, a tiered approach is proposed for the CEA. The tiered approach provides a framework to assist the decision maker in placing relative weight upon the potential for each project/plan assessed cumulatively to ultimately be realised, based upon the project/plan's current stage of maturity. The allocation of projects/plans into tiers is not affected by the screening process; it is a categorisation applied to all projects/plans that have been screened in for assessment.

4.8.3.2 The definitions of the tiers to be used will be included in the PEIR and will be broadly consistent with The Planning Inspectorate's Advice Note Seventeen (The Planning Inspectorate, 2019) and the RenewableUK Cumulative Impact Assessment Guidelines, specifically Guiding Principle 4 and Guiding Principle 7 (RenewableUK, 2013).

4.8.3.3 All projects/plans that have been screened into the CEA via the screening process will be allocated into one of the tiers and assessed for cumulative effect. Where practicable, the CEA methodology then follows the outline of the project-alone assessment methodology as described above in section 4.4. This approach allows consistency throughout the EIA and enables comparisons to be made.

4.9 Transboundary impacts

4.9.1 Legislation and guidance

4.9.1.1 Transboundary effects arise when impacts from a project within one state affect the environment of another state(s). The need to consider such transboundary effects has been embodied by the United Nations Economic Commission for Europe Convention on EIA in a Transboundary Context (commonly referred to as the 'Espoo Convention'). The Convention requires that assessments are extended across borders between Parties of the Convention when a planned activity may cause significant adverse transboundary impacts.

4.9.1.2 The Espoo Convention has been implemented in the UK by 2017 EIA Regulations. Regulation 32 of the 2017 EIA Regulations set out a prescribed process of consultation and notification. In addition, The Planning Inspectorate's Advice Note Twelve: Transboundary Impacts (The Planning Inspectorate, 2020) sets out the procedures for consultation in association with an application for a DCO where such a development may have significant transboundary impacts.

4.9.1.3 The Planning Inspectorate's Advice Note Twelve (The Planning Inspectorate, 2020) also sets out the procedure for screening, consulting and assessing transboundary issues. This procedure involves the following broad steps which are divided into two stages:

- Stage 1:
  - Developer carries out pre-application consultation with other state(s).
  - Developer notifies The Planning Inspectorate of EIA potentially requiring transboundary assessment.
  - Developer prepares initial matrix to identify potential significant impacts on other state(s) and provides to The Planning Inspectorate.
  - The Secretary of State undertakes transboundary screening for potential significant impacts.
  - The Secretary of State notifies other relevant state(s), including London Gazette notice.
  - Other state(s) notify The Planning Inspectorate of their wish to participate in the consultation.
- Stage 2:
  - Developer submits DCO application, including translated non-technical summary and a consultation report summarising pre-submission transboundary consultation that took place.
  - Secretary of State undertakes consultation with other relevant state(s).
  - Other state(s) consult with their public and provide comments to the Secretary of State
  - Consultation responses are taken account of by the Secretary of State in the decision-making process.

4.9.1.4 The Morgan Offshore Wind Project generation assets will follow this broad process with regard to transboundary EIA, including any other guidance that may prevail at the time of undertaking the assessment.

4.9.2 Screening

4.9.2.1 Identification and screening of transboundary impacts has been undertaken and is presented in part 3, annex A: Transboundary screening, of this EIA Scoping Report.

4.10 Inter-related effects

4.10.1.1 Regulation 5(2) of the 2017 EIA Regulations require a consideration of the interactions or inter-relationships between EIA topics that may lead to additional environmental effects. For example, the separate impacts of subsea noise and habitat loss may together have an effect upon a single receptor, such as marine mammals.

4.10.1.2 Guidance on inter-related effects is provided within The Planning Inspectorate's Advice Note Nine: Rochdale Envelope (The Planning Inspectorate, 2018), which state that 'interactions between aspect assessments includes where a number of separate impacts, e.g. noise and air quality, affect a single receptor such as fauna'. The approach to inter-related effects will take into account this Advice Note, along with any other guidance that may prevail at the time.

4.10.1.3 The approach to the assessment of inter-related effects will consider two levels of potential effect:

4.10.1.4 Project lifetime effects: effects that occur throughout more than one phase of the Morgan Offshore Wind Project generation assets (e.g. construction, operation and maintenance or decommissioning).

4.10.1.5 Receptor-led effects: effects that interact spatially and/or temporally resulting in inter-related effects upon a single receptor.

4.10.1.6 The assessment of inter-related effects will be undertaken with specific reference to the potential for such effects to arise in relation to receptor groups (i.e. the proposed approach assessment will, in the main, not assess every individual receptor assessed at the EIA stage, but rather, potentially sensitive groups of receptors).

4.10.1.7 The broad approach to inter-related effects assessment will follow the below key steps:

- Review of effects for individual EIA topic areas.
- Review of the assessment carried out for each EIA topic area, to identify ’receptor groups’ requiring assessment.
- Identify potential inter-related effects on these receptor groups via review of the assessment carried out across a range of topics.
- Develop tables that list all potential effects on the selected receptor across the construction, operation and maintenance phases (project lifetime effects).
- Develop lists for all potential receptor-led effects.
- Qualitative assessment on how individual effects may combine to create inter-related effects.

4.10.1.8 It is important to note that the inter-relationships assessment will consider only effects produced by the Morgan Offshore Wind Project generation assets, and not those from other projects (these will be considered within the CEA).

5. Consultation process

5.1 Pre-application consultation

5.1.1.1 The Planning Inspectorate's Advice Note Three: EIA Notification and Consultation (The Planning Inspectorate, 2017a) states that 'It is the responsibility of the Applicant to ensure that their pre-application consultation fully accords with the requirements of the [Planning Act 2008], including associated regulations, and that they have regard to relevant guidance'.

5.1.1.2 The Planning Act 2008 requires the Applicant to consult with the local authorities and such persons as prescribed in Section 42 and Section 44 of the Planning Act 2008 and Schedule 1 of the Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009 (as amended).

5.1.1.3 In addition, the Applicant is to have regard to guidance issued in accordance with section 50 of the Planning Act 2008, which includes 'Planning Act 2008: Guidance on the pre-application process' (Department for Communities for Communities, 2015).

5.1.1.4 Section 43 of the Planning Act 2008 details local authorities that must be consulted and section 47 sets out the process that an applicant must comply with in consulting people living in the vicinity of the land of the proposed application. As the Morgan Offshore Wind Project generation assets are located wholly within English offshore waters (beyond 12nm from the English coast), these requirements do not apply.

5.1.1.5 Notwithstanding this the Applicant intends to voluntarily consult with local communities that may be affected by the project. The Applicant will identify and consult with relevant local authorities on the proposed scope of consultation with their affected communities.

5.1.1.6 The Applicant will consult a range of statutory consultees as identified by The Planning Inspectorate (this EIA Scoping Report will help inform that consultation exercise). The Applicant will have regard to any relevant responses to this consultation, as prescribed in Section 49 of the Planning Act 2008.Consultation from non-statutory consultees will also be taken into account where relevant.

5.1.1.7 Anyone with an active interest in the Morgan Offshore Wind Project generation assets is encouraged to participate in the pre-application consultation and more detail on the consultation that will be undertaken by the Applicant is set out in section 5.4 below.

5.2 Statement of Community Consultation (SoCC)

5.2.1.1 Under Section 47 of the Planning Act 2008, the Applicant has a duty to prepare a SoCC, which sets out how it plans to consult local communities in the vicinity of the land on which the proposed development. The Applicant must conduct its consultation in line with the SoCC. The Applicant will consult with relevant local authorities on the approach to consultation with the communities likely to be affected by the Morgan Offshore Wind Project generation assets.

5.3 Evidence plan process

5.3.1.1 Since September 2012, applicants of Nationally Significant Infrastructure Projects (NSIPs) located in England have been able to agree evidence plans with relevant Statutory Nature Conservation Bodies (SNCBs).

5.3.1.2 Evidence plans are formal mechanisms to agree what information the Applicant needs to supply to The Planning Inspectorate as part of a DCO application. This helps ensure compliance with the Habitats Regulations, and helps applicants provide sufficient information as part of their application.

5.3.1.3 Guidance on the evidence plan approach is provided by the Department for Environment, Food and Rural Affairs (Defra) in 'Habitats Regulations: Evidence Plans for Nationally Significant Infrastructure Projects' (Defra, 2012) and within The Planning Inspectorate's Advice Note Eleven, Annex H – Evidence Plans for Habitats Regulations Assessments of Nationally Significant Infrastructure Projects (The Planning Inspectorate, 2017b). The Planning Inspectorate's Advice Note Eleven, Annex H, describes four stages to the evidence plan process:

- The Applicant requests an evidence plan.
- The Applicant and relevant SNCB(s) agree the initial structure and content of the evidence plan.
- The Applicant gathers and analyses the evidence and the relevant SNCB(s) assess the evidence through an iterative process. The Applicant and SNCB(s) agree where specific issues are resolved.
- The evidence plan process is finalised and agreed by the Applicant and SNCB(s) during the pre-application stage.

5.3.1.4 An evidence plan steering group has been established for the Morgan Offshore Wind Project generation assets. The steering group is comprised of The Planning Inspectorate, the Applicant, Natural England, Natural Resources Wales (NRW), the Joint Nature Conservation Committee (JNCC) and the Marine Management Organisation (MMO) as the key regulatory bodies and SNCBs. The steering group will meet at key milestones throughout the EIA process. In addition, Expert Working Groups (EWG) have been established to discuss topic specific issues with relevant stakeholders. EWG meetings will be held at key stages in the EIA process or when new information becomes available for each topic, to provide the opportunity for stakeholders to provide feedback and advice at an early stage. EWGs have been established for the following topics:

- Physical processes, Benthic ecology and Fish and shellfish ecology
- Marine mammals
- Offshore ornithology.

5.4 Timing of consultation

5.4.1.1 Prior to the submission of the DCO application, further consultation will take place with relevant parties. This will include, but not be limited to, consultation on the preliminary environmental information (including submission of a Preliminary Environmental Information Report (PEIR)). This will ensure that relevant stakeholder feedback is received and can be taken into account.

5.4.1.2 Key dates include:

- Q2 2022: EIA Scoping
- Q3 2022: Phase 1 community consultation (non-statutory consultation)
- Q1 2023: Phase 2 community consultation (statutory consultation on the PEIR).

5.4.1.3 Consultation will continue with key topic-specific technical stakeholders throughout the EIA process.

5.4.2 Scoping

5.4.2.1 The Planning Inspectorate, having received this EIA Scoping Report, will consult with the relevant authorities and key statutory consultees to seek their comments on the scope of the Morgan Offshore Wind Project generation assets EIA. In addition to the bodies that The Planning Inspectorate will formally consult, the Applicant will make the EIA Scoping Report available to other stakeholders via the Morgan Offshore Wind Project generation assets website (https://www.enbw-bp.com/). Following consultation with statutory consultees on the scope of the EIA, the Secretary of State will provide a Scoping Opinion.

5.4.3 Phase 1 consultation

5.4.3.1 In parallel to seeking a Scoping Opinion from the Secretary of State, the Applicant will carry out its Phase 1 public consultation. Anyone who could potentially be affected by, or may have an active interest in, the Morgan Offshore Wind Project generation assets is encouraged to participate.

5.4.3.2 An online consultation platform will form a central hub for the consultation, making all information easily accessible and providing a simple way to provide feedback. Over the consultation period, a number of events are proposed. These are likely to include online events, public exhibitions and pop-up events to allow those interested in, or affected by, the Morgan Offshore Wind Project generation assets to view the information provided.

5.4.3.3 At these events (whether online or in person), members of the public will be able to view the latest information on the Morgan Offshore Wind Project generation assets, including maps and diagrams illustrating the proposed infrastructure. They will be able to speak directly with members of the Morgan Offshore Wind Project generation assets team and ask any questions or raise any concerns they may have. Participants will have the opportunity to complete a feedback form. The dates, venues and times will be confirmed nearer to the time and advertised online and in local media.

5.4.3.4 At the end of Phase 1 consultation a consultation feedback report will be produced. The report will include an overview of the issues raised during the Phase 1 community consultation events and will inform future development of the consultation and EIA process, where appropriate.

5.4.4 Phase 2 consultation

5.4.4.1 Phase 2 consultation comprises statutory consultation (under Section 42 of the Planning Act 2008) on the PEIR. This document will act as a draft ES, will be based on the EIA Scoping Report and Scoping Opinion, and will take into account comments received from the consultation process.

5.4.4.2 In parallel to this consultation with statutory consultees, the Applicant will hold a second round of public consultation events, either online or in local authority areas across the consultation zone (subject to public health advice on COVID-19 at the time). At this stage, the Applicant will specifically consult stakeholders and the local community on the contents of the PEIR and following this additional community consultation events will be held. The dates, venues and times will be confirmed nearer to the time and advertised online and in local media.

5.4.4.3 During these consultation events, the Applicant may be able to present a more refined scheme for development, on which members of the public can comment. Participants will have the opportunity to complete a feedback form and a consultation feedback report will be produced and made available online.

Preliminary Environmental Information Report (PEIR)

5.4.4.4 The EIA Regulations require preliminary environmental information (PEI) to be provided for public consultation by those seeking a DCO for NSIPs. The level of detail required in the PEI is not defined by The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017; however, it must cover those areas being assessed by the ES, which will accompany the application for development consent.

5.4.4.5 The Applicant plans to submit and consult upon a PEIR for the Morgan Offshore Wind Project generation assets as part of Phase 2 consultation during Q1 2023. The PEIR is intended to allow statutory consultees, local communities and interested parties to understand the nature, scale, location and likely significant environmental effects of the Morgan Offshore Wind Project generation assets, such that they can make an informed contribution to the process of pre-application consultation under the Planning Act 2008 and to the EIA process.

5.4.4.6 The Applicant expects it will further refine the Morgan Offshore Wind Project generation assets proposal, in terms of the detailed consent application to be submitted, based upon the consultation responses received from the PEI process. The final results of the EIA will be presented in an ES and a summary of all consultation responses received will be presented in a Consultation Report, both of which will accompany application for development consent.

5.4.5 Application for development consent

5.4.5.1 The application for development consent is planned to be submitted to The Planning Inspectorate in Q1 2024. The ES that will be submitted to accompany the application will be prepared taking into account the responses to the Phase 1 and Phase 2 consultation, which will be captured in the Consultation Report that will accompany the application.

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Part 2: Generation assets

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Glossary

Term	Meaning
Acoustic Deterrent Devices	A device of lower acoustic energy used to encourage marine mammals away from an area before high energy industrial activities begin.
Allision	The act of striking or collision of a moving vessel against a stationary object.
Amphipod	Members of the invertebrate order Amphipoda (Crustaceans).
Anthropogenic	An activity resulting from or relating to the influence of humans.
Automatic Identification System (AIS)	A system by which vessels automatically broadcast their identity, key statistics including location, destination, length, speed and current status.
Avoided Emissions	Avoided emissions are emission reductions that occur outside of a product's life cycle or value chain, but as a result of the use of that product.
Baseline GHG Emissions	The production of GHGs that have occurred in the past and which are being produced prior to the construction of the Morgan Offshore Wind Project.
Bathymetry	A measurement of the depth of water in the ocean
BC and BP	BP is used when discussing early prehistory (e.g. the Palaeolithic) and BC becomes the relevant term when discussing later prehistory (e.g. Mesolithic onwards)
Cadw	The Welsh government's historic environment service.
Carboniferous	A geological period of time from 359million years ago to 299 million years ago.
Carbon Intensity	The quantity of carbon dioxide CO_2 that it takes to make one unit of electricity a kilowatt per hour.
Code of Construction Practice	A document detailing the overarching principles of construction, contractor protocols, construction-related environmental management measures, pollution prevention measures, the selection of appropriate construction techniques and monitoring processes.
CO_2-Equivalents	A carbon dioxide equivalent is a metric measure used to compare the emissions from various greenhouse gases on the basis of their global-warming potential, by converting amounts of other gases to the equivalent amount of carbon dioxide with the same global warming potential.
Collision	The act or process of colliding (crashing) between two moving objects.
Construction Traffic Management Plan	A document detailing the construction traffic routes for HGV and personnel travel, protocols for delivery of Abnormal Indivisible Loads to site, measures for road cleaning and sustainable site travel measures.
Conversion Factors	Conversion factors allow organizations and individuals to calculate GHG emissions from a range of activities, including energy use, water consumption, waste disposal, recycling and transport activities.
Development Consent Order	A legal order granting development consent for one or more nationally significant infrastructure projects.
Embodied Carbon	Embodied carbon means all the CO_2 emitted in producing materials. It's estimated from the energy used to extract and transport raw materials as well as emissions from manufacturing processes.
Environmental Product Declarations	A transparent, objective report that communicates what a product is made of and how it impacts the environment across its entire lifecycle.
Epifauna	The animals living on top of the seabed
Fishery	A group of vessel voyages which target the same species or use the same gear.
Flight Level	A standard nominal altitude of an aircraft, in hundreds of feet, based upon a standardised air pressure at sea-level.
Formal Safety Assessment (FSA)	A structured and systematic process for assessing the risks and costs (if applicable) associated with shipping activity.
Gazetteer	A geographical index.
Gear Type	The method/equipment used for fishing.
Generation Assets	The generation assets of the Morgan Offshore Wind Project including the wind turbine generators, foundations, inter-array cables, interconnector cables, and offshore substation platforms.

Term	Meaning
Greenhouse Gases	The main gases responsible for the greenhouse effect include carbon dioxide, methane, nitrous oxide, and water vapor (which all occur naturally), and fluorinated gases (which are synthetic).
Helicopter Main Route (HMR)	Routes which are established to facilitate safe helicopter flights in instrument Flight Rules (IFR) conditions (i.e. when flight cannot be completed in visual conditions).
Hominid	A human or an early form of human.
Hydrozoa	Small predatory marine animals, some are colonial and can form large colonies of individual animals.
ICES Statistical Rectangles	Defined areas, 1 degree longitude x 0.5 degree latitude equalling approximately 30 x 30 NM used for fisheries statistics.
Infauna	The animals living within the seabed.
Instrument Flight Rules (IFR)	The rules governing procedures for flights conducted on instruments.
Instrument Meteorological Conditions (IMC)	Weather conditions which would preclude flight by the Visual Flight Rules (VFR) (i.e. conditions where the aircraft is in or close to cloud or flying in visibility less than a specified minimum).
Landings	Quantitative description of amount of fish returned to port for sale, in terms of value or weight.
Life Cycle Analysis Studies	Life cycle assessment is a methodology for assessing environmental impacts associated with all the stages of the life cycle of a commercial product, process, or service.
Magnetometer	A device that measures magnetic fields.
Marine Guidance Note (MGN)	A system of guidance notes issued by the Maritime and Coastguard Agency (MCA) which provide significant advice relating to the improvement of the safety of shipping and of life at sea, and to prevent or minimise pollution from shipping.
Mean Annual Significant Wave Height	A measure of wave height, it is the average height of the highest third of waves over a typical year.
Mean High Water Springs (MHWS)	The height of mean high water during spring tides in a year.
Mean Low Water Springs (MLWS)	The height of mean low water during spring tides in a year.
Metocean Buoy	Buoy that is deployed in the ocean that measure wave, current and sea surface wind speeds.
Minimum Safe Altitude (MSA)	Under aviation flight rules, the altitude below which it is unsafe to fly in IMC owing to presence of terrain or obstacles within a specified area.
Morgan Array Scoping Boundary	The Morgan Array Scoping Boundary within which the wind turbine generators, foundations, inter-array cables, interconnector cables and offshore substation platforms will be located.
Morgan Offshore Wind Project generation assets	The Morgan Offshore Wind Project generation assets is comprised of the generation assets and associated activities.
Net Effects	The overall effect on climate change, considering the positive and negative effects of the Morgan Offshore Wind Project generation assets on GHG emissions.
Peak Pressure	The highest pressure above or below ambient that is associated with a sound wave.
Polychaete	Marine segmented worms
Reefiness	A reefiness determination is the result of an assessment of the characteristics of a reef in order to determine if a habitat is considered a reef in the specific contact of the Habitats Directive. The features that contribute to the ‘reefiness’ of a rocky reef include (Irving, 2019): • Composition (percentage cover, including patchiness) • Elevation (hight of the reef above the seabed level) • Extent (percentage of species composed of epifaunal species)
Semi-diurnal Tides	A tide cycle with two nearly equal high tides and low tides every lunar day.
Sound Exposure Levels	The representation of a noise event if all the energy were compressed into a 1 second period. This provides a uniform way to make comparisons between noise events of different durations.
Traffic Separation Scheme (TSS)	A traffic-management route-system ruled by the IMO. The traffic-lanes (or clearways) indicate the general direction of the vessels in that zone; vessels

Term	Meaning
	navigating within a TSS all sail in the same direction or they cross the lane in an angle as close to 90 degrees as possible.
Triassic	A geological period of time from 252 million years ago to 201 million years ago.
Uncontrolled Airspace	Airspace in which Air Traffic Control (ATC) does not exercise any executive authority, but may provide basic information services to aircraft in radio contact. In the UK, Class G airspace is uncontrolled.
Vessel Monitoring System (VMS)	A system used in commercial fishing to allow environmental and fisheries regulatory organizations to monitor, minimally, the position, time at a position, and course and speed of fishing vessels.
Visual Flight Rules (VFR)	The rules governing flight conducted visually (i.e. with the crew maintaining separation from obstacles and other aircraft visually).

Acronyms

Acronym	Meaning
ADD	Acoustic Deterrent Devices
ADS	Archaeological Data Service
AFBI	Agri-Food and Biosciences Institute
AGA	Aerodromes and Ground Aids
AIS	Automatic Identification System
ALARP	As Low As Reasonably Practicable
AMSL	Above Mean Sea Level
ANIFPO	Anglo Northern Irish Fish Producers Organisation
ANSP	Air Navigation Service Provider
ARU	Acoustic Recorder Unit
ASA	Acoustic Society of America
ATC	Air Traffic Control
ATS	Air Traffic Service
BAE	British Aerospace
BAP	Biodiversity Action Plan
BC	Before Christ
BDMPS	Biologically Defined Minimum Population Scales
BEIS	Department for Business, Energy and Industrial Strategy
BGS	British Geological Survey
BODC	British Oceanographic Data Centre
BP	Before Present
CAA	Civil Aviation Authority
CAP	Civil Aviation Publication
CCC	Climate Change Committee
CCS	Carbon Capture and Storage
CCW	Countryside Council for Wales
CEF	Cumulative Effect Framework
CFPO	Cornish Fish Producers Organisation
CI	Confidence Intervals
CMACS	Centre for Marine and Coastal Studies Ltd
CMS	Construction Method Statement
CNS	Communication, Navigation and Surveillance
CSIP	Cable Specification and Installation Plan
CTA	Control Area
CV	Coefficient of Variation
DCO	Development Consent Order
DDV	Drop Down Video
Defra	Department for Environment, Food and Rural Affairs
DfT	Department for Transport
DIO	Defence Infrastructure Organisation
DSDP	Deep Sea Drilling Project

Acronym	Meaning
DUKES	Digest of UK Energy Statistics
ECMWF	European Centre for Medium-range Weather Forecasting
ECON	Ecological Consultancy Ltd
EEA	European Economic Area
EHO	Environmental Health Officer
EIA	Environmental Impact Assessment
EMEC	European Marine Energy Centre
EMF	Electromagnetic Fields
EMODnet	European Marine Observation and Data Network
EMP	Environmental Management Plan
EPD	Environmental Product Declarations
ERCoP	Emergency Response and Cooperation Plan
ES	Environmental Statement
ESCA	European Subsea Cables UK Association
ESRI	Environmental Systems Research Institute
EU	European Union
FIF	Federation of Irish Fishermen
FIR	Fishing Industry Representative
FLO	Fisheries Liaison Officer
FLOWW	Fishing Liaison with Offshore Wind and Wet Renewables Group
FL	Flight Level
FRA	Flood Risk Assessment
GEBCO	General Bathymetric Chart of the Oceans
GEMS	Geotechnical Engineering and Marine Surveys
GES	Good Environmental Status
GHG	Greenhouse Gas
GIA	Gross Internal Area
GPS	Global Positioning System
GSD	Ground Sampling Distance
GSI	Geological Survey Ireland
HE	Historic England
HER	Historic Environment Record
HM	Her Majesty’s
HMCG	Her Majesty’s Coastguard
HMR	Helicopter Main Route
HRA	Habitats Regulations Assessment
HSE	Health and Safety Executive
IALA	International Association of Marine Aids to Navigation and Lighthouse Authorities
ICES	International Council for the Exploration of the Sea
ICNIRP	International Commission on Non-ionising Radiation Protection
ICPC	International Cable Protection Committee
IEEM	Institute of Ecology and Environmental Management
IEF	Important Ecological Features

Acronym	Meaning
IEMA	Institute for Environmental Management and Assessment
IFP	Instrument Flight Procedures
IFR	Instrument Flight Rules
IMC	Instrument Meteorological Conditions
IMO	International Maritime Organisation
INFOMAR	Integrated Mapping for the Sustainable Development of Ireland's Marine Resource
INNS	Invasive Non-native Species
IPCC	Intergovernmental Panel on Climate Change
ISEFPO	Irish South and East Fish Producers Organisation
ISWFPO	Irish South and West Fish Producers Organisation
JCP	Joint Cetacean Protocol
JNCC	Joint Nature Conservation Committee
JRCC	Joint Rescue Coordination Centre
LAT	Lowest Astronomical Tide
LCA	Lifecycle Analysis
LF	Low Frequency
LGM	Last Glacial Maximum
LID	Lynn and Inner Dowsing
LSE	Likely Significant Effects
MAIB	Marine Accident Investigation Branch
Manx PO	Manx Fish Producers Organisation
MarESA	Marine Evidence based Sensitivity Assessment
MarLIN	Marine Life Information Network
MBA	Marine Biological Association
MBES	Multibeam Echo Sounder
MCA	Maritime and Coastguard Agency
MCAA	Marine and Coastal Access Act
MCZ	Marine Conservation Zone
MDS	Maximum Design Scenario
MEDIN	Marine Environmental Data and Information Network
MGN	Marine Guidance Note
MHWS	Mean High Water Springs
MMO	Marine Management Organisation
MNEF	Maritime Navigation Engagement Forum
MOD	Ministry of Defence
MRCC	Maritime Rescue Coordination Centre
MRSC	Maritime Rescue Sub Centre
MMMP	Marine Mammal Mitigation Protocol
MNCR	Marine Nature Conservation Review
MNR	Marine Nature Reserve
MoD	Ministry of Defence
MPA	Marine Protected Area
MPCP	Marine Pollution Contingency Plan

Acronym	Meaning
MSA	Minimum Safe Altitude
NATS	National Air Traffic Services
NBN	National Biodiversity Network
NDFA	North Devon Fisheries Association
NERC	Natural Environment and Rural Communities
NFFO	National Federation of Fishermen's Organisations
NIGFS	Northern Irish Ground Fish Trawl Survey
NIPFO	Northern Irish Fish Producers Organisation
NMFS	National Marine Fisheries Service
NMRW	National Monuments Record Wales
NOAA	National Oceanic and Atmospheric Administration
NOTAM	Notice to Airmen
NPS	National Policy Statement
NRA	Navigation Risk Assessment
NRHE	National Record of the Historic Environment
NRW	Natural Resources Wales
NTMs	Notice to Mariners
NWIFCA	North Western Inshore Fisheries and Conservation Authority
OGA	Oil and Gas Authority
OMP	Operational Management Plan
OPERA	Operational Programme for the Exchange of Weather Radar information
OREIs	Offshore Renewable Energy Installations
OSP	Offshore Substation Platform
PAD	Protocol for Archaeological Discoveries
PCW	Phocid Carnivores in Water
PDE	Project Design Envelope
PEI	Preliminary Environmental Information
PEIR	Preliminary Environmental Information Report
PEL	Probable Effect Levels
PELTIC	Pelagic ecosystem in the western English Channel and eastern Celtic Sea
PEXA	Practice and Exercise Area
PS	Piling Strategy
PSA	Particle Size Analysis
PSR	Primary Surveillance Radar
PVA	Population Viability Analysis
RAF	Royal Air Force
RCAHMW	Royal Commission on the Ancient and Historical Monuments of Wales
REWS	Radar Early Warning System
RIAA	Report to Inform Appropriate Assessment
rms	Root Mean Square
RNLI	Royal National Lifeboat Institution
ROV	Remotely Operated Vehicle
RYA	Royal Yachting Association

Acronym	Meaning
SAC	Special Area of Conservation
SAR	Search and Rescue
SBP	Sub-bottom Profiler
SCANS	Small Cetaceans in the European Atlantic and North Seas
SCOS	Special Committee on Seals
sCRM	stochastic Collision Risk Modelling
SEA	Strategic Environmental Assessment
SEL	Sound Exposure Level
SFF	Scottish Fishermen's Federation
SMRU	Sea Mammal Research Unit
SNCB	Statutory Nature Conservation Body
SPA	Special Protection Area
SPM	Suspended Particulate Matter
SSC	Suspended Sediment Concentration
SSR	Secondary Surveillance Radar
SSS	Side Scan Sonar
STECF	Scientific, Technical and Economic Committee for Fisheries
SWFPA	Scottish White Fish Producers Association
SWFPO	South West Fish Producers Organisation
TCE	The Crown Estate
TSS	Traffic Separation Scheme
UHRS	Ultra-high Resolution Seismic
UK	United Kingdom
UKCP	UK Climate Projections
UKCS	United Kingdom Continental Shelf
UKFEN	United Kingdom Fisheries Economics Network
UKGA	United Kingdom General Aviation
UKHO	UK Hydrographic Office
UKOOA	United Kingdom Offshore Operators Association
UXO	Unexploded Ordnance
VFR	Visual Flight Rules
VHF	Very High Frequency
VMP	Vessel Management Plan
VMS	Vessel Monitoring Systems
WCSP Ltd	West Coast Sea Products Ltd
WFA	Welsh Fishermen’s Association
WFPO	Western Fish Producers Organisation
WSI	Written Scheme of Investigation
ZOI	Zone of Influence

Units

Unit	Description
%	Percentage
£/GBP	Pound Sterling
°	Degrees
cm	Centimetre
CO_2e	CO_2-Equivalents
CO_2	Carbon Dioxide
dB	Decibels
ft	Feet
GW	Gigawatt
kHz	Kilohertz
km	Kilometres
km^2	Kilometres Squared
kV	Kilovolts
m/s	Metres Per Second (Speed)
mg/l	Milligrams Per Litre (Concentration)
m	Metres
m^2	Metres Squared
MW	Megawatt
nm	Nautical Miles
$kgCO_2e/MWh$	Kilogram CO_2-Equivalents Per Megawatt Hour
tCO_2e	Tonnes of CO_2-Equivalents
SEL_{cum}	Cumulative Sound Exposure Level
SEL_{peak}	Peak Sound Exposure Level

1 Introduction

1.1 Background

1.1.1.1 Part 2, Generation assets, of the EIA Scoping Report, provides an introduction to the generation assets of the Morgan Offshore Wind Project, including an overview of the considerations for site selection and alternatives, and identifies the main aspects of the offshore physical, biological and human environment likely to be significantly affected by the construction, operation and maintenance and decommissioning of the generation assets.

1.2 Morgan Offshore Wind Project generation assets overview

1.2.1.1 The Morgan Array Scoping Boundary (the area within which the offshore wind turbines will be located) is 322.2km^2 in area and is located in the east Irish Sea, 22.3km (12nm) from the Isle of Man and 36.2km (19.5nm) from the northwest coast of England (when measured from Mean High Water Springs (MHWS)). Figure 1.1 presents the Morgan Array Scoping Boundary.

1.2.1.2 A description of the Morgan Offshore Wind Project generation assets is presented in part 1, section 3: Project description, of the EIA Scoping Report. Key components of the Morgan Offshore Wind Project generation assets are likely to include:

- Offshore wind turbines
- Foundations and support structures
- Scour protection and cable protection
- Inter-array cables
- Interconnector cables
- Offshore substation platforms.

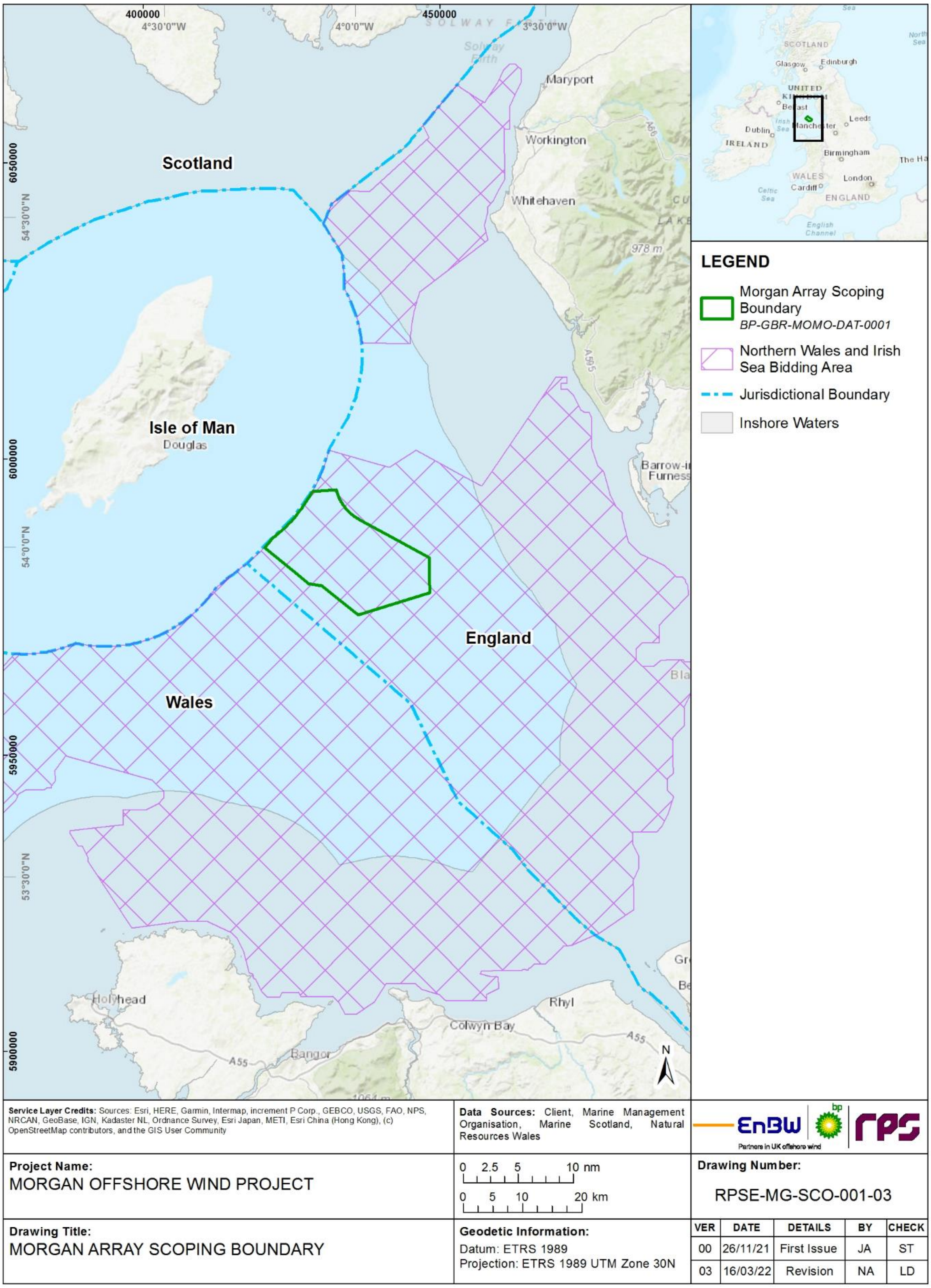


Figure 1.1: The Morgan Array Scoping Boundary.

1.3 Structure

1.3.1.1 The structure of part 2, Generation assets, of the EIA Scoping Report, is set out in Table 1.1. Each topic chapter will consider the impact of the construction, operation and maintenance and decommissioning of the Morgan Offshore Wind Project generation assets. The structure of the Preliminary Environmental Information Report (PEIR) and Environmental Statement (ES) is further described in part 1, section 4: EIA methodology, of the EIA Scoping Report.

Table 1.1: Topics considered within part 2, Generation assets, of the EIA Scoping Report.

Topic	Summary of Content	Section	Author
Part 2: Generation assets			
Section 1: Introduction			
Introduction	Background to the generation assets and what is considered within part 2 of the EIA Scoping Report.	Part 2, section 1	RPS
Section 2: Site selection and alternatives			
Site selection and alternatives	Description of the site selection process relevant to the generation assets, including the approach undertaken by the Applicant to identify the siting of the Morgan Offshore Wind Project generation assets.	Part 2, section 2	RPS and bp/EnBW
Section 3: Offshore physical environment			
Physical processes	Overview of the offshore physical environment (tidal elevations, currents, waves, bathymetry, geology, seabed sediments, suspended sediments and sediment transport) within the Morgan Array Scoping Boundary. Supports assessment of potential impacts to the offshore physical environment from construction, operation and maintenance and decommissioning.	Part 2, section 3.1	RPS
Underwater noise	Overview of approach to the assessment of underwater noise arising from the construction, operation and maintenance and decommissioning of the Morgan Offshore Wind Project generation assets. Required for understanding of potential impact to underwater noise sensitive receptors such as marine mammals and fish.	Part 2, section 3.2	RPS and Seiche
Section 4: Offshore biological environment			
Benthic subtidal and intertidal ecology	Overview of the ecology of the seabed within the Morgan Array Scoping Boundary. Required for understanding of potential impacts to seabed ecology from construction, operation and maintenance and decommissioning.	Part 2, section 4.1	RPS
Fish and shellfish ecology	Overview of the fish and shellfish ecology of the seabed within the Morgan Array Scoping Boundary. Required for understanding of potential impact to fish and shellfish ecology from construction, operation and maintenance and decommissioning.	Part 2, section 4.2	RPS
Marine mammals	Overview of the marine mammals within the vicinity of the Morgan Array Scoping Boundary. Required for understanding of potential impacts to marine mammals from construction, operation and maintenance and decommissioning.	Part 2, section 4.3	RPS
Offshore ornithology	Overview of the ornithology features within the vicinity of the Morgan Array Scoping Boundary. Required for understanding of potential impacts to ornithology from	Part 2, section 4.4	RPS

Topic	Summary of Content	Section	Author
	construction, operation and maintenance and decommissioning.		
Section 5: Offshore human environment			
Commercial fisheries	Overview of commercial fisheries within the vicinity of the Morgan Array Scoping Boundary. Required for understanding of potential impacts to commercial fisheries from construction, operation and maintenance and decommissioning.	Part 2, section 5.1	RPS and Marine Space
Shipping and navigation	Overview of the baseline shipping and navigation within the vicinity of the Morgan Array Scoping Boundary. Required for understanding of potential impacts to shipping and navigation from construction, operation and maintenance and decommissioning.	Part 2, section 5.2	RPS and Nash Maritime
Marine archaeology	Overview of marine archaeology within the vicinity of the Morgan Array Scoping Boundary. Supports understanding of impact to marine archaeology from construction, operation and maintenance and decommissioning.	Part 2, section 5.3	RPS
Other sea users	Overview of other sea users within the vicinity of the Morgan Array Scoping Boundary. Required for understanding of potential impacts to other sea users from construction, operation and maintenance and decommissioning.	Part 2, section 5.4	RPS
Section 6: Offshore and onshore combined topics			
Seascape, landscape and visual resources	Overview of seascape, landscape and visual resources within the Morgan Array Scoping Boundary. Required for understanding of potential impacts to seascape, landscape and visual resources from construction, operation and maintenance and decommissioning.	Part 2, section 6.1	RPS
Socio-economics and community	Overview of socio-economics and community within the vicinity of the Morgan Array Scoping Boundary. Required for understanding of potential impacts to socio-economics and community from construction, operation and maintenance and decommissioning.	Part 2, section 6.2	RPS and Hardisty Jones
Aviation and radar	Overview of aviation and radar receptors within the vicinity of the Morgan Array Scoping Boundary. Required for understanding of potential impacts to aviation and radar from construction, operation and maintenance and decommissioning.	Part 2, section 6.3	RPS and Osprey
Climate change	Overview of climate change receptors for the Morgan Offshore Wind Project generation assets.	Part 2, section 6.4	RPS
Noise and vibration	Overview of potential impacts of noise and vibration arising from the Morgan Offshore Wind Project generation assets.	Part 2, section 6.5	RPS
Section 7: Other Environmental Topics			
Topics with supporting information	Overview of topics of relevance to the Morgan Offshore Wind Project generation assets where a technical appendix only will be provided to support the relevant technical chapters of the ES.	Part 2, section 7.2	RPS
Topics proposed to be scoped out	Justification for scoping out relevant topics for the Morgan Offshore Wind Project generation assets.	Part 2, section 7.3	RPS
Topics covered elsewhere in the ES	Overview of topics of relevance to the Morgan Offshore Wind Project generation assets that will be covered in other technical chapters of the ES and are not proposed to be subject to standalone chapters or appendices within the ES.	Part 2, section 7.4	RPS
Section 8: Summary			
Summary	Presents an overview of the EIA Scoping Report and a summary of the topics which are proposed to be scoped into and out of the EIA relevant to the generation assets.	Part 2, section 8	RPS

2 Site selection and alternatives

2.1 Introduction

2.1.1.1 This section provides a summary of the considerations for site selection and alternatives for the generation assets of the Morgan Offshore Wind Project. It includes an outline of the stages of site selection that have been carried out in order to establish the Morgan Array Scoping Boundary.

2.1.1.2 The Preliminary Environmental Information Report (PEIR) and Environmental Statement (ES) will provide further detail on the site selection process that has been undertaken to establish the Morgan Array Scoping Boundary. The ES will also set out any refinements to the Morgan Offshore Wind Project generation assets that may have taken place as a result of the Environmental Impact Assessment (EIA) process and in response to consultation and stakeholder feedback, and will describe the main alternatives considered as part of this process.

2.2 Offshore Wind Leasing Round 4

2.2.1.1 Four Bidding Areas were identified by The Crown Estate (TCE) through the Offshore Wind Leasing Round 4 process. This process involved undertaking a regional characterisation exercise using data, analysis and stakeholder engagement to identify areas of the seabed that were the least constrained for offshore wind development.

2.2.1.2 Through engagement with stakeholders, TCE received over 500 written responses from over 20 organisations (The Crown Estate, 2019). TCE undertook further analysis to refine the areas and to establish a detailed evidence base. The seabed regions were further refined to remove areas where constraints were deemed to be high. These constraints included:

- Ministry of Defence (MOD) ranges and exercise areas.
- Potential visual sensitivity within 13km of shore.
- Overlap with Traffic Separation Schemes and shipping routes with traffic exceeding 1,000 ships per year.
- Potential for cumulative environmental impacts, particularly ornithology.

2.2.1.3 TCE are preparing a Plan-Level Habitats Regulations Assessment (HRA) which assesses the potential impact of the preferred bidding areas that were selected through the Round 4 process on the UK's network of designated sites and protected habitats and species. The Plan-Level HRA is due to be finalised in Spring/Summer 2022.

2.2.1.4 The Department for Business, Energy and Industrial Strategy (BEIS) are undertaking an offshore energy Strategic Environmental Assessment (SEA) (OESEA4), including leasing and licensing for offshore renewables (including wind, wave and tidal energy), offshore oil and gas exploration and production, offshore hydrocarbon and carbon dioxide gas storage, and offshore hydrogen production. OESEA4 is due to be published in 2022 and at the time of writing is subject to public consultation.

2.3 Northern Wales and Irish Sea Bidding Area

2.3.1.1 The Northern Wales and Irish Sea Bidding Area was one of four Bidding Areas identified by TCE through the Offshore Wind Leasing Round 4 process.

2.3.1.2 The Northern Wales and Irish Sea Bidding Area covers an area of approximately 8,500km^2 and has water depths up to 50m, with an average water depth of 34m.

2.3.1.3 A Bidding Area Report was prepared by TCE that identified the environmental designations within the Northern Wales and Irish Sea Bidding Area and the key species present (e.g. birds and fish). The report also identified a number of other constraints from activities such as fishing, oil and gas, NATS radar, defence and navigation.

2.4 Identification of the Preferred Bidding Areas

2.4.1.1 The Applicant identified two Preferred Bidding Areas (Morgan and Mona) within the Northern Wales and Irish Sea Bidding Area. In February 2021, TCE awarded the Applicant the right to develop up to 1.5GW of wind capacity within each of the two Preferred Bidding Areas.

2.4.1.2 The Morgan and Mona Preferred Bidding Areas were identified by the Applicant using an iterative process which involved consideration of the following constraints:

- MOD activity including radar, ranges, danger and exercise areas
- NATS radar
- Commercial fisheries
- Environmental designations including maintaining 10km offset from the Liverpool Bay Special Protection Area (SPA)
- Fish spawning and nursery areas
- Oil and gas infrastructure and licences including consideration of decommissioning timeframes and safety zones
- Shipping density
- Avoidance of Traffic Separation Schemes
- Other marine infrastructure including offshore wind, marine aggregates and dredging
- Geological conditions
- Landscape and visual designations
- Metocean considerations.

2.4.1.3 The consenting risks as provided by TCE in the Characterisation Area Report for the Northern Wales and Irish Sea Bidding Area were assessed by the Applicant against the Preferred Bidding Areas and compliance with the constraints was an important factor in identifying the suitability of the Preferred Bidding Area.

2.5 The Morgan Array Scoping Boundary

2.5.1.1 The Preferred Bidding Area for the Morgan Offshore Wind Project generation assets has been taken forward to the EIA Scoping stage and is referred to as the Morgan Array Scoping Boundary throughout this EIA Scoping Report.

2.5.1.2 The PEIR and ES will outline the process that has been followed to identify potential indicative turbine layouts within the Morgan Array Scoping Boundary, the main alternatives that were considered and the rationale for the selection of the indicative layouts taking into account any modifications identified during consultation. The final layout of the wind turbines will be confirmed at the final design stage (post-consent).

3 Offshore physical environment

3.1 Physical processes

3.1.1 Introduction

3.1.1.1 This section of the Environmental Impact Assessment (EIA) Scoping Report identifies the elements of physical processes of relevance to the Morgan Offshore Wind Project generation assets and considers the potential impacts arising from the construction, operation and maintenance, and decommissioning of the generation assets.

3.1.1.2 For the purposes of this EIA Scoping Report and subsequent Preliminary Environmental Information Report (PEIR) and Environmental Statement (ES), physical processes are defined as encompassing the following elements:

- bathymetry
- waves
- tidal elevations and currents
- geology
- seabed substrate
- suspended sediments and
- sediment transport.

3.1.1.3 The parameters listed above are collectively referred to as 'physical processes' throughout the remainder of this EIA Scoping Report.

3.1.2 Study area

3.1.2.1 The Morgan physical processes study area for the generation assets is defined as the area encompassing the Morgan Array Scoping Boundary plus a buffer of one tidal excursion (Figure 3.1). This is the predicted Zone of Influence (ZOI) of the Morgan Offshore Wind Project generation assets as the maximum distance suspended sediment would travel from the Morgan Array Scoping Boundary in one tidal cycle prior to deposition on slack water (ABPmer, 2018).

3.1.2.2 The Morgan physical processes study area for the generation assets forms the focus for the assessment, however the numerical modelling will provide predictions of effects over a wider area than the Morgan physical processes study area for the generation assets for waves, tidal elevation and currents, suspended sediments and sediment transport, over multiple tidal cycles. The assessment will therefore also identify any potential impacts that may occur beyond the Morgan physical processes study area for the generation assets.

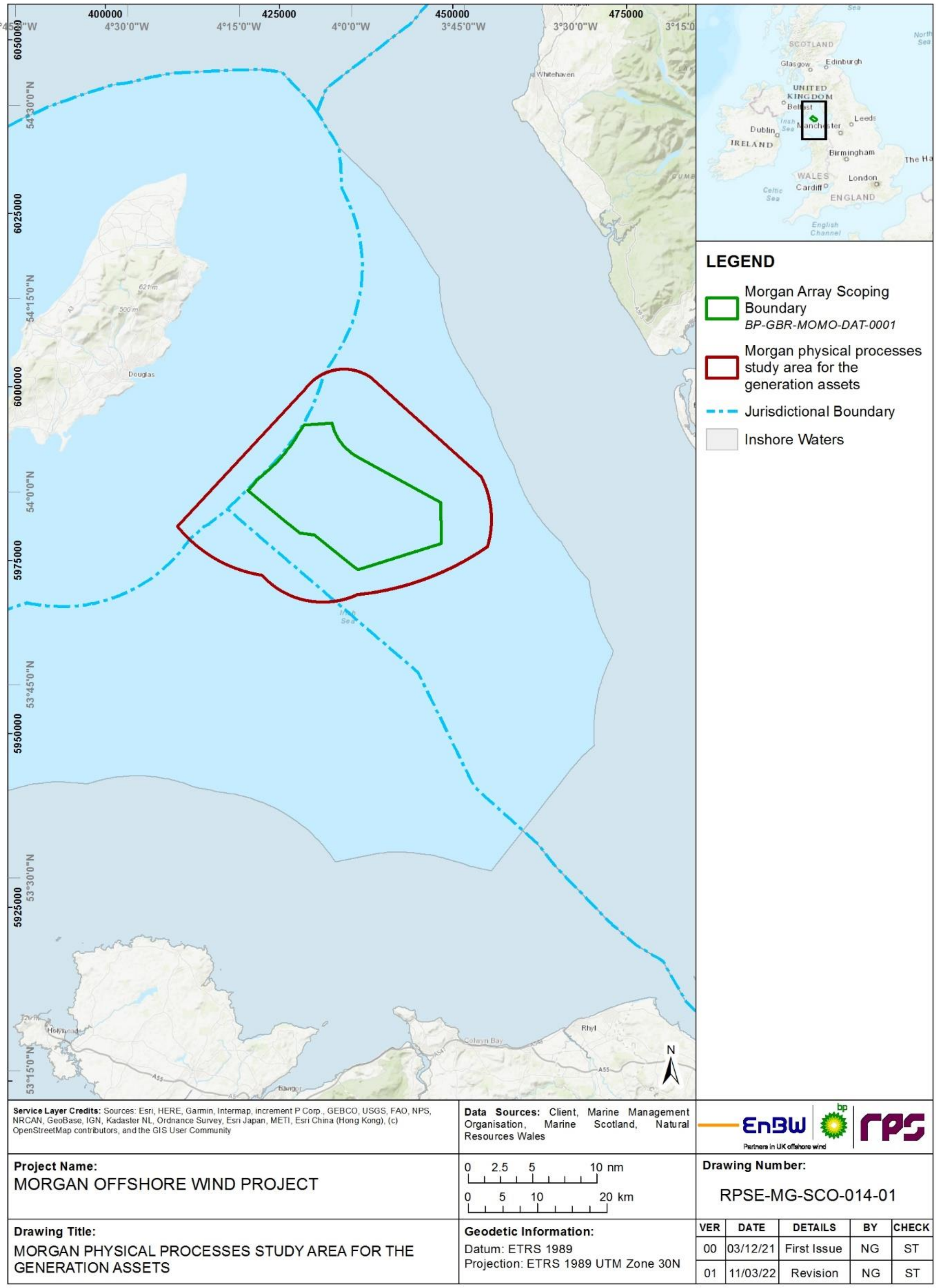


Figure 3.1: The Morgan physical processes study area for the generation assets.

3.1.3 Data sources

Desktop data

3.1.3.1 An initial desk based review of literature and data sources to support this EIA Scoping Report has identified a number of sources which provide coverage of the Morgan physical processes study area for the generation assets and provide information for the numerical model study. These are summarised in Table 3.1.

Table 3.1: Summary of key desktop datasets and reports.

Title	Source	Year	Author
European Marine Observation and Data Network (EMODnet)	EMODnet	2020	EMODnet
ABPmer Data exporer	ABPmer	2018	ABPmer
Hydrography of the Irish Sea, SEA6 Technical Report,	UK Government	2005	Howarth M.J.
Atlas of UK Marine Renewable Energy Resources	ABPmer	2008	ABPmer
Geology of the seabed and shallow subsurface: The Irish Sea.	British Geological Survey (BGS)	2015	Mellett *et al*.
Suspended Sediment Climatologies around the UK.	Department for Business, Energy and Industrial Strategy (BEIS)	2016	Cefas
Metocean data collection for the Ormonde offshore wind project	Marine Data Exchange	2011	Geotechnical Engineering and Marine Surveys (GEMS)
Irish Sea Zone Hydrodynamic measurment campaign	Marine Data Exchange	2010-2013	EMU Ltd (now Fugro Ltd)
Admiralty Tide Tables	UK Hydrographics Office (UKHO)	2021	UKHO
Marine Enviornmental Data and Information Network (MEDIN) Seabed Mapping Programme	Admiralty Marine Data Portal	2021	MEDIN
Integrated Mapping for the Sustainable Development of Ireland's Marine Resource (INFOMAR) Seabed Mapping Programme	Geological Survey Ireland (GSI) and Marine Institute	2021	INFOMAR
Long term wind and wave datasets	Eurpoean Centre for Medium-range Weather Forecasting (ECMWF)	2021	ECMWF
UK tide gauge network and database of current observation	British Oceanographic Data Centre (BODC)	2021	BODC
UK Climate Projections (UKCP)	Met Office	2018	Met Office
A user-friendly database of coastal flooding in the United Kingdom from 1915–2014	Scientific Data scientific journal	2015	Haigh *et al*.
Biritish Oceanographic Data Centre	National Oceanography Centre	various	National Oceanography Centre
Review of aggregate dredging off the Welsh coast	HR Wallingford	2016	HR Wallingford

Site specific survey data

3.1.3.2 A recent geophysical survey campaign was completed across the Morgan Array Scoping Boundary in summer 2021. This survey provides both geophysical and bathymetric data which will support the development of the Physical processes ES chapter for the Morgan Offshore Wind Project generation assets. The aims of the data collection, and a summary of the data collected during these surveys includes:

- Bathymetric data to determine site topography, gradients and a baseline to inform foundation design and cable installation using multibeam echo sounder (MBES).
- High-resolution side scan sonar (SSS) data to determine seabed features and the presence of boulders, seabed sediments and debris.
- High-resolution sub-bottom profiler (SBP) data to determine the shallow sub-surface soil conditions that may influence foundation design and cable installation such as boulders and shallow geology features.
- Multichannel 2D ultra-high resolution seismic (UHRS) data to windfarm infrastructure foundation depth to determine the deeper sub-surface soil conditions.
- Metocean buoy deployment to gather data relating to the metocean parameters within the Morgan Array Scoping Boundary.
- A subtidal benthic ecology survey across the Morgan Array Scoping Boundary providing an overview of the seabed sediment composition to support the characterisation of the subtidal environment.

3.1.3.3 An infill benthic subtidal ecology survey and geophysical survey are planned for spring/summer 2022 and will collect data on the seabed within one tidal excursion around the Morgan Array Scoping Boundary (the predicted ZOI of the Morgan Offshore Wind Project generation assets; Figure 3.1). The 2022 survey will also re-sample a number of sample stations within the Morgan Array Scoping Boundary that were taken during the 2021 benthic survey. The scope of the 2022 survey campaign has been discussed and agreed with consultees through the Evidence Plan process.

3.1.4 Baseline environment

Bathymetry

3.1.4.1 The bathymetry of the Morgan physical processes study area for the generation assets is relatively consistent with no large banks or large changes in water depth. A broad 50m channel, with orientation southwest to northeast, runs across the Morgan physical processes study area for the generation assets. Depths within the Morgan physical processes study area for the generation assets vary between 26m and 50m relative to Lowest Astronomical Tide (LAT). Shallower water depths are generally present to the east of the Morgan physical processes study area for the generation assets which is closer to the coast. Deeper water depths are present in the southwest, in the centre of the Irish Sea (Figure 3.2) (EMODnet, 2020).

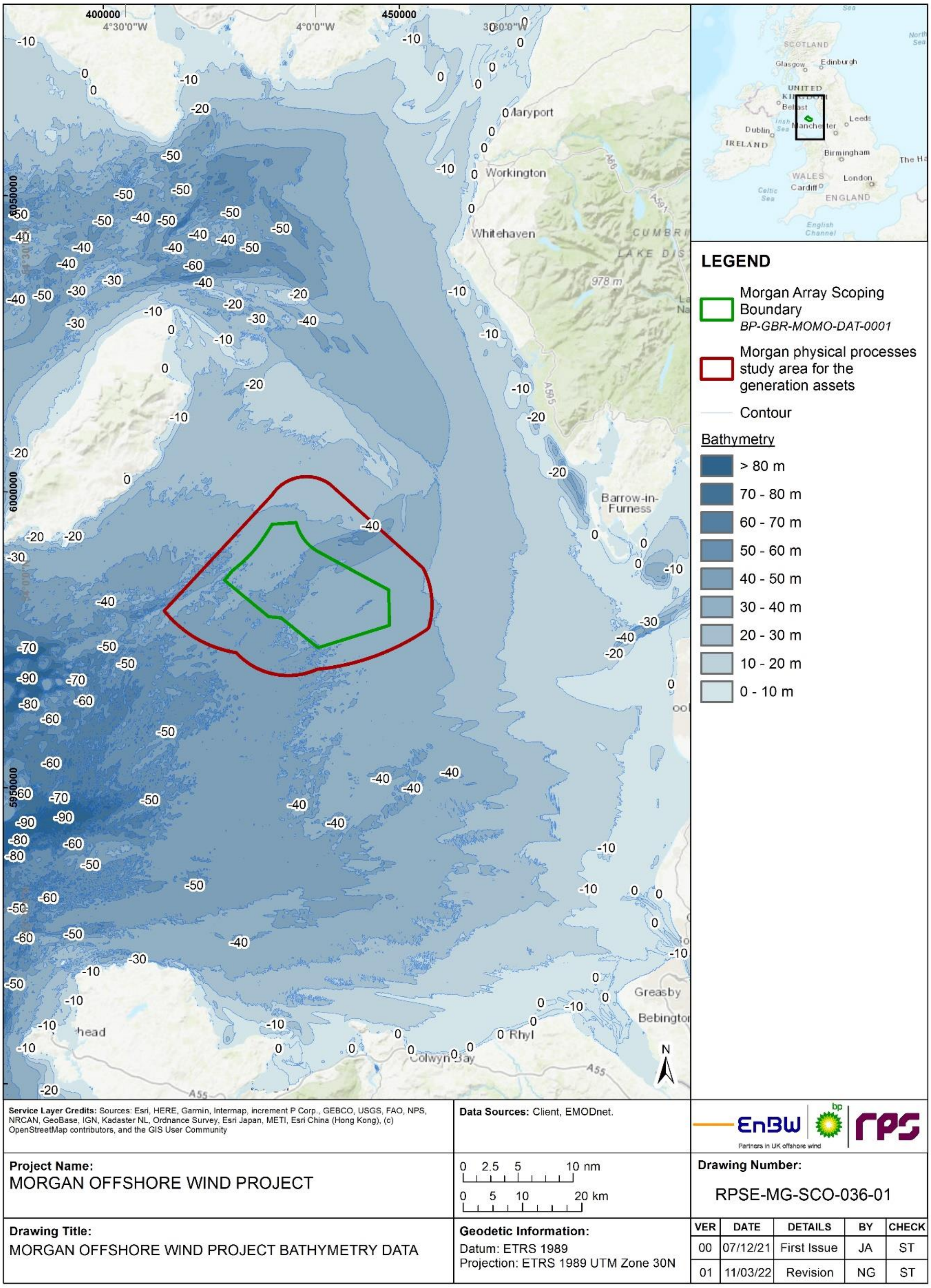


Figure 3.2: The Morgan physical processes study area for the generation assets with bathymetry data (EMODnet, 2020).

Waves

3.1.4.2 Waves in the Irish Sea are highest to the southwest of the Isle of Man with the highest mean annual significant wave height of 1.39m recorded between the Isle of Man and Anglesey. Significant wave height is reduced closer to the coast with the lowest significant wave height of 0.73m recorded to the west of the Dee Estuary (ABPmer, 2008)

3.1.4.3 Mean annual wave height in the Morgan physical processes study area for the generation assets is 1.3m. Over 40% of the waves arise from the southwest with all significant wave heights (>4m) arriving from the southwest or west. (ABPmer, 2018).

3.1.4.4 Metocean buoys were deployed within the Ormonde offshore wind project in 2010, to the east of the Morgan physical processes study area for the generation assets. Waves were recorded with a dominant direction from the southwest with the majority of the waves originating from the open sea. Significant wave heights ranged from 0.06m to 5.95m, with a maximum wave height of 14.22m recorded in November 2010 (GEMS, 2011).

3.1.4.5 Metocean buoys were deployed in 2010 to monitor the hydrodynamic conditions within the proposed Round 3 Irish Sea Offshore Wind Farm Development Zone. The campaign recorded significant wave heights of over 6m in October, November and December with the maximum wave height recorded at 9.8m. The most commonly occurring wave direction was from the southwest (EMU, 2013).

3.1.4.6 Within the Physical processes ES chapter, a detailed baseline will be presented which will provide an overview of the wave regime within the region and specific to the Morgan Offshore Wind Project generation assets, utilising data collected from the deployed metocean buoys.

Tidal currents and elevation

3.1.4.7 An understanding of the tidal currents provides an insight into the patterns and rates of naturally occurring sediment transport. Currents are primarily driven by tides with a residual component generally dominated by storm driven currents (Ramsay and Brampton, 2000).

3.1.4.8 The semi-diurnal tides are the dominant physical process in the Irish Sea moving into the Irish Sea from the Atlantic Ocean through both the North Channel and St. George’s Channel. The tidal range in the Irish Sea is highly variable with the range in Liverpool Bay exceeding 10m on the largest spring tides, the second largest in the Britain. Mean tidal elevation over the Irish Sea is highest around the English Coast with average tidal elevations of 3m (m^2 tidal elevation amplitude in metres). Tidal elevation decreases out to the Isle of Man with average tidal elevations of 2m and 2.5m over the Morgan physical processes study area for the generation assets (Howarth, 2005).

3.1.4.9 Tidal currents in the Irish Sea are strongest around the North of Anglesey with a mean spring peak flow of 2.8m/s. Tidal currents in the Irish Sea are also strong between the Isle of Man and Scotland with a mean spring peak flow of 2m/s. Tidal currents within the Morgan physical processes study area for the generation assets are lower with a mean spring peak flow of between 1.05m/s and 0.72m/s. Tidal currents vary, with the fastest currents in the west and the slowest currents in the east of the Morgan physical processes study area for the generation assets (ABPmer, 2008).

3.1.4.10 The Ormonde offshore wind project metocean buoys deployed near the coast, to the east of the Morgan physical processes study area for the generation assets, recorded a maximum current speed of 0.85m/s in March 2011 with an average speed across the survey of 0.30m/s. The major current axis flowed in an east/northwest direction (GEMS, 2011).

3.1.4.11 Metocean buoys were deployed in 2010 to monitor the hydrodynamic conditions within the proposed Round 3 Irish Sea Offshore Wind Farm Development Zone. The highest tidal range observed was 8.71m. The minimum tidal range observed was 6.40m. The tidal current direction varied across the zone, with the greatest differences occurring from the southwest of the zone with an observed depth averaged flood and ebb bearing of 56°/236°, to the southeast corner of the zone with a depth averaged flood bearing of 102°/282°. The maximum current speed recorded was 1.7m/s (EMU, 2013).

Geology

3.1.4.12 Information on the geology of the Morgan physical processes study area for the generation assets allows for an understanding of the origin and stability of the seabed, and the geology which will be encountered during the installation of the Morgan Offshore Wind Project generation assets.

3.1.4.13 The predominant bedrock lithologies in the region are Triassic and Carboniferous sandstone and mudstone (Mellett *et al.,* 2015). The bedrock is covered by sediments of Quaternary age (<2.6 million years old) over much of the Irish Sea area, with only small areas of exposed bedrock. Quaternary sediment thickness exceeds 50m in the eastern and western Irish Sea. Quaternary sediment thickness is generally <20m in the central Irish Sea although relict glacial valleys can cause it to increase to >100 m over a short distance (Mellett *et al.,* 2015). The uppermost surface of the bedrock underlying the Quaternary sediments has potentially been weathered during the last glacial period and may be weaker than the underlying rock (Mellett *et al.,* 2015).

Seabed substrate

3.1.4.14 Bedforms show a high degree of variability in the Irish Sea and can range from very small ripples (5cm high) to very large sediment waves (>10m high). The largest are found to the west of the Isle of Man and Anglesey, however, there are several bedform banks in the central Irish Sea, forming a boundary between the east Irish mud belt and the central gravel belt (Mellett *et al.,* 2015).

3.1.4.15 Seabed sediments are subdivided into regions of soft mud- (clay and silt) rich sediment in the eastern and western Irish Sea and a central gravel belt comprising coarse sand and gravel. Small areas of bedrock outcrop at the seabed have also been recorded. The Morgan Array Scoping Boundary sits within the central Irish Sea gravel belt (Mellett *et al.,* 2015).

3.1.4.16 Seabed sediments within the Morgan physical processes study area for the generation assets are dominated by circalittoral coarse sediment and circalittoral sand sediment with areas of circalittoral mixed sediment and circalittoral mud (EMODnet, 2019). Further detail on the seabed substrate is presented in section 4.1.

Sediment transport and suspended sediment

3.1.4.17 The Cefas Climatology Report 2016 (Cefas, 2016) provides the spatial distribution of average non-algal Suspended Particulate Matter (SPM) for the majority of the UK continental shelf (UKCS). Between 1998 and 2005, the greatest plumes are associated with large rivers such as the Thames Estuary, The Wash and Liverpool Bay, which show mean values of SPM above 30mg/l. Based on the data provided within this study, the SPM within the Morgan physical processes study area for the generation assets has been estimated as approximately 2mg/l to 10mg/l over the 1998 to 2005 period. Higher levels of SPM are experienced more commonly in the winter months; however, due to the tidal influence, even during summer months the levels remain elevated.

3.1.4.18 The principal mechanisms governing suspended sediment concentrations (SSC) in the water column are tidal currents, with fluctuations observed across the spring-neap cycle and across the different tidal stages (high water, peak ebb, low water, peak flood) observed throughout both datasets. It is key to note that SSCs can also be temporarily elevated by wave driven currents during storm events. During high-energy storm events, levels of SSC can rise significantly, both near bed and extending into the water column. Following storm events, SSC levels will gradually decrease to baseline conditions, regulated by the ambient regional tidal regimes. The seasonal nature and frequency of storm events supports a broadly seasonal pattern for SSC levels.

3.1.4.19 Sediments in the Irish Sea have been reported, on average, to experience mobilisation 35% of the time during a year (Coughlan *et al*., 2021). Sediments in the east Irish Sea have been reported to experience 5-95% sediment mobility with the highest mobility around Morecambe Bay, Solway Firth and around the north coast of Anglesey (Coughlan *et al*., 2021). The 2012 report commissioned by Celtic Array as part of the Zonal Appraisal and Planning process reported that in the east Irish Sea, sediment suspension and transport are mainly driven by tidal currents. Sediment transport was reported to be of a net northeasterly and easterly transport pathway into Liverpool Bay (Celtic Array Ltd., 2014).

3.1.4.20 Metocean buoys were deployed in 2010 to monitor the hydrodynamic conditions within the proposed Round 3 Irish Sea Offshore Wind Farm Development Zone. Mean SSC near the seabed ranged from 4.3mg/l to 23.6mg/l. Maximum SSCs were recorded at 48mg/l (EMU, 2013). Mean SSC in the water column ranged from 1.6mg/l to 55.8mg/l (EMU, 2013).

Designated sites

3.1.4.21 The identification of sites designated for their conservation value for inclusion in the Physical processes ES chapter was carried out as follows:

- Sites with relevant qualifying features which overlap with the Morgan Array Scoping Boundary were screened in for further assessment.

- Sites with relevant qualifying features, which are located within the likely Zone of Influence (ZOI) of effects associated with the Morgan Array Scoping Boundary were screened in for further assessment. The likely ZOI is encapsulated by the Morgan physical processes study area for the generation assets and has been determined through a review of the potential impacts associated with the Morgan Offshore Wind Project generation assets. This ensures that all designated sites and their features potentially affected by changes in water quality (e.g. increased suspended sediment concentrations) and potential changes to the hydrodynamic regime are included in the physical processes assessment.

3.1.4.22 West of Copland Marine Conservation Zone (MCZ) overlaps with the Morgan physical processes study area for the generation assets (Figure 3.3). West of Walney MCZ does not overlap with the Morgan physical processes study area for the generation assets however it has been included due to its proximity. The designated sites which have therefore been screened in for consideration in the Physical processes ES chapter comprise of national designated sites (i.e. MCZs; Table 3.2).

3.1.4.23 Information to support a full screening of European sites with qualifying physical processes interest features will be provided in the Habitats Regulation Assessment (HRA) Screening Report. Relevant features screened in will be fully considered and assessed in the Physical processes ES chapter, with the information to support the assessment on European sites and features provided in the Report to Inform Appropriate Assessment (RIAA). A preliminary screening of relevant MCZs has been included in part 3, Annex B: MCZ Screening, of the EIA Scoping Report.

Table 3.2: Summary of designated sites with relevant physical processes features within the Morgan physical processes study area for the generation assets.

Designated Site	Distance to the Morgan Array Scoping Boundary (km)	Features
West of Copland MCZ	7.3	• Subtidal coarse sediment • Subtidal sand • Subtidal mixed sediments
West of Walney MCZ	7.6	• Subtidal sand • Subtidal mud • Sea pens and burrowing megafuana communities

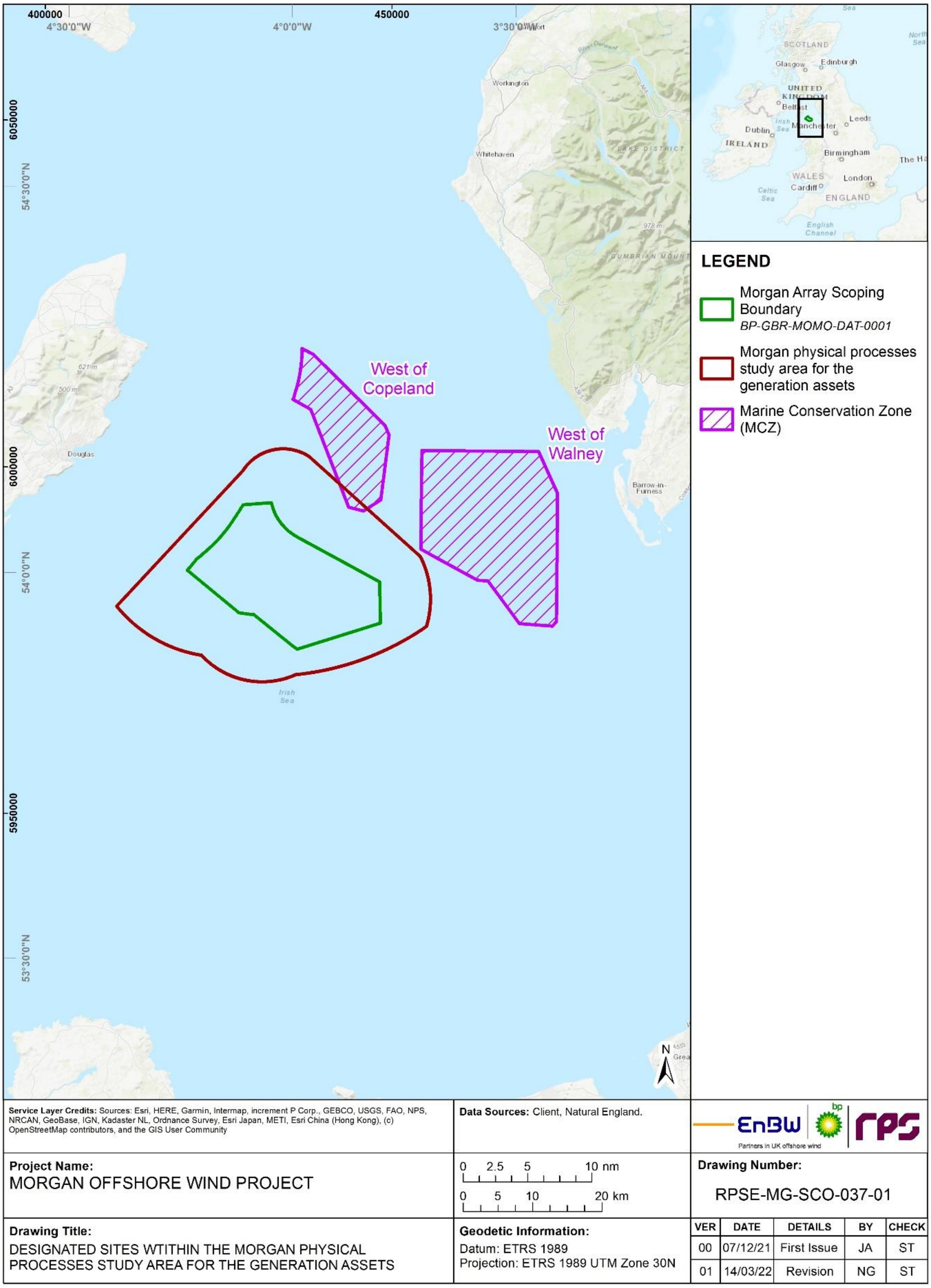


Figure 3.3: Sites designated for their nature conservation value (with features of relevance to physical processes) which overlap with the Morgan physical processes study area for the generation assets.

3.1.5 Potential project impacts

3.1.5.1 A range of potential impacts on physical processes have been identified which may occur during the construction, operation and maintenance, and decommissioning phases of the Morgan Offshore Wind Project generation assets.

3.1.5.2 The impacts that have been scoped into the assessment are outlined in Table 3.3 together with a description of any additional data collection (e.g. site-specific surveys) and supporting analyses (e.g. modelling) that will be required to enable a full assessment of the impacts.

3.1.5.3 Potential impacts scoped out of the assessment are presented in Table 3.4, with justification.

Table 3.3: Impacts proposed to be scoped into the project assessment for physical processes (project phase refers to construction (C), operation and maintenance (O) and decommissioning (D)).

Impact	Project phase			Justification	Data collection and analysis required to characterise the baseline environment	Summary of proposed approach to assessment
	C	O	D			
Impacts to the wave regime due to presence of infrastructure and the associated potential impacts along adjacent shorelines.	✓	✓	✓	The interaction of the wind turbine and offshore substation foundations and associated infrastructure with the wave regime has the potential to impact upon adjacent physical coastal features and sediment transport.	Data collected during the 2021 site-specific survey and data that will be collected during the 2022 site-specific infill geophysical survey campaigns will support the development of the physical processes numerical modelling. Data collected from the metocean Lidar surveys will also be utilised. A detailed desktop data review will be undertaken to gather other relevant data which will support the assessment. An overview of this is presented in section 3.1.3.	The potential impact of the Morgan Offshore Wind Project generation assets on coastal features and sediment transport will be informed by the physical processes numerical modelling detailed in section 3.1.7. A qualitative assessment of impact on key coastal features will be presented within the Physical processes ES chapter.
Increase in suspended sediments due to construction, operation and maintenance and/or decommissioning related activities, and the potential impact to physical features.	✓	✓	✓	There is potential for increased SSCs and deposition associated with seabed preparation activities, foundation installation and cable installation activities, maintenance activities such as cable repairs, and decommissioning activities.		Numerical modelling (see details in section 3.1.7) will be undertaken to provide an overview of the potential impacts to physical processes relating to the various activities of the Morgan Offshore Wind Project generation assets. This assessment will consider the potential impacts arising due to changes in SSC and deposition on physical processes and sediment transport. Elevations in SSC and subsequent deposition of disturbed sediments also have the potential to result in adverse and indirect impacts on receptors for other offshore topics which lie in other Offshore topics, such as benthic subtidal and intertidal ecology, fish and shellfish ecology, marine mammals, marine archaeology and infrastructure and other users. For these receptor groups significance of effect for direct and indirect impacts will not be assigned within the physical processes assessment. The designed in measures discussed within section 3.1.6 will reduce the potential impact arising from this impact pathway.
Impacts to the tidal regime due to presence of infrastructure and the associated potential impacts along adjacent shorelines.	✓	✓	✓	The interaction of the wind turbine and offshore substation platform foundations and associated infrastructure with the tidal regime has the potential to impact upon adjacent physical coastal features and sediment transport.		The potential impact of the Morgan Offshore Wind Project generation assets on coastal features and sediment transport will be informed by the physical processes numerical modelling detailed in section 3.1.7.

Impact	Project phase			Justification	Data collection and analysis required to characterise the baseline environment	Summary of proposed approach to assessment
	C	O	D			
						A qualitative assessment of impact on key coastal features will be presented within the Physical processes ES chapter.
Impacts to sediment transport and sediment transport pathways due to presence of infrastructure and associated potential impacts to physical features and bathymetry.	✓	✓	✓	Foundations and associated scour protection within the Morgan Array Scoping Boundary may interrupt sediment transport pathways. In addition, cable protection may pose an obstacle to sediment transport pathways.		The potential impact of the Morgan Offshore Wind Project generation assets on sediment transport and sediment transport pathways will be informed by the physical processes numerical modelling outlined in section 3.1.7. This assessment will be presented within the Physical processes ES chapter.

Table 3.4: Impacts proposed to be scoped out of the project assessment for physical processes.

Impact	Justification
Changes to bathymetry due to depressions left by jack-up vessels.	The potential for jack-up vessel spud-cans to affect the sediment regime has been scoped out of the assessment. Jack-up footprint depressions would likely only persist temporarily after jack-up operations have been completed and these would infill over time. Monitoring at the Barrow offshore wind farm showed depressions were almost entirely infilled 12 months after construction (BOWind, 2008). It is not anticipated that jack-up vessel footprints will have implications for the sediment regime.
Scour of seabed sediments during the operation and maintenance phase.	Interaction between the waves and current and the Morgan Offshore Wind Project generation assets infrastructure has the potential to cause localised scouring of seabed sediment. Scour protection will be a measure adopted as part of the project to prevent scour from occurring. The scour protection measures will be subject to engineering design to ensure they are fit for purpose and prevent scour from occurring. The seabed habitat disturbed/lost due to scour protection will be considered in the Benthic subtidal and intertidal ecology chapter of the ES. Therefore, it is proposed that scour of seabed sediments is scoped out of the Physical processes ES chapter.

3.1.6 Measures adopted as part of the project

3.1.6.1 The following measures adopted as part of the project are relevant to physical processes. These measures may evolve as the engineering design and the EIA progress:

- Scour protection will be used around offshore structures as set out in part 1, section 3: Project description, of the EIA Scoping Report. Note that scour protection and potential impact on benthic communities will be assessed in the Benthic subtidal and intertidal ecology ES chapter.
- Development and adherence to a Cable Specification and Installation Plan which will include cable burial where possible and cable protection as necessary.

3.1.6.2 The requirement for and feasibility of any further mitigation will be dependent on the significance of effects and will be consulted upon with statutory consultees throughout the EIA process.

3.1.7 Proposed assessment methodology

3.1.7.1 The Physical processes ES chapter will follow the methodology set out in part 1, section 4: EIA methodology, of the EIA Scoping Report. Specific to the Physical processes ES chapter, the following guidance documents will also be considered:

- Advice to Inform Development of Guidance on Marine, Coastal and Estuarine Physical Processes Numerical Modelling Assessments (Pye *et al*., 2017).
- Guidance on Best Practice for Marine and Coastal Physical Processes Baseline Survey and Monitoring Requirements to inform EIA of Major Development Projects (Brooks *et al*., 2018).
- Collaborative Offshore Wind Energy Research into the Environment (COWRIE) - Coastal Process Modelling for Offshore Wind farm Environmental Impact Assessment: Best Practice Guide (Lambkin *et al.,* 2009).
- Guidelines in the use of metocean data through the lifecycle of a marine renewables development (ABPmer *et al*., 2008).

3.1.7.2 To support the development of the Physical processes ES chapter, a numerical modelling study is planned. This study will be undertaken using the MIKE software developed by DHI (www.dhigroup.com), which contains a suite of coastal and environmental modelling modules of global standard. The key to the MIKE suite of computational models is that each module may be applied to a single model and then the modelling of combined (coupled) parameters may be undertaken.

3.1.7.3 The MIKE 21 Flexible Mesh coupled modules would be used to model baseline wave climate, tidal flows and sediment transport, using a model which, whilst providing sufficient detail to simulate the necessary parameters, is also computationally efficient by utilising a flexible mesh comprised of the most up to date bathymetric data. The computational model applied in the baseline study will be amended to include the impact of the wind turbine and offshore substation platform structures with associated scour and cable protection to quantify the change in tidal flow, sediment transport and wave climate. Similarly, sediment will be released into the water column to replicate the construction phase works during the seabed clearance, foundation installation and installation of the inter-array and interconnector cabling and the sediment dispersion and fate will be gauged. Modelling will be validated using all available data sources.

3.1.7.4 The computational modelling will quantify the potential impacts of the installation (including seabed preparation activities) and ongoing operational effects on the tide, wave and sediment transport processes. It will also provide the transport and fate of any material released into the water column as part of the installation works.

3.1.7.5 The results of this numerical modelling will be used to support the impact assessments within the below topics:

- benthic subtidal and intertidal ecology (section 4.1)
- fish and shellfish ecology (section 4.2)
- marine mammals (section 4.3)
- marine archaeology (section 5.3)
- other sea users (section 5.4).

3.1.7.6 The results of the numerical modelling will also support the HRA Screening Report and RIAA.

3.1.8 Potential cumulative effects

3.1.8.1 The predicted effects of construction, operation and maintenance, and decommissioning of the Morgan Offshore Wind Project generation assets on physical processes predominately occur within the footprint of the Morgan Array Scoping Boundary. However, there is potential for cumulative effects to occur on physical processes from other projects or activities within and outside the Morgan physical processes study area for the generation assets, where projects or plans could act cumulatively with the Morgan Offshore Wind Project generation assets to affect physical processes.

3.1.8.2 The cumulative effects assessment will follow the approach outlined in section part 1, section 4: EIA methodology, of the EIA Scoping Report.

3.1.9 Potential inter-related effects

3.1.9.1 The assessment of potential inter-related effects will be considered within the Physical processes ES chapter. It will include consideration of project lifetime effects and receptor-led effects, in line with the approach outlined in part 1, section 4: EIA methodology, of the EIA Scoping Report.

3.1.10 Potential transboundary impacts

3.1.10.1 A screening of transboundary impacts has been carried out and is presented in part 3, Annex A: Transboundary Impacts Screening, of the EIA Scoping Report. This screening exercise identified that there is no potential for transboundary impacts upon physical processes due to construction, operation and maintenance, and decommissioning impacts of the Morgan Offshore Wind Project generation assets.

3.2 Underwater noise

3.2.1 Introduction

3.2.1.1 This section of the Environmental Impact Assessment (EIA) Scoping Report identifies the elements of underwater noise of relevance to the Morgan Offshore Wind Project generation assets and considers the potential impacts arising from the pre-construction, construction, operation and maintenance, and decommissioning of the generation assets.

3.2.1.2 Underwater noise and vibration sources during construction may include piling, vibro-piling or drilling for the wind turbine and offshore substation platform foundations and will include the use of barges and vessels, heavy machinery and generators on the vessels. Underwater noise during operation could include noise transmitted into the water from aerodynamic noise from wind turbine blades passing through the air via the air to water interface, and structure borne mechanical noise from the gearbox and generators of the wind turbines.

3.2.1.3 An underwater noise study will be undertaken to provide an assessment of the level of underwater noise generated from the Morgan Offshore Wind Project generation assets and will be provided as a technical appendix to support the relevant offshore chapters of the Environmental Statement (ES) including the following receptor groups:

- fish and shellfish ecology (section 4.2)
- marine mammals (section 4.3)
- commercial fisheries (section 5.1).

3.2.2 Study area

3.2.2.1 No separate study area has been outlined for underwater noise as this is defined by the receptors and discussed within the relevant topics listed in section 3.2.1.

3.2.3 Data sources

Desktop data

3.2.3.1 An initial desk-based review of literature and data sources has been undertaken to support this EIA Scoping Report. This is summarised in Table 3.5.

3.2.3.2 Seabed bathymetry data will be sourced from the online General Bathymetric chart of the Oceans (GEBCO) database. GEBCO's current gridded bathymetric data set, the GEBCO_2021 Grid, is a global terrain model for ocean and land, providing elevation data, in metres, on a 15 arc-second interval grid. Seabed sediment and geological condition data will be sourced from the Deep Sea Drilling Project (DSDP) and the British Geological Survey (BGS).

Table 3.5: Summary of key desk top datasets and reports.

Title	Source	Year	Author
Gebco database	https://www.gebco.net/data_and_products/ gridded_bathymetry_data/	2021	GEBCO
Deep Sea Drilling Project	http://deepseadrilling.org/	1983-2003	Ocean drilling program
British Geological Survey	Seabed sediment data	2020	BGS
Geology of the seabed and shallow subsurface: The Irish Sea	BGS	2015	Mellett *et al*.

3.2.4 Baseline environment

3.2.4.1 Baseline noise levels vary significantly depending on multiple factors, such as seasonal variations and different sea states. Lack of long term sound measurements is a widely recognised gap in knowledge in relation to general soundscape and potential effects of human activities on marine life. Understanding the baseline sound level could therefore be valuable in enabling future studies to assess long term effects related to continuous sound levels over time in addition to activity specific effects such as masking impacts. The baseline sound environment will be discussed and agreed through the Evidence Plan process.

3.2.4.2 Sound can be either impulsive (pulsed) such as impact piling, or non-impulsive (continuous) such as ship engines, and the magnitude of the impact on marine life will depend heavily on these characteristics. Background or “ambient” underwater sound is created by several natural sources, such as rain, breaking waves, wind at the surface, seismic sound, biological sound and thermal sound. Biological sources include marine mammals (using sound to communicate, build up an image of their environment and detect prey and predators) as well as certain fish and shrimp. Anthropogenic sources of sound in the marine environment include fishing boats, ships (non-impulsive), industrial marine construction noise (such as piling or dredging), subsurface (seismic) and seabed imaging surveys and leisure activities (all could be either impulsive or non-impulse), all of which add to ambient background sound. Anthropogenic sound within the vicinity of the Morgan Offshore Wind Project generation assets will arise primarily from shipping, the offshore oil and gas industry, subsea geophysical and geotechnical surveys, and the offshore renewables industry. Measurements of underwater sound from the operational Ormonde windfarm were undertaken in June 2012 (Nedwell *et al*., 2012). The results reported that there was an increase in noise levels between 0 and 50kHz at a distance of 30m from individual wind turbines. The noise was continuous in nature, and the increase was detectable to a maximum range of approximately 1km. Beyond this range, the underwater sound level was consistent with the ambient underwater sound in the region (Nedwell *et al*., 2012). Shipping routes and shipping traffic are discussed in section 5.2.

3.2.5 Potential project impacts

3.2.5.1 A range of potential impacts resulting from a change in underwater noise have been identified which may occur during the construction, operation and maintenance, and decommissioning phases of the Morgan Offshore Wind Project generation assets. There is the potential for underwater noise to impact sensitive ecological receptors. The potential effects on these receptors will be assessed within the relevant technical sections of the ES (marine mammals, fish and shellfish and commercial fisheries).

3.2.5.2 The impacts that have been scoped into the assessment are outlined in Table 3.6 together with a description of any additional data collection (e.g. site-specific surveys) and supporting analyses (e.g. modelling) that will be required to enable a full assessment of the impacts.

3.2.5.3 Potential impacts scoped out of the assessment are presented in Table 3.7, with justification.

Table 3.6: Impacts proposed to be scoped into the project assessment for underwater noise (project phase refers to construction (C), operation and maintenance (O) and decommissioning (D)).

Impact	Project phase			Justification	Data collection and analysis required to characterise the baseline environment	Summary of proposed approach to assessment
	C	O	D			
Effects of underwater noise on marine life due to construction, operation and maintenance and decommissioning vessels and rigs	✓	✓	✓	Although noise from these sources will be relatively low in level (e.g. compared to impact piling) and continuous in nature (rather than impulsive) there is still some residual potential for disturbance due to long term increased traffic and use of rigs etc.	N/A	The approach used for assessing underwater noise is detailed in section 3.2.7. The results of the noise modelling will be presented in a Underwater Noise Technical Report, which will inform the Fish and shellfish ecology, Marine mammal and Commercial fisheries ES chapters.
Effects of underwater noise on marine life due to impact driven and drilled pile installations for the wind turbine and offshore substation platform foundations	✓	×	×	Due to the potentially high source levels involved and impulsive nature of the sound, modelling and assessment of the proposed piling activities will be undertaken.	N/A	
Effects of underwater noise on marine life due to jacket or monopile cutting and removal	×	×	✓	There is potential for disturbance or possibly injury from decommissioning activities, depending on the techniques utilised. It is therefore proposed to include these activities in the assessment.	N/A	
Effects of underwater noise from wind turbine operation during operation and maintenance	×	✓	×	There is potential for disturbance from wind turbine operation, the magnitude of which will depend on the size of the turbines constructed. The underwater noise impact of very large turbines during operation is not well understood. A qualitative assessment will be included for this impact. Modelling will be undertaken if sufficient input data exists.	N/A	
Effects of underwater noise on marine life due to clearance of unexploded ordnance (UXO) detonation	✓	×	×	There is potential for disturbance during the construction phase due to the clearance or detonation of UXO, depending on the occurrence, size, and techniques used. It is therefore proposed to include these activities in the assessment.	N/A	
Effects of the particle motion element of underwater noise on fish and shellfish receptors	✓	×	✓	There is potential for injury or disturbance due to particle motion. The impact of the construction and demolition phases is not well understood and therefore it is proposed to include both in the assessment to at least a qualitative level.	N/A	

Table 3.7: Impacts proposed to be scoped out of the project assessment for underwater noise.

Impact	Justification
Effects of the particle motion element of underwater noise on marine mammals during all phases.	There is insufficient evidence that particle motion has any effect on marine mammals therefore this impact is scoped out of the Marine mammals ES chapter.

3.2.6 Measures adopted as part of the project

3.2.6.1 Measures adopted as part of the project are discussed within each of the relevant sections of the EIA Scoping Report for which underwater noise is considered relevant (section 4.3: Marine mammals, section 4.2: Fish and shellfish ecology and section 5.1: Commercial fisheries). Each of the proposed measures adopted as part of the project relating to reducing potential impacts on receptors from underwater noise will be modelled to assess their efficacy in a quantitative way. These measures may evolve as the engineering design and the EIA progresses.

3.2.6.2 The requirement and feasibility of any further mitigation will be dependent on the significance of effects of underwater noise on the receptors associated with each topic and will be consulted upon with statutory consultees throughout the EIA process. Any approach to noise mitigation will be informed by best available evidence and latest guidance, including any outputs from work undertaken during assessment and construction of the nearby operational offshore wind farms and lessons learnt within the industry.

3.2.7 Proposed assessment methodology

3.2.7.1 The underwater noise EIA will follow the methodology set out in part 1, section 4: EIA methodology, of the EIA Scoping report. Specific to the underwater noise assessment, the following guidance documents will also be considered:

- Good practice guide to underwater noise measurement (NPL, 2014).
- Review of underwater acoustic propagation models (NPL) (Wang *et al*., 2014).
- National Oceanic and Atmospheric Administration (NOAA) technical guidance for assessing the effects of anthropogenic sound on marine mammal hearing (NMFS, 2016).
- Underwater acoustic thresholds for onset of permanent and temporary threshold shifts (NMFS, 2018).
- Marine mammal noise exposure criteria: Updated scientific recommendations for residual hearing effects (Southall *et al*., 2019).
- Marine mammal noise exposure criteria: assessing the severity of marine mammal behavioural response to human noise (Southall *et al.*, 2021).
- Sound exposure guidelines for Fishes and Sea Turtles (Popper *et al.,* 2014).
- Statutory nature conservation agency protocol for minimising the risk of injury to marine mammals from piling noise (JNCC, 2010)
- JNCC guidelines for minimising the risk of injury to marine mammals from geophysical surveys (JNCC, 2017).
- Guidance on noise management in harbour porpoise SACs (JNCC, 2020).

- The European Union (EU) Marine Strategy Framework Directive (Directive 2008/56/EC). This seeks to achieve good environmental status (GES) in Europe’s seas by 2020. The qualitative descriptors for determining GES include "Introduction of energy, including underwater noise, is at levels that do not adversely affect the marine environment." This Directive was transposed into United Kingdom (UK) law by the Marine Strategy Regulations 2010.
- Department for Business, Energy and Industrial Strategy (BEIS) Policy Statement - Marine environment: unexploded ordnance clearance joint interim position statement (BEIS, 2022).

3.2.7.2 The impact criteria will be based on the most recent and up-to-date scientific research and guidance, while utilising a precautionary approach. Potential impacts arising from underwater noise on marine mammals and fish will be assessed with respect to the potential for injury and behavioural disturbance. Where possible, noise source data will be based on measured data from similar wind turbine devices. Source noise levels will be based on a combination of theoretical and empirical predictions, and detailed source level modelling where appropriate. The associated source levels of other types of underwater noise associated with the Morgan Offshore Wind Project generation assets will be based on published data and established prediction methodologies.

3.2.7.3 Underwater noise modelling is planned to assess the impact of construction and operational noise using a robust, peer reviewed model. In accordance with National Physical Laboratory guidance (NPL, 2014), the choice of model will depend upon many factors which will be determined during the consultation period and will depend on site-specific circumstances (such as bathymetry etc.). However, the chosen model will be appropriate and peer reviewed, such as the energy flux model (Weston, 1976). Such models have been successfully benchmarked against other sound propagation models (e.g. Etter, 2018; Toso *et al*., 2014; Schulkin and Mercer, 1985) and used in previous underwater noise assessments for offshore wind and tidal energy developments as well as for oil and gas and port developments. The noise model proposed for this assessment has been calibrated against a range of other noise models showing good agreement (typically within +/- 1dB out to a range of 2.5km).

3.2.7.4 The exact scope, specification and methodology of the noise propagation modelling will be discussed and agreed with the Marine Management Organisation (MMO) and Statutory Nature Conservation Bodies (SNCBs). On the basis of previous underwater noise modelling completed for other recent offshore wind projects, the assessment will consider the bathymetry and other characteristics of the area, including the geo-acoustic properties of the seabed, as well as other factors such as the sound source characteristics and frequency range of interest. It is anticipated that the underwater noise assessment will likely include:

- A review of the publicly available literature and studies on the impact of impulsive underwater noise on marine mammal and fish species, including an assessment of the sensitivity of fish and marine mammals to underwater noise, and derivation of criteria for estimating the impact to be agreed with the MMO and SNCBs.

- Estimation of the realistic design scenario for source level noise for impact piling operations within the Morgan Array Scoping Boundary. This will include consideration of the hammer energy, hammer type, ground conditions, water depth, pile size, pile geometry, strike rate, number of strikes and other relevant parameters.
- Estimation of the maximum design scenario for source level noise for impact piling operations within the Morgan Array Scoping Boundary. This will include consideration of the hammer energy, hammer type, ground conditions, water depth, pile size, pile geometry, strike rate, number of strikes and other relevant parameters.
- Noise propagation modelling to estimate potential impact ranges for injury and behaviour to marine mammals and fish as a result of piling during construction within the Morgan Array Scoping Boundary.
- Noise propagation modelling to estimate potential impact ranges for injury and behaviour to marine mammals and fish as a result of the operation and maintenance phase and decommissioning phases within the Morgan Array Scoping Boundary.
- Noise propagation modelling to estimate potential impact ranges for injury and behaviour to marine mammals and fish as a result of concurrent piling operations within the Morgan Array Scoping Boundary.

3.2.7.5 The model will be used to estimate the unweighted and hearing group weighted Sound Exposure Level (SEL), Root Mean Square (rms) (T90) sound pressure level and peak/peak-to-peak pressure level parameters as recommended by Southall *et al.,* 2019, National Marine Fisheries Service (NMFS) 2018, Southall *et al.,* 2007, Acoustic Society of America (ASA) Sound Exposure Guidelines for Fishes and Sea Turtles (Popper *et al*., 2014) and other guidance. The model will also incorporate swim speeds of marine mammals and fish to calculate cumulative SELs (for example see Table 3.8).

Table 3.8: Assessment swim speeds of marine mammals and fish that are likely to occur within the Irish Sea for the purpose of exposure modelling.

Species	Hearing group	Swim speed (m/s)	Source reference
Harbour seal *Phoca vitulina*	Phocid Carnivores in Water (PCW)	1.8	Thompson, 2015
Grey seal *Halichoerus grypus*	PCW	1.8	Thompson, 2015
Harbour porpoise *Phocoena phocoena*	Very High Frequency (VHF)	1.5	Otani *et al.,* 2001
Minke whale *Balaenoptera acutorostrata*	Low Frequency (LF)	2.3	Boisseau *et al.,* 2001
Bottlenose dolphin *Tursiops truncatus*	High Frequency (HF)	1.52	Bailey and Thompson, 2010

Species	Hearing group	Swim speed (m/s)	Source reference
White-beaked dolphin *Lagenorhynchus albirostris*	HF	1.52	Bailey and Thompson, 2010
Short beaked common dolphin *Delphinus delphis*	HF	1.52	Bailey and Thompson, 2010
Risso's dolphin *Grampus griseus*	HF	1.52	Bailey and Thompson, 2010
Basking shark *Cetorhinus maximus*	Group 1 fish	1.0	Sims, 2000
All fish hearing groups (excluding basking sharks)	Group 1 to 4 fish	0.5	Popper *et al*., 2014

3.2.7.6 Historically, research relating to both physiological effects and behavioural disturbance of noise on marine receptors has typically been based on determining the absolute noise level for the onset of that effect (whether presented as a single onset threshold or a dose response/probabilistic function). Consequently, the available numerical criteria for assessing the effects of noise on marine mammals, fish and shellfish, tend to be based on the absolute noise criteria, rather than the difference between the baseline noise level and the noise being assessed (Southall *et al.*, 2007). The available research rarely takes into account other factors such as measures of impulsivity, frequency content and other characteristics which could be as (or more) important than the absolute level alone. In 2021 Southall *et al.* released additional guidance for the types of measurements and parameters which should be reported as part of studies into the impact of anthropogenic noise on the behaviour of marine life, however no additional quantitative guidance for the assessment of those levels were included (Southall *et al*., 2021). Instead, the guidance makes recommendations for additional parameters to be reported for future studies in order to ensure that better information becomes available in future in order to derive better relationships between the sound, its characteristics and the response (e.g. by investigation the exposure novelty, signal-to-noise ratio, sensation level, rise time etc.). In the meantime, assessing potential behavioural disturbance due to anthropogenic sound is a challenging topic and requires a combination of quantitative assessment (e.g. use of dose-response relationships such as those set out in Graham *et al*. (2017)) and qualitative considerations. The approach proposed for the assessment is described in part 2, section 4.3: Marine mammals, of the EIA Scoping Report.

3.2.7.7 The cumulative effect of multiple events/operations will also be assessed/modelled and will consider the likely exposure times of species, allowing for safe distances and reaction ranges to be determined. Further, modelling will be undertaken with the consideration of mitigation, for example acoustic deterrent devices (ADDs), comparing otherwise identical scenarios with and without ADDs.

3.2.7.8 The results of the noise modelling will be presented in an Underwater Noise Technical Report which will cover underwater noise for the Morgan Offshore Wind Project generation assets.

3.2.8 Potential cumulative effects

3.2.8.1 Consideration will be given to cumulative effects from underwater noise, in particular during construction related piling activities. The potential for cumulative effects with other offshore wind farm developments, including the Mona Offshore Wind Project, and other offshore developments with the potential to create underwater noise will be considered in the relevant topic receptor chapters of the ES. A detailed assessment of offshore developments within the area and their construction windows (where available) will be required for the ES, to identify which other offshore developments will be considered in terms of the cumulative underwater noise assessment.

3.2.8.2 The cumulative effects assessment will be considered within the respective ES chapters for marine mammals, fish and shellfish ecology and commercial fisheries.

3.2.9 Potential inter-related effects

3.2.9.1 The potential inter-related effects for underwater noise will be assessed within the relevant technical sections of the ES and described within the relevant sections of the EIA Scoping Report (section 4.3: Marine mammals, section 4.2: Fish and shellfish ecology and section 5.1: Commercial fisheries).

3.2.10 Potential transboundary impacts

3.2.10.1 A screening of transboundary impacts has been carried out and is presented in part 3, Annex A: Transboundary Impacts Screening, of the EIA Scoping Report. Any transboundary impacts will be discussed within each of the relevant sections of the EIA Scoping Report for which underwater noise is considered relevant (section 4.3: Marine mammals, section 4.2: Fish and shellfish ecology and section 5.1: Commercial fisheries).

4 Offshore biological environment

4.1 Benthic subtidal and intertidal ecology

4.1.1 Introduction

4.1.1.1 This section of the Environmental Impact Assessment (EIA) Scoping Report identifies the benthic subtidal and intertidal ecology receptors of relevance to the Morgan Offshore Wind Project generation assets and considers the potential impacts arising from the construction, operation and maintenance, and decommissioning of the generation assets.

4.1.2 Study area

4.1.2.1 To support the development of the Benthic Subtidal and Intertidal Ecology Environmental Statement (ES) chapter, two study areas are defined:

- The Morgan benthic subtidal and intertidal ecology study area for the generation assets: this is defined as the area encompassing the Morgan Array Scoping Boundary plus a buffer of one tidal excursion (Figure 4.1). This is the predicted Zone of Influence (ZOI) of the Morgan Offshore Wind Project generation assets and is the area within which site-specific benthic surveys have been undertaken, with further surveys planned for summer 2022. The results of the site-specific benthic surveys will inform the baseline characterisation and identification of benthic receptors against which potential impacts associated with the Morgan Offshore Wind Project generation assets will be assessed.
- The Morgan regional benthic subtidal and intertidal ecology study area for the generation assets covers the east Irish Sea, extending from Mean High Water Springs (MHWS) out to the furthest west extent from the Mull of Galloway in Scotland to the western tip of Anglesey. This study area has been selected to encompassing the wider Irish Sea habitats and includes the neighbouring consented and developing offshore wind farms and designated sites (Figure 4.1). This was considered appropriate as it will provide wider context to the site-specific data collected within the Morgan benthic subtidal and intertidal ecology study area for the generation assets and is large enough to consider all potential direct and indirect impacts of the Morgan Offshore Wind Project generation assets on the identified receptors.

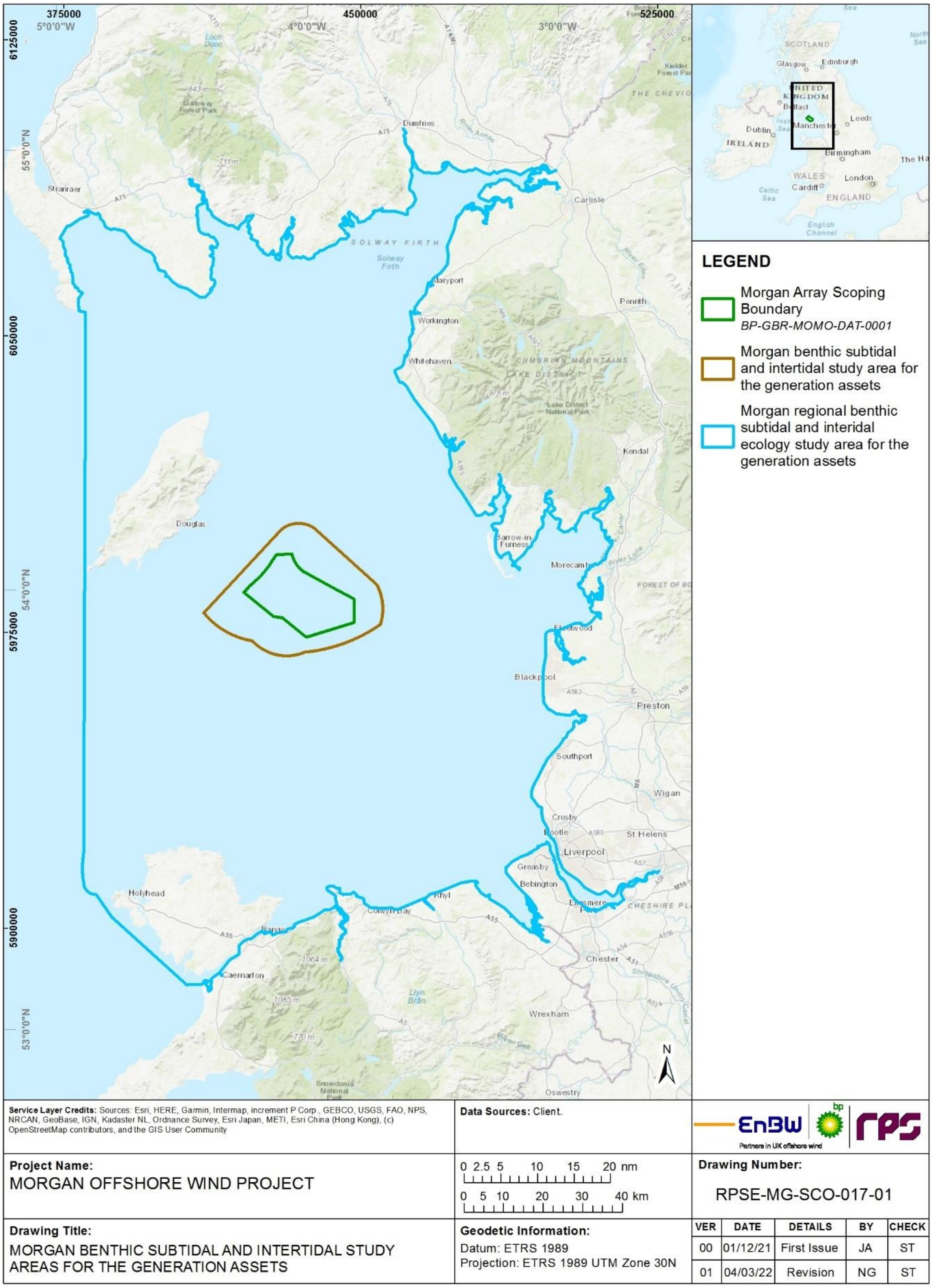


Figure 4.1: Morgan benthic subtidal and intertidal ecology study areas for the generation assets.

4.1.3 Data sources

Desktop data

4.1.3.1 An initial desk based review of literature and data sources to support this EIA Scoping Report has identified a number of data sources which provide coverage of the Morgan regional benthic subtidal and intertidal ecology study area for the generation assets, and which will provide context to the site-specific benthic ecology survey data collected. These are summarised in Table 4.1.

Table 4.1: Summary of key desk top datasets and reports.

Title	Source	Year	Author
OneBenthic	Cefas	2021	Cefas
Marine recorder public UK snapshot	Joint Nature Conservation Comittee (JNCC)	2020	JNCC
National Biodiversity Network (NBN) Atlas	NBN Atlas	2019	NBN Atlas
EMODnet broad scale seabed habitat map for Europe (EUSeaMap)	EMODnet – Seabed Habitats	2019	EMODnet – Seabed Habitats
JNCC Marine Protected Area (MPA) mapper	JNCC	2019	JNCC
Burbo Bank extension benthic and annex I habtiat pre-construction survey	Marine Data Exchange	2015	CMACS
Rhiannon offshore wind project PEIR- benthic Ecology	Marine Data Exchange	2014	Celtic Array Ltd
Walney Year 3 post-consent benthic monitoring survey report	Marine Data Exchange	2014	CMACS
Burbo Bank extension environmental statement - benthic ecology	Marine Data Exchange	2013	Dong Energy Ltd.
Walney Extension environmental statement. chapter 10 benthic ecology	Marine Data Exchange	2013	Dong Energy
Walney Year 2 post-construction benthic monitoring survey report	Marine Data Exchange	2013	CMACS
Ormonde Year 1 post-construction benthic enviornmental monitoring survey	Marine Data Exchange	2012	CMACS
Burbo Bank Year 3 post-construction benthic monitring survey	Marine Data Exchange	2010	CMACS
Walney pre-construction monitoring report	Marine Data Exchange	2009	CMACS
Gwynt y Môr offshore wind farm baseline characterisation	Marine Data Exchange	2005	CMACS
Burbo Bank pre-construction contaminants investigation	Marine Data Exchange	2005	CMACS
Marine Nature Conservation Review (MNCR) areas summaries- Liverpool Bay and the Solway Firth	JNCC	1998	Covey. R.

Site-specific survey data

4.1.3.2 A site-specific survey was undertaken across the Morgan Array Scoping Boundary in summer 2021. The subtidal survey combined drop down video (DDV) and 0.1m^2 Hamon grab sampling. The sampling strategy was designed to adequately sample the area to provide up to date data for baseline characterisation. The survey design was discussed and updated following advice from Natural Resource Wales (NRW), JNCC and Natural England in June 2021.

4.1.3.3 Sampling was conducted from the MV *Ocean Resolution* vessel. The survey comprised:

- Combined DDV and 0.1m^2 Hamon grab sampling at 35 sampling locations and an additional two camera only stations within the Morgan Array Scoping Boundary to ensure adequate data coverage for both infaunal and epifaunal communities at each location, with grab samples analysed for benthic infauna (abundance and biomass), sediment chemistry and particle size analysis (PSA). Sample locations are presented in Figure 4.2.

4.1.3.4 Site specific geophysical surveys were also undertaken across the Morgan Array Scoping Boundary in summer 2021. This included a 2DUHR geophysical survey, side scan sonar (SSS), sub-bottom profiler (SBP) and magnetometer survey. This data will be used to further inform the baseline characterisation alongside the marine ecological datasets.

4.1.3.5 This site-specific data along with the comprehensive desk top information and data sources available will inform the characterisation of the benthic subtidal and intertidal ecology baseline within the Preliminary Environmental Information Report (PEIR) and ES.

4.1.3.6 An infill benthic subtidal ecology survey is planned for spring/summer 2022 which will collect data on the benthic habitats within one tidal excursion around the Morgan Array Scoping Boundary (the predicted ZOI of the Morgan Offshore Wind Project generation assets; Figure 4.1). The 2022 survey will also re-sample a number of sample stations within the Morgan Array Scoping Boundary that were taken during the 2021 benthic survey. The scoping of the 2022 survey campaign will be discussed and agreed with consultees through the Evidence Plan process.

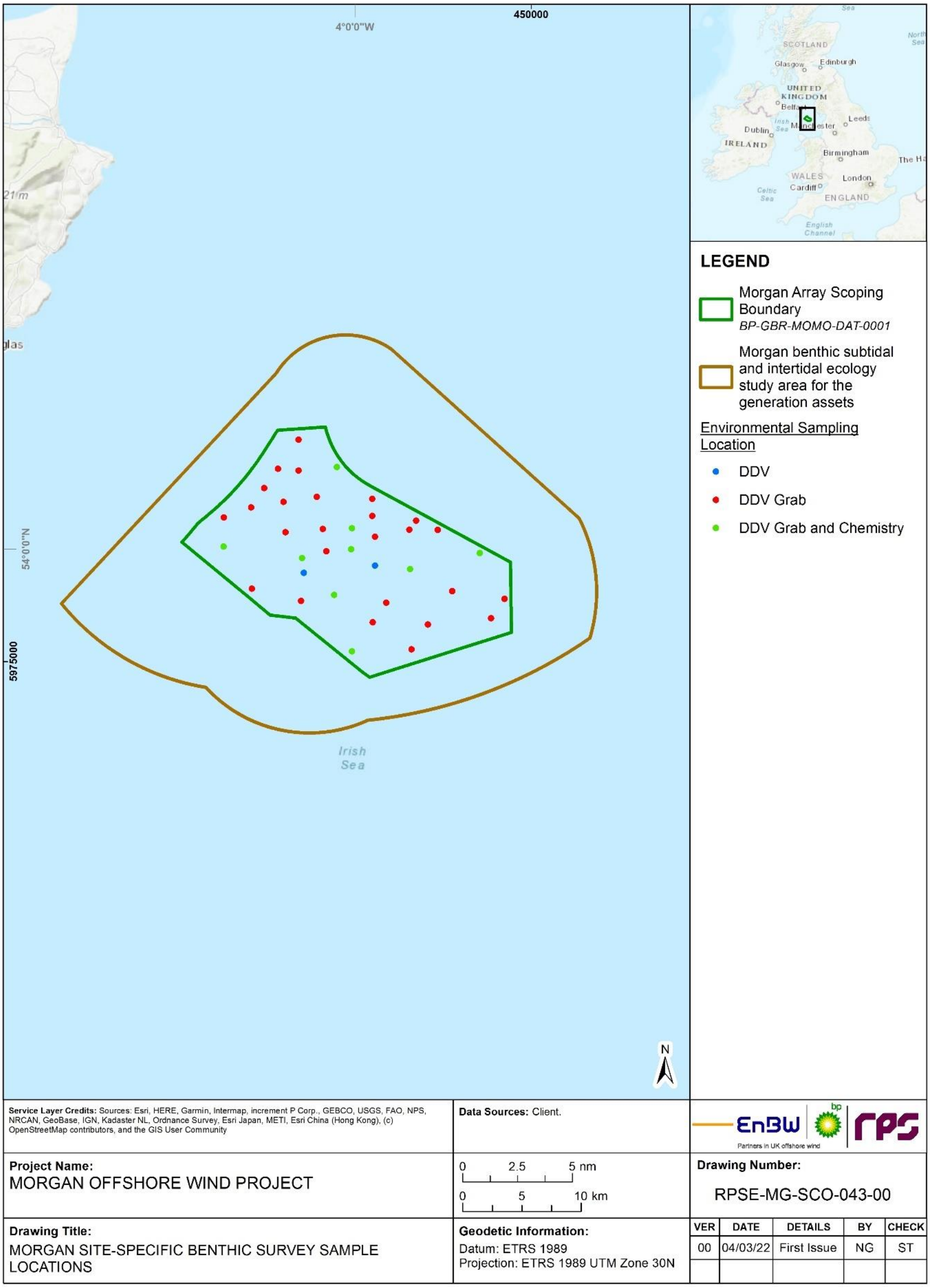


Figure 4.2: Sample locations undertaken across the Morgan Array Scoping Boundary during the summer 2021 benthic survey.

4.1.4 Baseline environment

4.1.4.1 This section provides a summary of the benthic ecology baseline environment for the Morgan Offshore Wind Project generation assets, based on desktop data only.

Subtidal sediments

Morgan regional benthic subtidal and intertidal ecology study area for the generation assets

4.1.4.2 Within the Morgan regional benthic subtidal and intertidal ecology study area for the generation assets, seabed sediments are dominated by ‘circalittoral coarse sediment’ (SS.SCS.CCS) and ‘circalittoral mixed sediments’ (SS.SMx.CMx) in the west with sediment transitioning to ‘offshore circalittoral sand’ (SS.SSa.OSa) and ‘offshore circalittoral mud’ (SS.SMu.OMu) to the east of the regional Morgan benthic subtidal and intertidal ecology study area for the generation assets. South of the Morgan regional benthic subtidal and intertidal ecology study area for the generation assets, sediment also transition to SS.SSa.OSa with areas of ‘circalittoral rock’ (CR) around the coast of Anglesey Seabed sediments along the north Wales coast are dominated by ‘circalittoral fine sand’ (SS.SSa.CFiSa) and ‘circalittoral muddy sands’ (SS.SSa.CMuSa), with areas of SS.SCS.CCS closer to shore around Great Orme headland. A larger area of SS.SCS.CCS occurs north of Colwyn Bay which extends slightly east of Rhyl (illustrated in Figure 4.3; EMODnet, 2019).

4.1.4.3 The Isle of Man is located northwest of the Morgan Array Scoping Boundary (Figure 4.3) within the Morgan regional benthic subtidal and intertidal ecology study area for the generation assets. SS.SCS.CCS are recorded to the south and east of the isle, while ‘infralittoral coarse sediments’ (SS.SCS.ICS) were observed north of the isle. SS.SSa.CFiSa and SS.SSa.CMuSa were present to the east of the isle (illustrated in Figure 4.3, EMODnet, 2019).

4.1.4.4 The benthic surveys conducted for planned and operational offshore wind projects within the Morgan regional benthic subtidal and intertidal ecology study area for the generation assets also provide an overview of the sedimentary habitats present within the immediate vicinity of the Morgan benthic subtidal and intertidal ecology study area for the generation assets (illustrated in Figure 4.4).

4.1.4.5 The Ormonde offshore wind project is within the northeast of the Morgan regional benthic subtidal and intertidal ecology study area for the generation assets. The 2013 year 1 post-construction benthic monitoring survey for the Ormonde offshore wind project reported mud, sand and gravel sediments across the Ormonde offshore wind project array area and export cable corridor. Sample sites further offshore reported a higher percentage of mud compared to the inshore sample sites (CMACS, 2012).

4.1.4.6 Pre-construction monitoring surveys for Walney Extension in 2011 and 2012 and a subsequent monitoring survey for Walney in 2014 were undertaken in the east of the Morgan regional benthic subtidal and intertidal ecology study area for the generation assets. The surveys reported the presence of subtidal mud and subtidal sand within the Morgan regional benthic subtidal and intertidal ecology study area for the generation assets (Dong Energy, 2013; CMACS, 2014).

4.1.4.7 Benthic surveys were undertaken in 2010 and 2012 to support the EIA benthic baseline characterisation for the Rhiannon offshore wind project. These surveys reported that sediments were dominated by SS.SCS.CCS, SS.SCS.CCS, SS.SMx.CMx with patches of moderately exposed rock reef. Sediments graded into mud sediments towards the Welsh coast. Two large sandbanks were recorded off Lynas Point, as illustrated in Figure 4.4. These were composed of very well sorted mobile sand that remains submerged at all times (Celtic Array Ltd, 2014a).

<u>Morgan benthic subtidal and intertidal ecology study area for the generation assets</u>

4.1.4.8 Preliminary results from the 2021 site-specific survey report that sediments within the Morgan Array Scoping Boundary ranged from slightly gravelly sand to muddy sandy gravel with some isolated areas of cobbles. The survey reported a higher gravel contact in the west of the Morgan Array Scoping Boundary. The survey identified SS.SCS.CCS, SS.SMx.CMx and SS.SSa.CFiSa.

4.1.4.9 Sediments overlapping with the Morgan benthic subtidal and intertidal ecology study area for the generation assets were reported in the Rhiannon baseline surveys as SS.SMx.CMx with SS.SCS.CCS to the centre and south with SS.SSa.OSa to the north of the Morgan benthic subtidal and intertidal ecology study area for the generation assets (Celtic Array Ltd, 2014a).

4.1.4.10 The EUSeaMap data describes the Morgan benthic subtidal and intertidal ecology study area for the generation assets as being dominated by A5.15 deep circalittoral coarse sediment in the western extent and A5.27 deep circalittoral sand in the eastern extent of the Morgan benthic subtidal and intertidal ecology study area for the generation assets. The southern extent of the Morgan benthic subtidal and intertidal ecology study area for the generation assets also contains patches of A5.45 deep circalittoral mixed sediments and A5.37 deep circalittoral mud. The northern extent of the Morgan benthic subtidal and intertidal ecology study area for the generation assets contains A5.25 or A5.26 circalittoral fine sand or circalittoral muddy sand (Figure 4.3; EMODnet, 2019). The EUSeaMap describes these habitats as moderate energy habitats (EMODnet, 2019).

4.1.4.11 Further detail on the seabed sediments within the Morgan benthic subtidal and intertidal ecology study area for the generation assets from the site-specific surveys will be presented in the PEIR and ES.

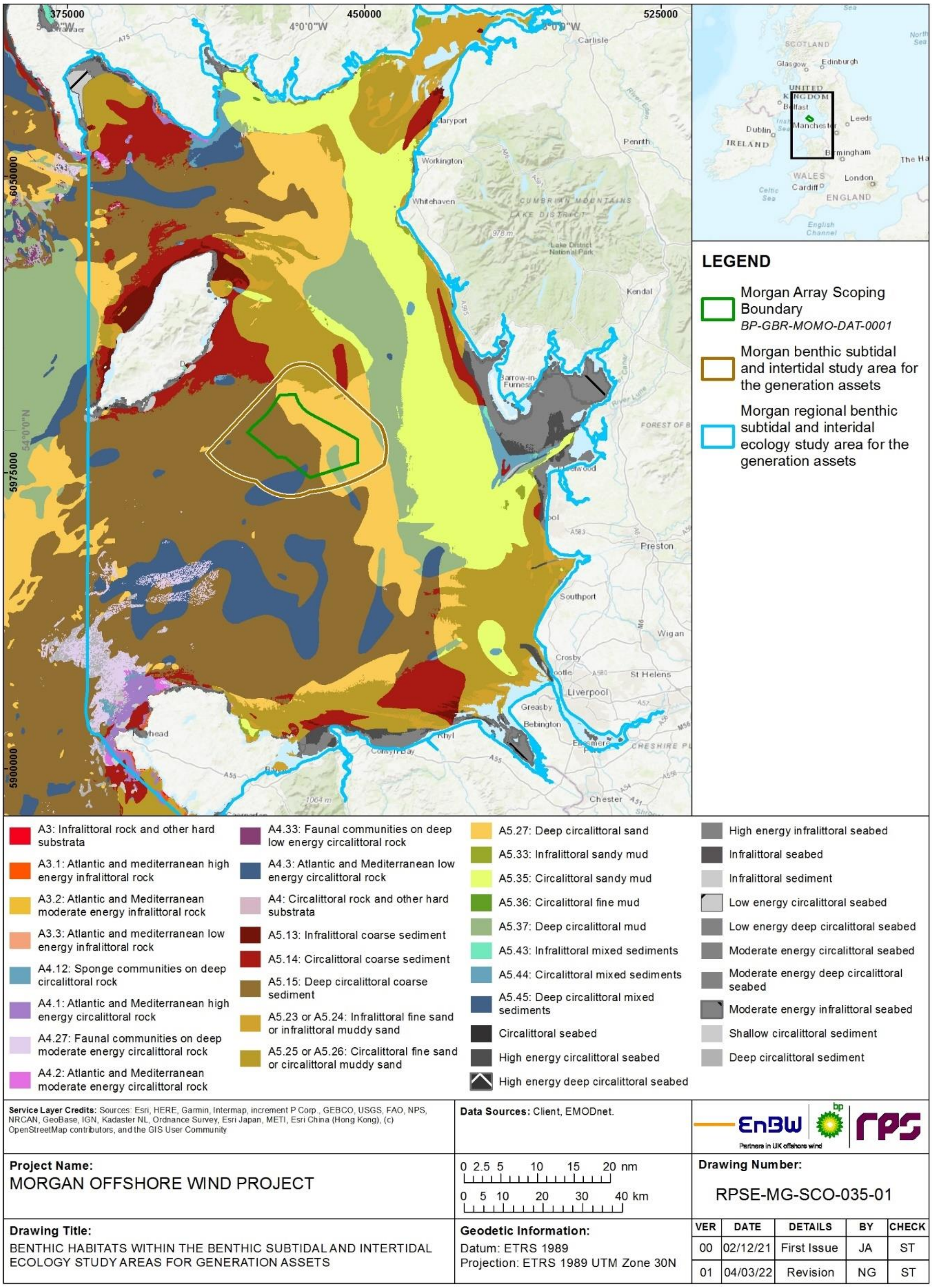


Figure 4.3: Predicted ENUIS habitats from the EUSeaMap for the benthic subtidal and intertidal ecology study areas for the generation assets (Source, EMODnet, 2019).

Sediment contamination

4.1.4.12 Benthic surveys undertaken for the Rhiannon offshore wind project reported sediment chemical contaminants at generally very low levels across the Morgan benthic subtidal and intertidal ecology study area for the generation assets and wider surveyed area. Arsenic marginally exceeded Cefas Action Level 1 in a several samples taken across the Rhiannon offshore wind project array area, within the west of the Morgan benthic subtidal and intertidal ecology study area for the generation assets (Figure 4.4). Arsenic levels are relatively high in Liverpool Bay and surrounding areas (e.g. Camacho-Ibar *et al.,* 1992). This is generally considered to be due to weathering of glaciated regions such as North Wales and the Lake District rather than to anthropogenic sources (e.g. Leah *et al.,* 1992; Thornton *et al.,* 1975).

4.1.4.13 Pre-construction monitoring surveys for Walney Extension in 2011 and 2012 reported elevated levels of aluminium, iron and arsenic, however they were at levels not considered to pose a risk to the environment (Dong Energy, 2013).

4.1.4.14 Pre-construction monitoring surveys for Burbo Bank offshore wind project in 2005 reported that most contaminants were below the interim sediment quality guidelines and Probable Effect Levels (PELs) (Cole *et al*., 2001; Nagpal *et al*., 2001). Elevated levels of lead and mercury were reported, with only arsenic and zinc detectable below 1.5m from the seabed surface. The report concluded that the construction, operation and decommissioning of the offshore wind farm prosed no increased risk to water quality (CMACS, 2005).

Subtidal benthic communities

<u>Morgan regional benthic subtidal and intertidal ecology study area for the generation assets</u>

4.1.4.15 Benthic surveys undertaken for the Rhiannon offshore wind project reported that this section of the east Irish Sea was dominated by SS.SMx.CMx, ‘offshore circalittoral mixed sediments’ (SS.SMx.OMx), SS.SMx.CMx-‘*Ophiothrix fragilis*[1] and/or *Ophiocomina nigra*[2] on sublittoral mixed sediment’ SS.SMx.CMx.OphMx and SS.SCS.CCS (Figure 4.4).

4.1.4.16 The ‘*Mediomastus fragilis*[3], *Lumbrineris*[3] spp. and venerid bivalves in circalittoral coarse sand or gravel’ (SS.SCS.CCS.MedLumVen) biotope was reported to be widespread across the south of the Morgan regional benthic subtidal and intertidal ecology study area for the generation assets. However, when considering the wider area, the match was not felt to be sufficiently strong enough to be a separate biotope on the final biotope map for the Rhiannon offshore wind farm (Figure 4.4; Celtic Array Ltd, 2014a). The SS.SMx.CMx habitats were often sufficiently covered with the brittlestar *Ophiothrix fragilis*[1] to be classified as the biotope SS.SMx.CMx.OphMx (Figure 4.4; Celtic Array Ltd, 2014a).

[1] Common brittlestar

[2] Black brittlestar

[3] Polychaete

4.1.4.17 Annex I (of the Habitats Directive; see part 1, section 2: Policy and legislation, of the EIA Scoping Report) rocky reefs of mostly low to moderate reefiness, were recorded to the east of the Rhiannon offshore wind project array area, over 20km to the south of the Morgan Array Scoping Boundary and over 10km south of the Morgan benthic subtidal and intertidal ecology study area for the generation assets. It was characterised by relatively sparse epifauna dominated by starfish, with some dense patches of brittlestar *O. fragilis*[1]. Annex I reefs were mapped separately and was not presented on the biotope map available on the Marine Data Exchange (as of December 2021). Annex I stony reefs were also recorded over 20km to the west of the Morgan Array Scoping Boundary and over 10km from the Morgan benthic subtidal and intertidal ecology study area for generation assets, however these mostly occurred as a patchwork of boulders over areas more generally described as SS.SCS.CCS or SS.SMx.CMx and were not presented on the biotope map available on the Marine Data Exchange (Figure 4.4; Celtic Array Ltd, 2014a).

4.1.4.18 No Annex I *Sabellaria spinulosa*[4] reefs were recorded, however a mosaic of '*Sabellaria spinulosa*[4] encrusted circalittoral rock' (CR.MCR.CSab.Sspi) and '*Sabellaria spinulosa*[4] on stable circalittoral mixed sediment' (SS.SBR.PoR.SspiMx) were recorded in a very small patch over 20km outside the Morgan Array Scoping Boundary, in the east of the Morgan regional benthic subtidal and intertidal ecology study area for the generation assets (Figure 4.4; Celtic Array Ltd, 2014a).

4.1.4.19 Areas of potential *Modiolus*[5] reefs were recorded over 20km outside the Morgan Array Scoping Boundary, to the south of the Morgan benthic subtidal and intertidal ecology study area for the generation assets. This occurs within the biotope 'Sublittoral mussel beds' (SS.SBR.Smus) (Celtic Array Ltd, 2014; Figure 4.4). Potential *Modiolus*[5] reefs have also been recorded by NRW in 2015 north of Anglesey, to the southeast of the Morgan benthic subtidal and intertidal ecology study area for the generation assets (Moore *et al*., 2017).

4.1.4.20 Benthic surveys undertaken in 2013 for the Walney Year 2 post-construction survey recorded sandy mud sediment communities within the Walney offshore wind project array area. They recorded mixed sediment communities closer to the coast and bivalve dominated communities closest to the Morgan benthic subtidal and intertidal ecology study area for the generation assets (CMACS, 2013; Figure 4.4). The main four habitats recorded were:

- 'Amphiura filiformis[6], Mysella bidentata[5] and Abra nitida[7] in circalittoral sandy mud' (SS.SMu.CSaMu.AfilMysAnit)

[4] Ross worm

[5] Bivalve

[6] Brittlestar

[7] Glossy furrow shell

- '*Thyasira*[5] spp. and *Nuculoma tenuis*[5] in circalittoral sandy mud/*Abra alba*[8] and *Nucula nitidosa*[9] in circalittoral muddy sand or slightly mixed sediment' (SS.SMu.CSaMu.ThyNten/SS.SSA.CMuSa.AalbNuc).
- *Ampelisca*[10] spp., *Photis longicaudata*[10] and other tube-building amphipods and polychaetes in infralittoral sandy mud' (SS.SMu.ISaMu.AmpPlor).
- '*Fabulina fabula*[11] and *Magelona mirabilis*[3] with venerid bivalves and amphipods in infralittoral compacted fine muddy sand' (SS.SSa.IMuSa.FfabMag).

4.1.4.21 The 2013 year 1 post-construction benthic monitoring survey for the Ormonde offshore wind project reported that faunal taxa composition of samples was dominated by annelids, molluscs and crustaceans. Number of individuals was dominated by annelids and echinoderms which was attributable to the high number of a *Amphiura filiformis*[6]. No Annex I reef was recorded (CMACS, 2012).

4.1.4.22 Pre-construction monitoring surveys for Walney Extension recorded *A. filiformis*[6] and phoronid worms in high abundances alongside species of bivalve molluscs and polychaete worms that are adapted to mud sediments. The dominant benthic habitats recorded in the 2011 and 2012 surveys were (Dong Energy, 2013):

- SS.SMx.CMx.
- 'Mysella bidentata[5] and Thyasira[5] spp. in circalittoral, muddy mixed sediments' (SS.SMx.CMx.MysThyMx).
- SS.SMu.CSaMu.AfilMysAnit.

4.1.4.23 The dominant benthic habitats recorded in the 2014 surveys were (CMACS, 2014):

- 'Nephtys cirrosa[3] and Bathyporeia[10] spp. in infralittoral sand' (SS.SSa.IFiSa.NcirBat).
- 'Dense *Lanice conchilega*[12] and other polychaetes in tide-swept infralittoral sand and mixed gravelly sand' (SS.SCS.ICS.SLan).
- SS.SSa.IMuSa.FfabMag.
- SS.SMu.CSaMu.AfilMysAnit.
- 'Thyasira[5] spp. and Nuculoma tenuis[5] in circalittoral sandy mud' (SS.SMu.CSaMu.ThyNten).
- 'Circalittoral Sandy Mud' (SS.SMu.CSaMu).

4.1.4.24 Evidence of the habitat feature of conservation importance 'sea pen and burrowing megafauna communities' has previously been within the Walney

[8] White furrow shell

[9] Shiny nut shell

[10] Amphipod

[11] Ben-like tellin

[12] Sand mason worm

Offshore Wind Farm and the Walney Extension Offshore Wind Farm. Within the Morgan regional benthic subtidal and intertidal ecology study area for the generation assets, over 10km from the Morgan Array Scoping Boundary (Figure 4.4; Dong Energy, 2013; CMACS, 2014).

Morgan benthic subtidal and intertidal ecology study area for the generation assets

4.1.4.25 Benthic surveys undertaken for the Rhiannon offshore wind project reported rich faunal communities on circalittoral coarse sediments SS.SCS.CCS, circalittoral mixed sediment SS.SMx.CMx and circalittoral fine sand SS.SSaCFi habitats in the Morgan benthic subtidal and intertidal ecology study area for the generation assets. An area of a mosaic of circalittoral mixed sediment, *Ophiothrix fragilis*[1] and/or *Ophiocomina nigra*[2] brittlestar beds on sublittoral mixed sediment SS.SMx.CMx.OphMx and *Pomatoceros triqueter*[3] with barnacles and bryozoan crusts on unstable circalittoral cobbles and pebbles SS.SCS.CCS.PomB, was recorded in the west of the Morgan benthic subtidal and intertidal ecology study area for the generation assets (Figure 4.4; Celtic Array Ltd, 2014a).

4.1.4.26 Preliminary results from the 2021 site-specific drop down video benthic subtidal survey reported sparse visible fauna in mobile sandy sediments and higher densities of visible fauna in areas of gravel. Initial survey results reported SS.SMx.CMx.OphMx within the centre of the Morgan Array Scoping Boundary. Initial analysis of 'sea pen and burrowing megafauna communities' habitat suggest that the Morgan Array Scoping Boundary is unlikely to constitute anything other than low resemblance to the habitat. Initial survey results show no evidence of any Annex I habitats, priority habitats or species, species or habitats on the OSPAR (2008) list of threatened and/or declining species and habitats or species on the IUCN (2021) Global Red List.

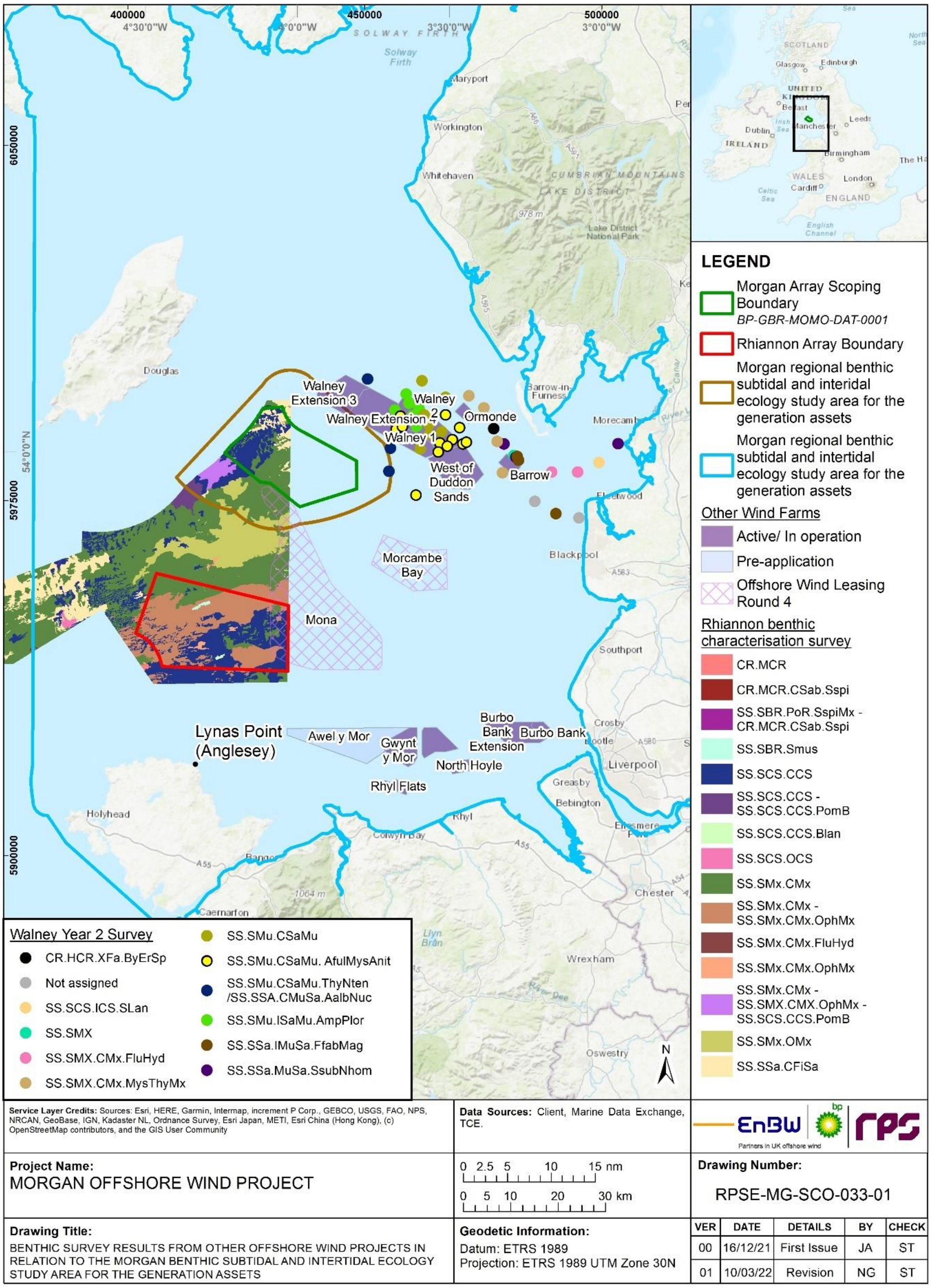


Figure 4.4: Benthic survey results for the other offshore wind projects in relation to the Morgan benthic subtidal and intertidal ecology study area for the generation assets.

Table 4.2: JNCC marine habitat codes used in Figure 4.4 (JNCC, 2022).

Habitat code	Biotope description
CR.MCR	Moderate energy circalittoral rock
CR.MCR.CSab.Sspi	*Sabellaria spinulosa*[4] encrusted circalittoral rock
CR.HCR.XFa.ByErSp	Bryozoan turf and erect sponges on tide-swept circalittoral rock
SS.SBR.PoR.SspiMx	*Sabellaria spinulosa*[4] on stable circalittoral mixed sediment
SS.SBR.Smus	Sublittoral mussel beds (on sublittoral sediment)
SS.SCS.CCS	Circalittoral coarse sediment
SS.SCS.CCS.PomB	*Pomatoceros triqueter* with barnacles and bryozoan crusts on unstable circalittoral cobbles and pebbles
SS.SCS.CCSBlan	*Branchiostoma lanceolatum*[13] in circalittoral coarse sand with shell gravel
SS.SCS.OCS	Offshore circalittoral coarse sediment
SS.SMx	Sublittoral mixed sediment
SS.SMx.CMx	Circalittoral mixed sediment
SS.SMx.OphMx	*Ophiothrix fragilis* and/or *Ophiocomina nigra*[2] brittlestar beds on sublittoral mixed sediment
SS.SMx.CMx.FluHyd	*Flustra foliacea*[14] and *Hydrallmania falcata*[15] on tide-swept circalittoral mixed sediment
SS.SMx.CMx.MysThyMx	*Mysella bidentata* and *Thyasira* spp. in circalittoral muddy mixed sediment
SS.SMx.OMx	Offshore circalittoral mixed sediment
SS.SSa.CFiSa	Circalittoral fine sand
SS.SMu.CSaMu	Circalittoral sandy mud
SS.SMu.CSaMu.AfulMysAnit	*Amphiura filiformis*, *Mysella bidentata* and *Abra nitida* in circalittoral sandy mud
SS.SMu.CSaMu.ThyNten	*Thyasira* spp and *Nuculoma tenuis* in circalittoral sandy mud
SS.SSa.CSaMu.AalbNuc	*Abra alba* and *Nucula nitidosa* in circalittoral muddy sand or slightly mixed sediment
SS.SMu.ISaMu.AmpPlor	*Ampelisca* spp., *Photis longicaudata* and other tube-building amphipods and polychaetes in infralittoral sandy mud
SS.SSa.IMuSa.FfabMag	*Fabulina fabula* and *Magelona mirabilis* with venerid bivalves and amphipods in infralittoral compacted fine muddy sand
SS.SSa.MuSa.SsubNhom	*Spisula subtruncata*[16] and *Nephtys hombergii* in shallow muddy sand

Designated sites

4.1.4.27 The identification of designated sites for inclusion in the Morgan benthic subtidal and intertidal ecology EIA was carried out as follows:

- Sites with relevant qualifying features which overlap with the Morgan Array Scoping Boundary were screened in for further assessment.

[13] European lancelet

[14] Hornwrack

[15] Hydrozoa

[16] Cut through shell

- Sites with relevant qualifying features, which are located within the likely ZOI of effects associated with the Morgan Array Scoping Boundary were screened in for further assessment. The likely ZOI is encapsulated by the Morgan benthic subtidal and intertidal ecology study area for the generation assets and has been determined through a review of the potential impacts associated with the Morgan Offshore Wind Project generation assets. On this basis, designated sites within the Morgan benthic subtidal and intertidal ecology study area for the generation assets have been included. This ensures that all sites potentially affected by changes in water quality (e.g. increased suspended sediment concentrations) and potential changes to the hydrodynamic regime are included in the assessment.

4.1.4.28 West of Copeland Marine Conservation Zone (MCZ) overlaps with the Morgan benthic subtidal and intertidal ecology study area for the generation assets. The West of Walney MCZ does not overlap with the Morgan benthic subtidal and intertidal ecology study area for the generation assets however it has been included due to proximity. The nature conservation designations which have been screened in for consideration in the benthic subtidal and intertidal ecology EIA comprise of national conservation sites (i.e. MCZs; Table 4.3).

4.1.4.29 Information to support a full screening of European sites with qualifying benthic subtidal and/or intertidal interest features will be provided in the Likely Significant Effects (LSE) screening report for the Morgan Offshore Wind Project generation assets, as part of the Habitats Regulations Assessment (HRA) process. Relevant features screened into the benthic subtidal and intertidal ecology assessment will be fully considered and assessed in the Benthic subtidal and intertidal ecology ES chapter. The information to support the assessment on European sites and effects on the site(s) conservation objectives will be undertaken in the Report to Inform Appropriate Assessment (RIAA). Information on and a preliminary screening of relevant Marine Conservation Zones (MCZs) has been included in part 3, Annex B: MCZ Screening, of the EIA Scoping Report.

Table 4.3: Summary of designated sites with relevant benthic ecology features within the Morgan benthic subtidal and intertidal ecology study area for the generation assets.

Designated Site	Distance to the Morgan Array Scoping Boundary (km)	Features (below MHWS)
West of Copeland MCZ	7.3	• Subtidal coarse sediment • Subtidal sand • Subtidal mixed sediments
West of Walney MCZ	7.6	• Subtidal sand • Subtidal mud • Sea pen and burrowing megafauna communities

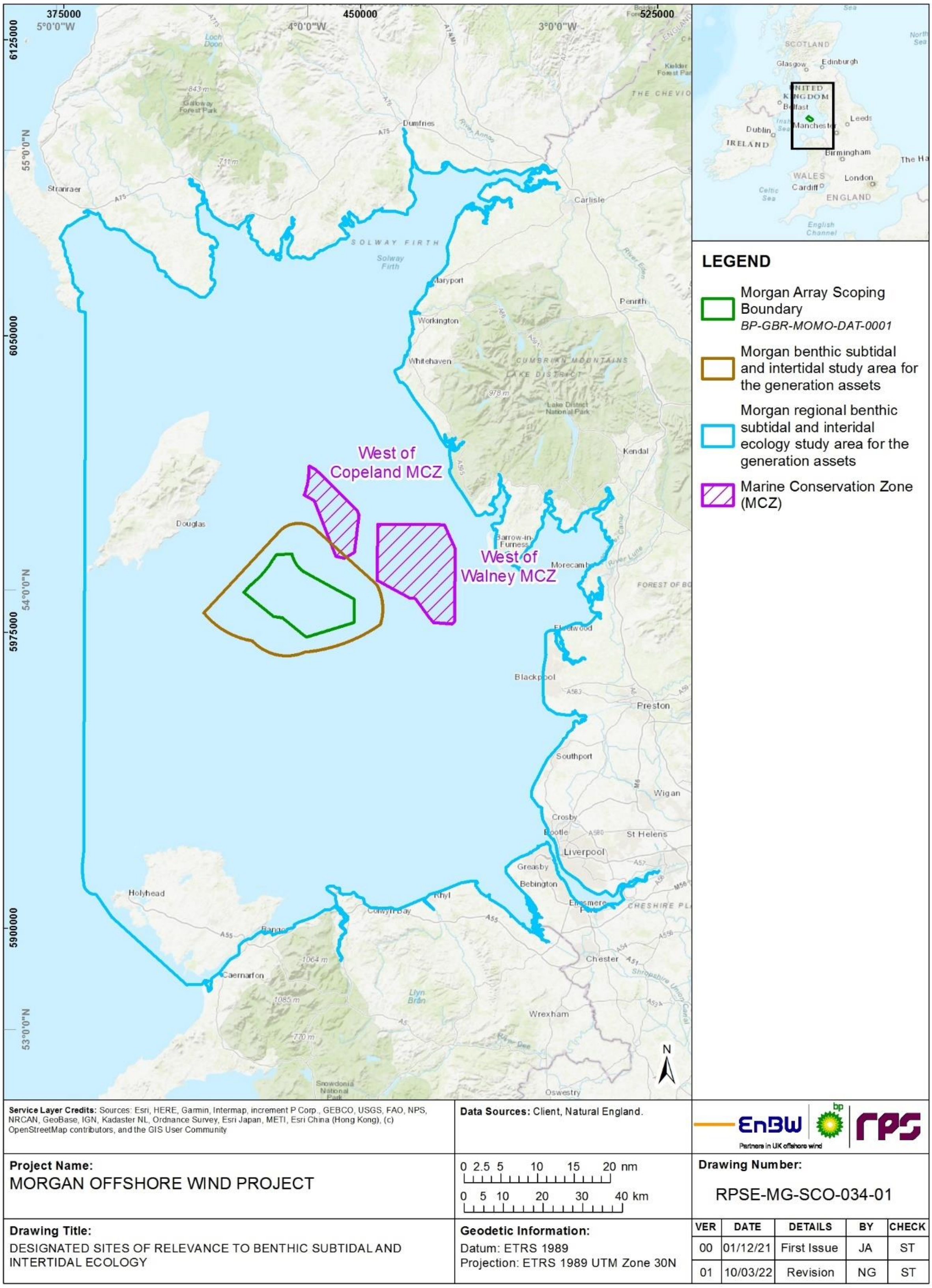


Figure 4.5: Marine nature conservation designations with relevance to benthic subtidal and intertidal ecology and the Morgan Offshore Wind Project generation assets.

Protected species and habitats

4.1.4.30 Several species and habitats of conservation importance have been recorded or have the potential to occur within the Morgan benthic subtidal and intertidal ecology study area for the generation assets. These are presented below in Table 4.4 and include those species and habitats protected under Annex I of the Habitats Regulations. Where species are afforded protection under other legislation, this has also been noted.

Table 4.4: Relevant protected benthic species and habitats which have the potential to occur within the Morgan benthic subtidal and intertidal ecology study area for the generation assets.

Benthic Species and habitats	Protection legislation
Rocky Reef	• Annex I of the Habitats Regulations
Cobble Reef	• Annex I of the Habitats Regulations
Sabellaria spinulosa reef	• Annex I of the Habitats Regulations • Habitat of principal importance in England under the Natural Environment and Rural Communities Act 2006 (NERC 2006 Act) • UK Biodiversity Action Plan (BAP) prioity habitat that continues to be regarded as conservation priorities in the subsequent UK Post-2010 Biodiversity Framework • Annex V of the OSPAR (Oslo-Paris) convention • MCZ Feature of Conservation Importance (FOCI)
Modiolus reef	• Annex I of the Habitats Regulations • Habitat of principal importance in England under the NERC Act 2006. • UK BAP priority habitat that continues to be regarded as conservation priorities in the subsequent UK Post-2010 Biodiversity Framework • Annex V of the OSPAR convention • MCZ Habitat FOCI
Sea pen and burrowing megafauna communities	• UK BAP prioity habitat that continues to be regarded as conservation priorities in the subsequent UK Post-2010 Biodiversity Framework • Annex V of the OSPAR convention • Habitat of principal importance in England under the NERC Act 2006. • MCZ Habitat FOCI
Subtidal sands and gravels	• Annex I of the Habitats Regulations • Habitat of principal importance in England under the NERC Act 2006. • UK BAP priority habitat that continues to be regarded as conservation priorities in the subsequent UK Post-2010 Biodiversity Framework • Annex V of the OSPAR convention • MCZ Habitat FOCI

4.1.5 Potential project impacts

4.1.5.1 A range of potential impacts on Benthic subtidal and intertidal ecology have been identified which may occur during the construction, operation and maintenance, and decommissioning phases of the Morgan Offshore Wind Project generation assets.

4.1.5.2 The impacts that have been scoped into the assessment are outlined in Table 4.5 together with a description of any additional data collection (e.g. site-specific surveys) and supporting analyses (e.g. modelling) that will be required to enable a full assessment of the impacts.

4.1.5.3 Potential impacts scoped out of the assessment are presented in Table 4.6, with justification.

Table 4.5: Impacts proposed to be scoped into the project assessment for benthic subtidal and intertidal ecology (project phase refers to construction (C), operation and maintenance (O) and decommissioning (D)).

Impact	Project phase			Justification	Data collection and analysis required to characterise the baseline environment	Summary of proposed approach to assessment
	C	O	D			
Increased suspended sediment concentrations (SSC) and associated deposition.	✓	✓	✓	Sediment disturbance arising from construction activities (e.g. foundation and cable installation – including drilling and any deposits arising, unexploded ordnance (UXO) detonation and seabed preparation); maintenance operations (e.g. cable repair/reburial, use of jack-up vessels to facilitate wind turbine component repairs etc.); and decommissioning activities (e.g. foundation removal) may result in indirect impacts on benthic communities due to temporary increases in SSCs and associated sediment deposition (i.e. smothering effects). Changes in SSCs can impact benthic receptors through changes in water clarity and reduced feeding due to increases in suspended solids and smothering and siltation rate changes.	Benthic subtidal surveys were undertaken across the Morgan Array Scoping Boundary in 2021. A 2022 infill benthic subtidal ecology survey will also be undertaken. Together these will provide data to support the benthic characterisation within the Morgan benthic subtidal and intertidal ecology study area for the generation assets.	The outputs of numerical modelling undertaken for the physical processes assessment will inform this impact assessment. Further details of this modelling are presented within section 3.1. For the operation and maintenance phase, the magnitude is assumed to be no greater than for the construction phase therefore modelling carried out for the construction phase will be used to quantify the magnitude of effect. The significance of effects upon benthic receptors will be determined by correlating the magnitude of the impact and the sensitivity of the receptor. Where possible, the magnitude of the impact will be quantified for the maximum design scenario (MDS). For example, the MDS for increases in SSC/associated deposition will be quantified and the assessment will present the areas of habitat potentially affected in the context of the size of the Morgan regional benthic subtidal and intertidal ecology study area for the generation assets. The sensitivity of benthic receptors will be determined using the Marine Evidence based Sensitivity Assessment (MarESA) tool.
Temporary habitat loss/disturbance.	✓	✓	✓	There is potential for temporary, direct habitat loss and disturbance as a result of site preparation activities in advance of installation activities, cable installation activities (including UXO detonation, pre-cabling seabed clearance and anchor placements), and placement of spud-can legs from jack-up operations. Temporary habitat loss/disturbance may occur during the operation and maintenance phase as a result of operations (e.g. cable repair/reburial, use of jack-up vessels to facilitate wind turbine component repairs etc.). The impacts associated with these operations are likely to be similar in nature to those associated with the construction phase although of reduced	Benthic subtidal surveys were undertaken across the Morgan Array Scoping Boundary in 2021. A 2022 infill benthic subtidal ecology survey will also be undertaken. Together these will provide data to support the benthic characterisation within the Morgan benthic subtidal and intertidal ecology study area for the generation assets.	No specific modelling is required to inform this impact assessment, although the assessment will be quantitative in nature (i.e. clearly presenting the maximum spatial scale of impacts). This assessment will be based on information derived from the Project Design Envelope (PDE). The approach to assigning the significance of effect is outlined above for 'Increased suspended sediment concentrations and associated deposition' and discussed below.

Impact	Project phase			Justification	Data collection and analysis required to characterise the baseline environment	Summary of proposed approach to assessment
	C	O	D			
				magnitude. There is potential for temporary, direct habitat loss and disturbance due to decommissioning activities, resulting in potential effects on benthic ecology.		
Long term habitat loss.	✓	✓	×	There is the potential for long term habitat loss to occur directly under all foundation structures and associated scour protection, and under any cable protection required. As foundations are installed throughout the construction phase this impact is also relevant to the construction phase although this impact will largely occur throughout the operation and maintenance phase. Permanent habitat loss may occur under any infrastructure that is not decommissioned at the end of the Morgan Offshore Wind Project generation assets lifetime.	Benthic subtidal surveys were undertaken across the Morgan Array Scoping Boundary in 2021. A 2022 infill benthic subtidal ecology survey will also be undertaken. Together these will provide data to support the benthic characterisation within the Morgan benthic subtidal and intertidal ecology study area for the generation assets.	No specific modelling is required to inform this impact assessment, although the assessment will be quantitative in nature (i.e. clearly presenting the maximum spatial scale of impacts). This assessment will be based on information derived from the PDE. The approach to assigning the significance of effect is outlined above for 'Increased suspended sediment concentrations and associated deposition' and discussed in below.
Increased risk of introduction and spread of invasive non-native species (INNS).	✓	×	✓	There is potential for an increased risk of introduction and spread of INNS through the vessel movements required during the construction phase and decommissioning phase.	Benthic subtidal surveys were undertaken across the Morgan Array Scoping Boundary in 2021. A 2022 infill benthic subtidal ecology survey will also be undertaken. Together these will provide data to support the benthic characterisation within the Morgan benthic subtidal and intertidal ecology study area for the generation assets.	No specific modelling is required to inform this impact assessment. A qualitative assessment will be undertaken and presented in the ES. This assessment will be based on information derived from the PDE. The approach to assigning the significance of effect is outlined above for 'Increased suspended sediment concentrations and associated deposition' and discussed below.
Colonisation of hard structures.	×	✓	×	Artificial structures placed on the seabed (i.e. foundations and scour/cable protection) in the offshore environment are expected to be colonised by a range of marine organisms leading to localised increases in biodiversity. These structures may also facilitate the spread of marine INNS.	Benthic subtidal surveys were undertaken across the Morgan Array Scoping Boundary in 2021. A 2022 infill benthic subtidal ecology survey will also be undertaken. Together these will provide data to support the benthic characterisation within the Morgan benthic subtidal and intertidal ecology study area for the generation assets.	No specific modelling is required to inform this impact assessment. A qualitative assessment will be undertaken and presented in the ES. This assessment will be based on information derived from the PDE. Invasive non-native species (INNS) will be considered, particularly in relation to colonisation of hard structures. The approach to assigning the significance of effect is outlined above for 'Increased suspended sediment concentrations and associated deposition' and discussed below.
Changes in physical processes.	×	✓	×	The presence of foundation structures, associated scour protection and cable	Benthic subtidal surveys were undertaken across the Morgan Array Scoping Boundary in 2021. A 2022	Outputs of numerical modelling (as per section 3.1) undertaken for the physical processes assessment will inform this impact assessment.

Impact	Project phase			Justification	Data collection and analysis required to characterise the baseline environment	Summary of proposed approach to assessment
	C	O	D			
				protection may introduce localised changes to the tidal flow and wave climate, resulting in potential changes to the sediment transport pathways and associated effects on benthic ecology.	infill benthic subtidal ecology survey will also be undertaken. Together these will provide data to support the benthic characterisation within the Morgan benthic subtidal and intertidal ecology study area for the generation assets.	The approach to assigning the significance of effect is outlined above for 'Increased suspended sediment concentrations and associated deposition' and discussed below.
Removal of hard substrates.	×	×	✓	The removal of foundations during decommissioning has the potential to lead to loss of species/habitats colonising these structures.	Benthic subtidal surveys were undertaken across the Morgan Array Scoping Boundary in 2021. A 2022 infill benthic subtidal ecology survey will also be undertaken. Together these will provide data to support the benthic characterisation within the Morgan benthic subtidal and intertidal ecology study area for the generation assets.	No specific modelling is required to inform this impact assessment, although the assessment will be quantitative in nature (i.e. clearly presenting the maximum spatial scale of impacts). This assessment will be based on information derived from the PDE. The approach to assigning the significance of effect is outlined above for 'Increased suspended sediment concentrations and associated deposition' and discussed below.

Table 4.6: Impacts proposed to be scoped out of the project assessment for benthic subtidal and intertidal ecology.

Impact	Justification
Impacts to benthic invertebrates due to electromagnetic fields (EMF).	EMF generated through the subsea electrical cabling may affect benthic subtidal receptors however there is limited evidence on the electro sensitivity of benthic organisms and therefore the impact of EMFs on benthic invertebrates. In addition, for buried cables, the magnetic field at the seabed is reduced due to the distance between the cable and the seabed surface as a result of field decay with distance from the cable (CSA, 2019). A recent study conducted by CSA (2019) found that inter-array and export cables buried between depths of 1 m to 2 m reduces the magnetic field at the seabed surface four fold. For cables that are unburied and instead protected by thick concrete mattresses or rock berms, the field levels were found to be similar to buried cables. A Cable Specification and Installation Plan (CSIP) for the Morgan Offshore Wind Project generation assets will include cable burial where possible or cables will be protected as necessary therefore there is limited scope for impacts to benthic invertebrates due to electromagnetic fields. Impacts of EMF on shellfish species will be fully assessed in the Fish and shellfish ecology ES chapter (see part 2, section 4.2: Fish and shellfish ecology, of the EIA Scoping Report).
Accidental pollution during construction, operation and maintenance and decommissioning.	There is a risk of pollution being accidentally released during the construction, operation and maintenance and decommissioning phases from sources including vessels/vehicles and equipment/machinery. However, the risk of such events is managed by the implementation of measures set out in standard post-consent plans (e.g. Environmental Management Plan, including Marine Pollution Contingency Plan (MPCP)s). These plans include planning for accidental spills, address all potential contaminant releases and include key emergency contact details. It will also set out industry good practice and OSPAR (Oslo-Paris), International Maritime Organisation (IMO) and MARPOL (International Convention for the Prevention of Pollution from Ships) guidelines for preventing pollution at sea. Therefore, the likelihood of an accidental spill occurring is very low and in the unlikely event that such events did occur, the magnitude of these will be minimised through measures such as a MPCP. As such, it is intended that this impact is scoped out of further consideration within the Benthic subtidal and intertidal ecology ES chapter.
Impacts from the release of sediment-bound contaminants.	Seabed disturbance associated with construction, maintenance and decommissioning activities (e.g. foundation and cable installation) could lead to the remobilisation of sediment-bound contaminants that may result in harmful and adverse effects on benthic communities. Historical sampling within the vicinity of the Morgan Array Scoping Boundary has shown levels of sediment contaminants are low. The risk of sediment-bound contaminants being present in concentrations likely to be harmful to benthic receptors is considered to be low. Site-specific sediment chemistry sampling will be undertaken across the Morgan Array Scoping Boundary during subtidal sampling. This potential impact is proposed to be scoped out of further consideration within the Benthic subtidal and intertidal ecology ES chapter subject to the results of the site specific surveys and consultation with the Statutory Nature Conservation Bodies (SNCBs) via the Evidence Plan process.

4.1.6 Measures adopted as part of the project

4.1.6.1 The following measures adopted as part of the project are relevant to benthic subtidal and intertidal ecology. These measures may evolve as the engineering design and EIA progresses.

- Development and adherence to a CSIP which will include cables to be buried to where possible and cable protection as necessary (The potential impact of this measure will be consulted upon with statutory consultees throughout the EIA process).
- Development of, and adherence, to a Construction Method Statement (CMS).
- Development of, and adherence to, an Environmental Management Plan, including actions to minimis INNS, and a MPCP which will include planning for accidental spills, address all potential contaminant releases and include key emergency details.

4.1.6.2 Any further mitigation will be dependent on the significance of the effects and will be consulted upon with statutory consultees throughout the EIA process.

4.1.7 Proposed assessment methodology

4.1.7.1 The benthic subtidal and intertidal ecology EIA will follow the methodology set out in part 1, section 4: EIA methodology, of the EIA Scoping Report. Specific to the Benthic subtidal and intertidal ecology EIA, the following guidance documents will also be considered:

- Guidelines for Ecological Impact Assessment (EcIA) in the UK and Ireland. Terrestrial, Freshwater and Coastal (CIEEM, 2019).
- Guidance on Environmental Considerations for Offshore Wind Farm Development (OSPAR, 2008).
- Best Methods for Identifying and Evaluating *Sabellaria spinulosa* and Cobble Reef (Limpenny *et al*., 2010).
- Defining and Managing *Sabellaria spinulosa* Reefs (Gubbay, 2007).
- Identification of the Main Characteristics of Stony Reef Habitats under the Habitats Directive (Irving, 2009).
- Advances in assessing Sabellaria spinulosa reefs for ongoing monitoring (Jenkins *et al.,* 2018).
- Marine Evidence-based Sensitivity Assessment – A Guide (Tyler-Walters *et al*., 2018).
- Guidelines for Data Acquisition to Support Marine Environmental Assessments of Offshore Renewable Energy Projects (Judd, 2012).

4.1.7.2 A Benthic subtidal and intertidal ecology technical report will present a detailed baseline characterisation for the Morgan Offshore Wind Project generation assets using specific survey data and the most recent desk top data. This report will inform the Benthic subtidal and intertidal ecology ES chapter. The approach and focus of these impact assessments will be discussed with stakeholders through the Benthic Ecology, Fish and Shellfish and Physical Processes Evidence Plan process.

4.1.7.3 For the purposes of undertaking the EIA, marine habitats and species identified as occurring in the Morgan benthic subtidal and intertidal ecology study area for the generation assets will be grouped into broad habitat/community types. These broad habitat/community types will serve as the Important Ecological Features (IEFs) against which impacts associated with the construction, operation and maintenance and decommissioning phases of the Morgan Offshore Wind Project generation assets will be assessed. Habitats with similar physical and biological characteristics (including species complement and richness/diversity) as well as conservation status/interest will be grouped together for the purposes of the EIA. Consideration will also be given to the sensitivities of different habitats in assigning the groupings, such that habitats and species with similar vulnerability and recoverability, often as a result of similar broad sediment types and species complements, will be grouped together. Impacts on IEFs will be described in terms of the magnitude of that impact and correlated against the sensitivity of each IEF to that each impact, to produce a statement of significance (see part 1, section 4: EIA methodology, of the EIA Scoping Report).

4.1.7.4 Information on the sensitivities of benthic ecology receptors will largely be drawn from the Marine Evidence based Sensitivity Assessment (MarESA) (Tyler-Walters *et al*., 2018). The MarESA is a database which has been developed through the Marine Life Information Network (MarLIN) of Britain and Ireland and is maintained by a number of organisations, including the Marine Biological Association (MBA) and other statutory organisations in the UK. This database comprises a detailed review of available evidence on the effects of pressures on marine species or habitats, and a subsequent scoring of sensitivity against a standard list of pressures, and their benchmark levels of effect.

4.1.7.5 The evidence base presented in the MarESA is peer reviewed and represents the largest review undertaken to date on the effects of human activities and natural events on marine species and habitats. It is considered to be one of the best available sources of evidence relating to recovery of benthic species and habitats.

4.1.7.6 Further detail on how sensitivity is defined is outlined in Tyler-Walters *et al*. (2018). Sensitivities to the key activities across the lifetime of the Morgan Offshore Wind Project generation assets (i.e. construction, operation and maintenance, and decommissioning phases) will be summarised according to the MarESA for each of the IEFs within the Morgan benthic subtidal and intertidal ecology study area for the generation assets. Where sensitivity information on specific biotopes are not available through the MarESA, suitable proxies will be used.

4.1.8 Potential cumulative effects

4.1.8.1 The majority of predicted effects of construction, operation and maintenance, and decommissioning of the Morgan Offshore Wind Project generation assets infrastructure within the Morgan Array Scoping Boundary on benthic communities are considered to be localised to within the footprint of the Morgan Offshore Wind Project generation assets. However, there is potential for cumulative effects to occur on benthic subtidal and intertidal ecology from other projects or activities within the Morgan regional benthic subtidal and intertidal ecology study area for the generation assets, where projects or plans could act collectively with the Morgan Offshore Wind Project generation assets to affect benthic receptors. The cumulative effects assessment will follow the approach outlined in part 1, section 4: EIA methodology, of the EIA Scoping Report.

4.1.9 Potential inter-related effects

4.1.9.1 The assessment of potential inter-related effects will be considered within the Benthic subtidal and intertidal ecology ES chapter. It will include consideration of project lifetime effects and receptor-led effects, in line with the approach outlined in part 1, section 4: EIA methodology, of the EIA Scoping Report.

4.1.10 Potential transboundary impacts

4.1.10.1 A screening of transboundary impacts has been carried out and is presented in part 3, Annex A: Transboundary Impacts Screening, of the EIA Scoping Report. This screening exercise identified that there is no potential for significant transboundary effects with regard to benthic subtidal and intertidal ecology due to construction, operation and maintenance, and decommissioning impacts of the Morgan Offshore Wind Project generation assets, as the predicted impacts on the benthic communities will largely occur within the footprint of the Morgan Array Scoping Boundary.

4.2 Fish and shellfish ecology

4.2.1 Introduction

4.2.1.1 This section of the Environmental Impact Assessment (EIA) Scoping Report identifies the fish and shellfish ecological receptors of relevance to the Morgan Offshore Wind Project generation assets and considers the potential impacts arising from the construction, operation and maintenance, and decommissioning of the generation assets.

4.2.2 Study area

4.2.2.1 Fish and shellfish are spatially and temporally variable therefore, for the purpose of the fish and shellfish ecology characterisation, a broad study area has been defined. The Morgan fish and shellfish ecology study area for the generation assets is presented in Figure 4.6 and described below.

4.2.2.2 The Morgan fish and shellfish ecology study area for the generation assets covers the east Irish Sea, extending from Mean High Water Springs (MHWS) out to the furthest west extent from the Mull of Galloway in Scotland to the western tip of Anglesey. This study area has been selected to account for the spatial and temporal variability of fish and shellfish populations, including fish migration. This was considered appropriate as it will ensure characterisation of all fish and shellfish receptors in the east Irish Sea and is large enough to consider all potential direct (e.g. habitat loss/disturbance within project boundaries) and indirect (e.g. underwater noise over a much wider area) impacts of the Morgan Offshore Wind Project generation assets on the identified receptors.

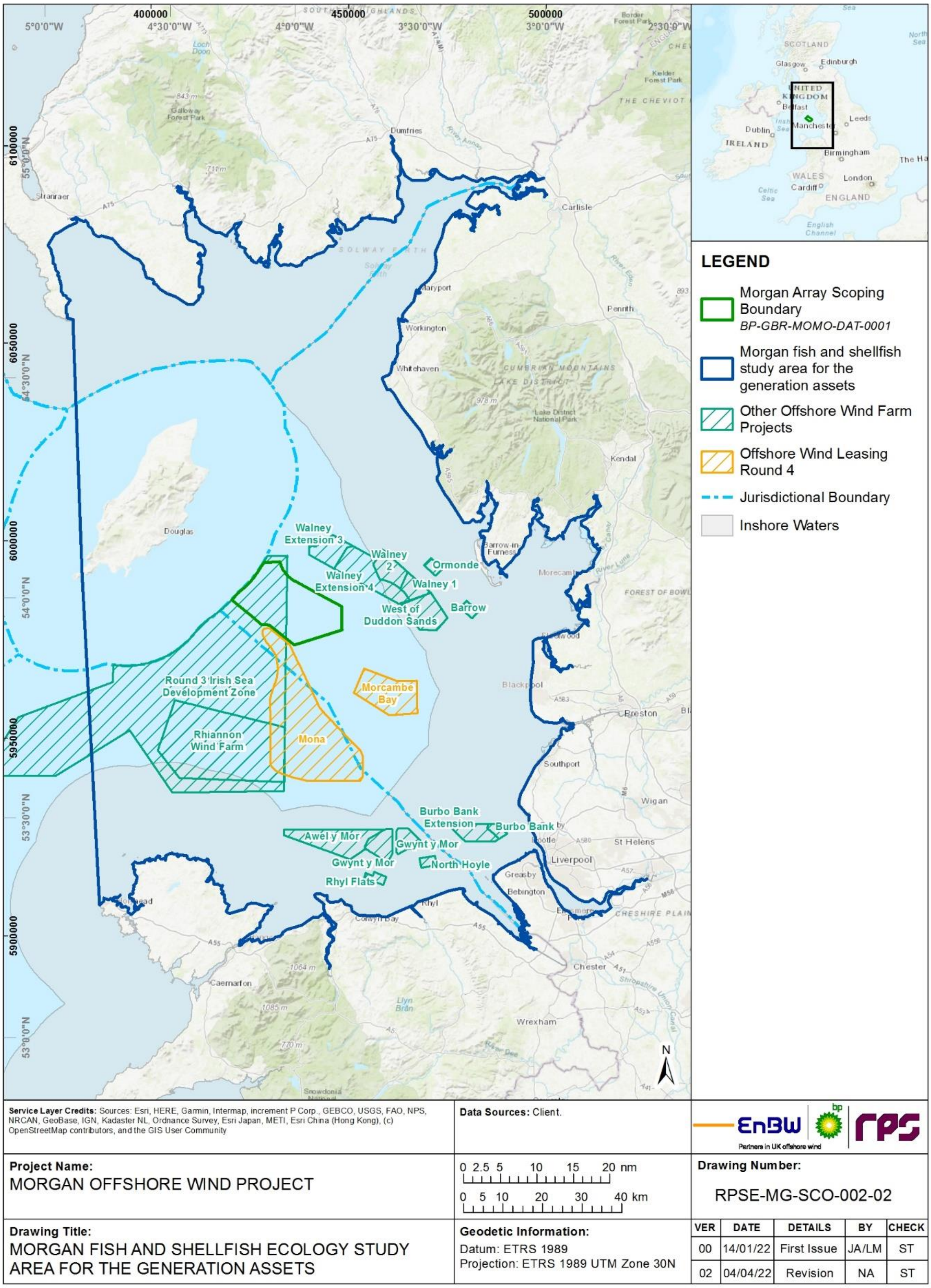


Figure 4.6: The Morgan fish and shellfish ecology study area for the generation assets.

4.2.3 Data sources

Desktop data

4.2.3.1 An initial desk based review of literature and data sources to support this EIA Scoping Report has identified a number of data sources which provide coverage of the Morgan fish and shellfish ecology study area for the generation assets. These are summarised in Table 4.7.

Table 4.7: Summary of key desktop datasets and reports.

Title	Source	Year	Author
International council for the exploration of the sea (ICES) working group on surveys on ichthyoplankton in the North Sea and adjacent seas	ICES	2021	ICES
Marine Recorder Public UK Snapshot	Joint Nature Conservation Committee (JNCC)	2020	JNCC
Bass and Ray Ecology in Liverpool Bay	Bangor University Sustainable Fisheries and Aquaculture Group.	2020	Moore *et al*.
National Biodiversity Network (NBN) Atlas	NBN Atlas	2019	NBN Atlas
Welsh Waters Scallop Surveys and Stock Assessment	Bangor University	2019	Delargy *et al*.
JNCC MPA Mapper	JNCC	2019	JNCC
Walney Offshore Wind Farm, Year 2 Post-construction Monitoring Fish and Epibenthic Survey	Marine Data Exchange	2013	Brown and May Marine Ltd
Welsh waters scallop survey – Cardigan Bay to Liverpool Bay July-August 2013	Bangor University	2013	Lambert *et al*.
Celtic Array Ltd offshore wind farm preliminary environmental information chapter 10: fish and shellfish ecology	Marine Data Exchange	2014	Celtic Array Ltd
Northern Irish Ground Fish Trawl Survey (NIGFS)	ICES	2013	ICES
West of Duddon Sands Offshore Wind Farm, Adult and Juvenile Fish and Epibenthic Pre-Construction Surveys	Marine Data Exchange	2012	Brown and May Marine Ltd
Mapping the Spawning and Nursery Grounds of Selected Fish for Spatial Planning	Cefas	2012	Ellis *et al*.
Gwynt y Mor Offshore Wind Farm, Pre-construction Baseline Beam Trawl Data	Marine Data Exchange	2011	Centre for Marine and Coastal Studies Ltd (CMACS)
Burbo Bank Offshore Wind Farm, Post-construction (Year 3) Commercial Fish Survey	Marine Data Exchange	2010	CMACS
Ormonde Offshore Wind Farm, Construction (Year 1) Environmental Monitoring	Marine Data Exchange	2010	RPS Energy
Celtic Array Ltd (Zone 9) Autumn Fish Trawl Survey	Marine Data Exchange	2010	CMACS

Title	Source	Year	Author
Walney Offshore Wind Farm Pre-Construction Fish Survey	Marine Data Exchange	2009	Brown and May Marine Ltd
Rhyl Flats Offshore Wind Farm, Fish and Fisheries Baseline Study	Marine Data Exchange	2002-2006	Coastal Fisheries Conservation and Management
Burbo Bank Offshore Wind Farm, Electromagnetic Fields and Marine Ecology Study	Marine Data Exchange	2007	CMACS
Burbo Bank Offshore Wind Farm, Pre-construction Commercial Fish Survey (2m Beam Trawl)	Marine Data Exchange	2006	CMACS
Walney and West of Duddon Sands Offshore Wind Farms, Baseline Benthic Survey – Epifaunal Beam Trawl Results	Marine Data Exchange	2005	Titan Environmental Surveys Ltd
Fisheries Sensitivity Maps in British Waters	United Kingdom Offshore Operators Association (UKOOA) Ltd.	1998	Coull *et al*.
Herring larvae surveys of the northern Irish Sea	The Agri-Food and Biosciences Institute (AFBI)	1993-2021	AFBI
Fish and shellfish survey results for the east Irish Sea	Environment Agency	Various	Environment Agency
Marine Life Information Network (MarLIN)	MarLIN	2018	Tyler-Wlaters *et al*
SeaLifeBase	https://www.sealifebase.ca/	2021	Palomares and Pauly
Fish and shellfish survey results for the east Irish Sea	Environment Agency	Various	Environment Agency
Updating Fishereis Sensitivity Maps in British Waters	Scottish Marine and Freshwater Science Report	2014	Aires *et al*
Cefas Pelagic ecosystem in the western English Channel and eastern Celtic Sea (PELTIC) surveys	Cefas	Various	Cefas
Fish and shellfish sensitivity reports.	https://www.marlin.ac.uk/activity/pressures_report	n/a	Various

4.2.3.2 There are a number of publicly available fish and shellfish characterisation datasets and reports which overlap with the Morgan fish and shellfish ecology study area for the generation assets which will be used to inform the fish and shellfish baseline characterisation. Site-specific data collected as part of the benthic surveys will also be used to inform the fish and shellfish baseline characterisation. The benthic surveys will include benthic grab samples which will be analysed for particle size analysis (PSA) to inform habitat suitability for sandeels *Ammodytidae* and herring *Clupea harengus* spawning (discussed in section 4.2.4). Fish assemblage data collected through incidental observations of fish and shellfish species from the benthic grabs and seabed imagery (e.g. sandeels and crustaceans) will also provide additional validation to the desktop data. Site-specific data collected as part of the aerial marine mammal surveys will record basking shark (if sighted) which will inform the fish and shellfish baseline characterisation.

4.2.3.3 No further site-specific fish and shellfish surveys are therefore proposed across the Morgan fish and shellfish ecology study area for the generation assets.

4.2.4 Baseline environment

Fish assemblage

4.2.4.1 Distribution of fish is determined by a range of factors including abiotic parameters such as water temperature, salinity, depth, local scale habitat features and substrate type. In addition to biotic parameters such as predator prey interactions, competition and anthropogenic factors such as infrastructure and commercial fishing intensity.

4.2.4.2 The fish assemblage within the Morgan fish and shellfish ecology study area for the generation assets includes demersal species: European plaice *Pleuronectes platessa*, dab *Limanda limanda*, solenette *Buglossidium luteum*, Dover sole *Solea solea,* whiting *Merlangius merlangus*, lesser spotted dogfish *Scyliorhinus canicula* and cod *Gadus morhua*.

4.2.4.3 European seabass *Dicentrarchus labrax* and thornback ray *Raja clavata* have been recorded in Liverpool Bay, the Dee estuary and Morecambe Bay within the Morgan fish and shellfish ecology study area for the generation assets. European seabass caught in local fisheries recorded a bias towards females which is consistent with data from north Wales and could possibly indicate localized spawning (Moore *et al*., 2020).

4.2.4.4 Beam trawl surveys were undertaken in 2010 and 2011 across the Irish Sea Round 3 development zone which overlaps with the southwest of the Morgan fish and shellfish ecology study area for the generation assets and partially overlaps with the Morgan Array Scoping Boundary. The surveys reported that the most dominant fish species present were poor cod *Trisopterus minutus* and the lesser spotted dogfish. The next most common species were dragonet *Callionymus lyra*, grey gurnard *Eutrigla gurnardus* and red gurnard *Aspitrigla cuculus*. The most common commercial fish species was plaice. Seven elasmobranch species were recorded, including cuckoo ray *Raja naevus* and spotted ray *Raja montagui* (CMACS, 2010; Celtic Array Ltd, 2014b).

4.2.4.5 A number of fish surveys have been undertaken across the Morgan fish and shellfish ecology study area for the generation assets for the surrounding offshore wind farm developments (Figure 4.6). Beam and otter trawl surveys were undertaken during 2011-2013 for Walney offshore wind farm (year 2 post-construction monitoring), for the West of Duddon Sands offshore wind farm (pre-construction survey) and for the Gwynt y Mor offshore wind farm (pre-construction surveys). All surveys recorded plaice, dab, solenette and the lesser spotted dogfish as the most abundant species (CMACS, 2010; CMACS, 2011; Celtic Array Ltd, 2014b; Brown and May Marine Ltd, 2013; 2012). Cod and whiting were also consistently recorded across the area. Dover sole and cod were identified as species of key commercial importance in the area (Brown and May Marine Ltd, 2013). Sand goby *Pomatoschistus minutus* were recorded in high abundance within the Gwynt y Mor offshore wind farm (CMACS, 2011). Two elasmobranch species were also recorded within the Gwynt y Mor offshore wind farm: thornback ray and blonde ray *Raja brachyura* (CMACS, 2011).

4.2.4.6 Basking shark *Cetorhinus maximus* are known to migrate through the Irish Sea, with high numbers of sighting recorded around the Isle of Man (NBN Atlas, 2019). Basking shark have been sighted in a density of 11-50 individuals sighted per 0.5 by 0.5° (degrees) (50 by 50km) to the north of the Isle of Man, within the Morgan fish and shellfish ecology study area for the generation assets (Southall *et al.,* 2005). Basking shark have a north-south migration and are expected to occur in the vicinity of the Morgan fish and shellfish ecology study area for the generation assets during August to October and during the return migration in March to June (Doherty *et al*., 2017). No basking shark were recorded in the site-specific surveys from April 2021 to September 2021. Basking shark will be recorded (if sighted) in the remaining months of the site-specific aerial surveys undertaken for marine mammals across the Morgan Array Scoping Boundary. This data will be presented as part of the fish and shellfish baseline characterisation within the Preliminary Environmental Information Report (PEIR) and Environmental Statement (ES) chapter.

Diadromous fish species

4.2.4.7 Diadromous fish are species which migrate between freshwater and the sea during key life history stages (i.e. spawning). These may be anadromous (when fish spend most of their lives at sea but return to freshwater to spawn (e.g. Atlantic salmon *Salmo salar)*) or catadromous (when fish spend most of their lives in freshwater but return to the sea to breed (e.g. European eel)).

4.2.4.8 There is the potential for diadromous fish species to migrate to and from rivers in the vicinity of the Morgan Offshore Wind Project generation assets and, therefore, they may migrate through the Morgan fish and shellfish ecology study area for the generation assets to rivers during certain periods of the year (NBN Atlas, 2019).

4.2.4.9 Fish and epibenthic surveys carried out in 2013 for the Walney offshore wind farm and in 2012 for the West of Duddon Sands offshore wind farm recorded sea trout *Salmo trutta*, a migratory species of relevance within the Morgan fish and shellfish ecology study area for the generation assets (Brown and May Marine Ltd, 2013; 2012).

4.2.4.10 Sea trout, European eel river lamprey *Lampetra fluviatilis* and Atlantic salmon have been recorded in the estuaries of rivers across the Morgan fish and shellfish ecology study area for the generation assets. Twaite shad *Alosa fallax* and allis shad *Alosa alosa* have only been recorded at the mouth of the river Esk in the north of the Morgan fish and shellfish ecology study area for the generation assets (NBN Atlas, 2019).

4.2.4.11 Sea lamprey *Petromyzon marinus* have been recorded in the estuaries of the river Dee and the river Mersey however these records are from the 1960s and 1970s (NBN Atlas, 2019).

4.2.4.12 For the purposes of the fish and shellfish assessment, it will be assumed that the aforementioned diadromous species have the potential to occur within the Morgan fish and shellfish ecology study area for the generation assets, primarily during key migration periods (e.g. adult migration to spawning rivers and smolt/juvenile migration from natal rivers in the vicinity of the Morgan Offshore Wind Project generation assets). For migratory fish species, the fish and shellfish assessment will determine whether construction, operation and maintenance or decommissioning activities have the potential to lead to disruption to migration, for example construction noise potentially creating an effective barrier to fish migration. The timing of fish migration will therefore be an important element of the baseline characterisation and this will be collected through a review of desktop data sources e.g. recent papers (e.g. Gardiner *et al.*, 2018), local rod catches and fish stock reports (Cefas and Environment Agency, 2017).

Shellfish assemblage

4.2.4.13 North Wales has a long history of scallop fisheries with both king *Pecten maximus* and queen scallops *Aequipecten opercularis* regularly fished. Bangor University has conducted eight scallop research surveys in Welsh waters since 2012. The king scallop populations in Liverpool Bay have been recorded in consistently low densities and are dominated by larger, older individuals with little or highly sporadic recruitment occurring. However, the 2019 surveys did record evidence of pre-recruit (<110 mm) scallops in Liverpool Bay (Delargy *et al*., 2019).

4.2.4.14 Shellfish recorded in the trawl surveys undertaken in 2010 and 2011 across the Rhiannon offshore wind farm were king scallop, queen scallop, common whelk *Buccinum undatum*, edible crab *Cancer pagurus*, lobster *Homarus gammarus*, brown shrimp *Crangon crangon* and horse mussel *Modiolus modiolus*. Queen scallop were the most numerous shellfish species recorded (Celtic Array Ltd, 2014b).

4.2.4.15 Beam trawl surveys carried out in 2012 for the West of Duddon Sands offshore wind farm, in 2013 for the Walney offshore wind farm and in 2011 for the Gwynt y Mor offshore wind farm recorded a number of shellfish species within the Morgan fish and shellfish ecology study area for the generation assets. Frequently recorded species included: *Nephrops norvegicus*, swimming crab *Liocarcinus* spp., brown shrimp *Crangon allmanni*, transparent razor shell *Phaxas pellucidus*, prickly cockle *Acanthocardia echinata* and the common whelk (Brown and May Marine Ltd, 2013; 2012; CMACS, 2011).

4.2.4.16 *Nephrops* have been consistently recorded across the Walney offshore wind farm with the highest number of individuals (3,296) in a single otter trawl recorded in 2009 (Brown and May Marine Ltd, 2013). The otter trawl surveys for the Walney offshore wind farm post-construction monitoring recorded *Nephrops* as the most abundant shellfish species. *Nephrops* were identified as a species of key commercial importance in the area (Brown and May Marine Ltd, 2013). Beam trawl surveys carried out in 2012 for the West of Duddon Sands offshore wind farm also recorded *Nephrops* within the West of Duddon Sands offshore wind farm array area, which is within the Morgan fish and shellfish ecology study area for the generation assets (Figure 4.5).

Spawning and nursery grounds

4.2.4.17 Potential nursery and spawning areas in the Irish Sea for a range of species were identified by Coull *et al*. (1998), based on larvae, egg and benthic habitat data. Ellis *et al*. (2012) reviewed this data for several finfish species in the Irish Sea, including cod, whiting and herring, providing an updated understanding of areas of low and high intensity nursery and spawning grounds.

4.2.4.18 Based on this data, spawning areas and nursery for several species overlap the Morgan fish and shellfish ecology study area for the generation assets. Species with known spawning periods and nursery habitats identified within the Morgan fish and shellfish ecology study area for the generation assets have been summarised in Table 4.8, and illustrated in Figure 4.7 to Figure 4.16.

Table 4.8: Key species with geographic spawning and nursery overlaps with the Morgan fish and shellfish ecology study area for the generation assets (Coull *et al*., 1998 and Ellis *et al*., 2012. Mapped in Figure 4.7 to Figure 4.16).

Common name	Species	Spawning	Nursery
Anglerfish	*Lophius piscatorius*	×	✓
Cod	*Gadus morhua*	✓	✓
European Hake	*Merluccius merluccius*	✓	×
Haddock	*Melanogrammus aeglefinus*	×	✓
Herring	*Clupea harengus*	✓	✓
Horse mackerel	*Trachurus trachurus*	✓	×
Lemon sole	*Microstomus kitt*	✓	✓
Ling	*Molva molva*	✓	×
Mackerel	*Scomber scombrus*	✓	✓
Nephrops	*Nephrops norvegicus*	✓	✓
Plaice	*Pleuronectes platessa*	✓	✓
Sandeels	*Ammodytidae*	✓	✓
Sole	*Solea solea*	✓	✓
Spotted ray	*Raja montagui*	×	✓
Sprat	*Clupeidae sp.*	✓	×
Spurdog	*Squalus acanthias*	×	✓
Thornback ray	*Raja clavata*	×	✓
Tope shark	*Galeorhinus galeus*	×	✓
Whiting	*Merlangius merlangus*	✓	✓

4.2.4.19 A review of spawning and nursery grounds suggests there is an overlap of the Morgan fish and shellfish ecology study area for the generation assets with herring spawning and nursey grounds. For nursery grounds this overlap occurs across the east of the Morgan Array Scoping Boundary in inshore areas and is high intensity (Ellis *et al*., 2012; Figure 4.6). The (AFBI) in

Northern Ireland has undertaken herring larvae surveys of the northern Irish Sea in November every year since 1993. The 2019 survey results recorded that the majority of herring larvae were captured in the east Irish Sea in the vicinity of the Douglas Bank spawning ground and to the north of the Isle of Man (ICES, 2021). Additional data on the north Irish Sea herring larvae survey will be requested from the AFBI to support the baseline characterisation presented within the Fish and shellfish ecology ES chapter.

4.2.4.20 Herring are a commercially and ecologically important pelagic fish species (being an important prey species for numerous fish, marine mammal and bird species) and are common across much of the Irish Sea (Dickey-Collas *et al*., 2001). Herring utilise specific benthic habitats during spawning, which increases their vulnerability to activities impacting the seabed. Further, as a hearing specialist, herring are vulnerable to impacts arising from underwater noise.

4.2.4.21 A further review of the herring spawning and nursery grounds will be undertaken to support the fish and shellfish ecology assessment following guidelines set out by Boyle and New (2018) considering seabed sediment type and herring larval abundances (using data from the AFBI, as outlined above).

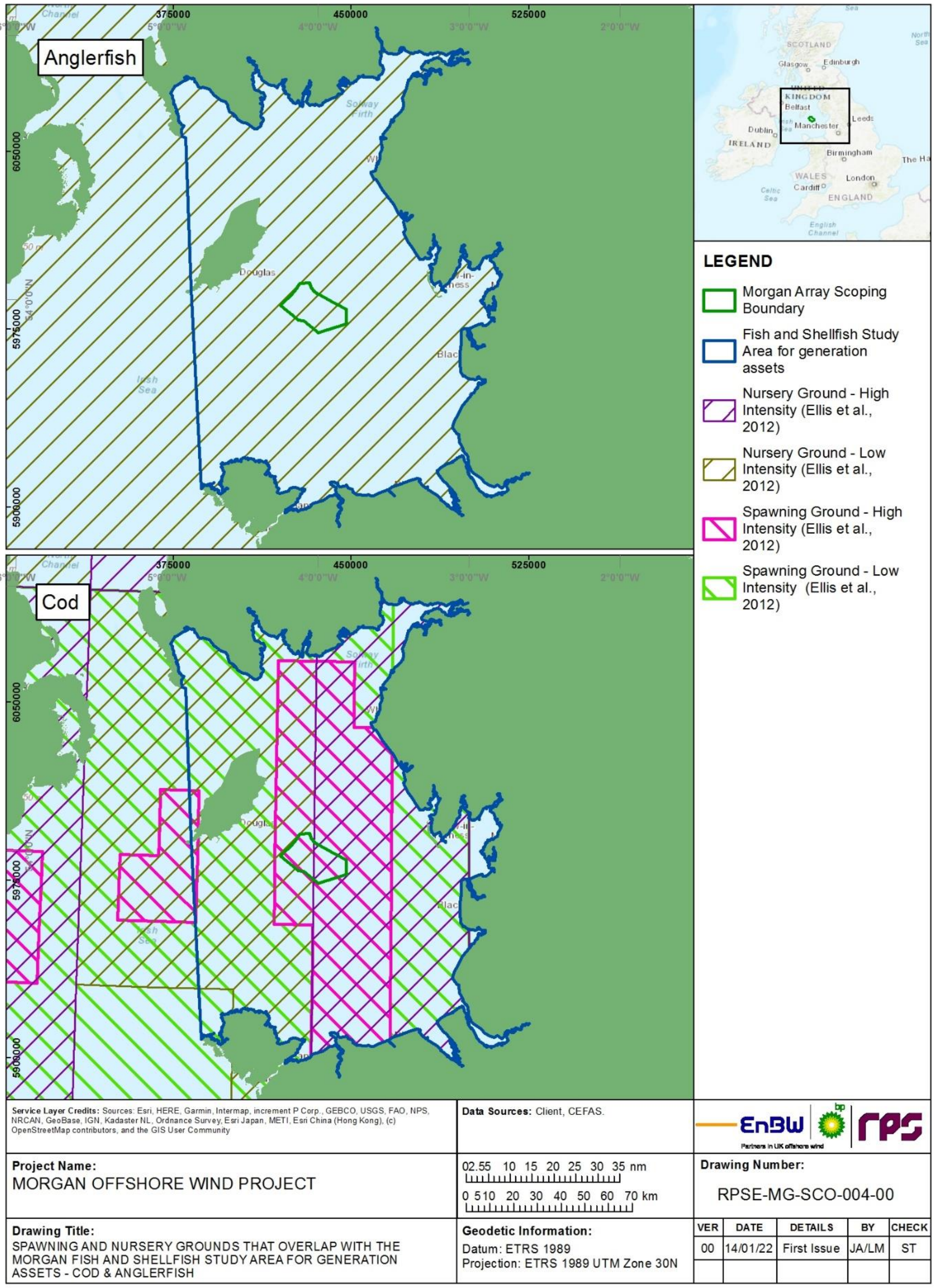


Figure 4.7: Cod and anglerfish spawning and nursery grounds in the vicinity of the Morgan Array Scoping Boundary (Coull *et al*., 1998 and Ellis *et al*., 2012).

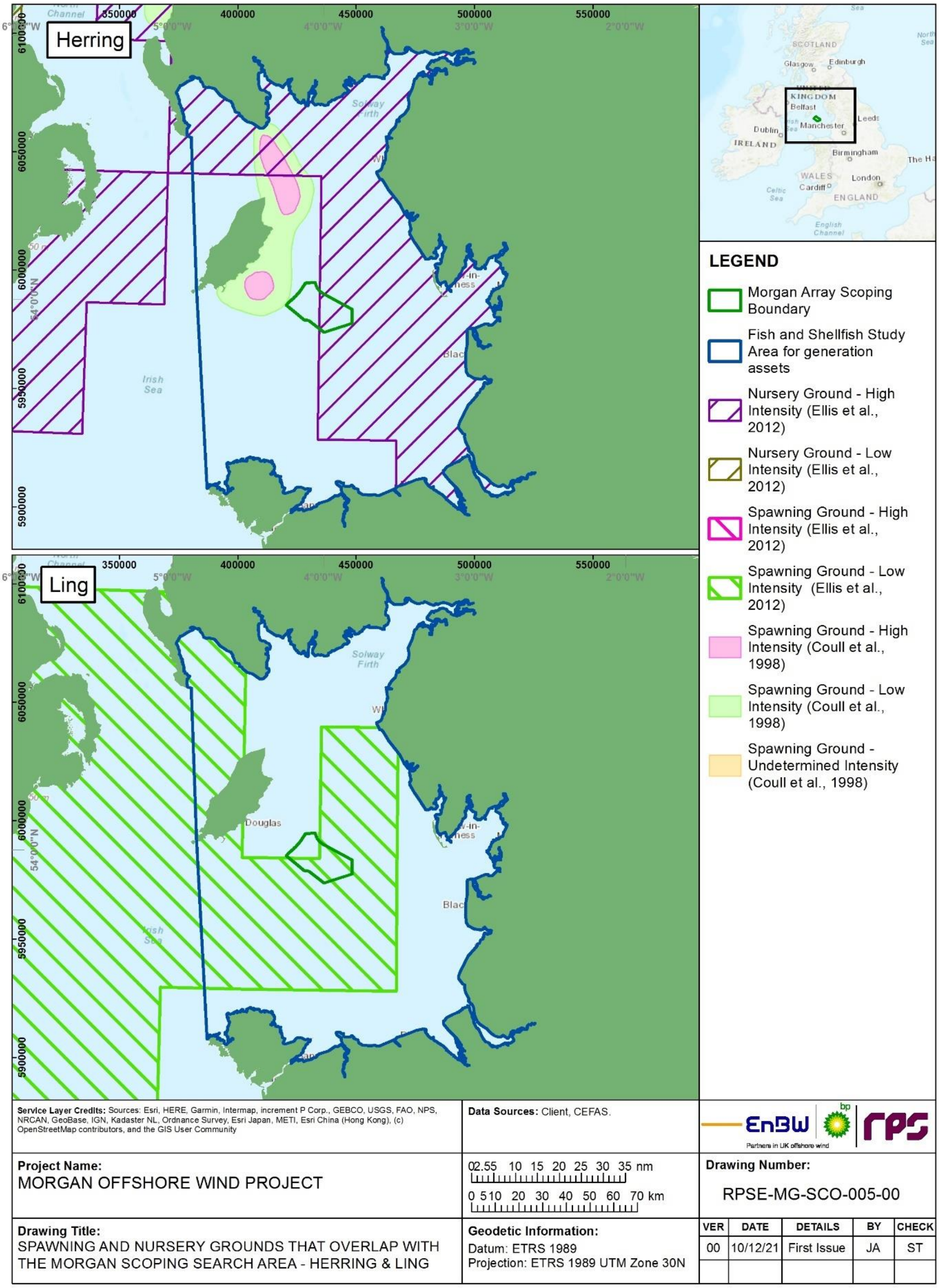


Figure 4.8: Herring and ling spawning and nursery grounds in the vicinity of the Morgan Array Scoping Boundary (Coull *et al*., 1998 and Ellis *et al*., 2012).

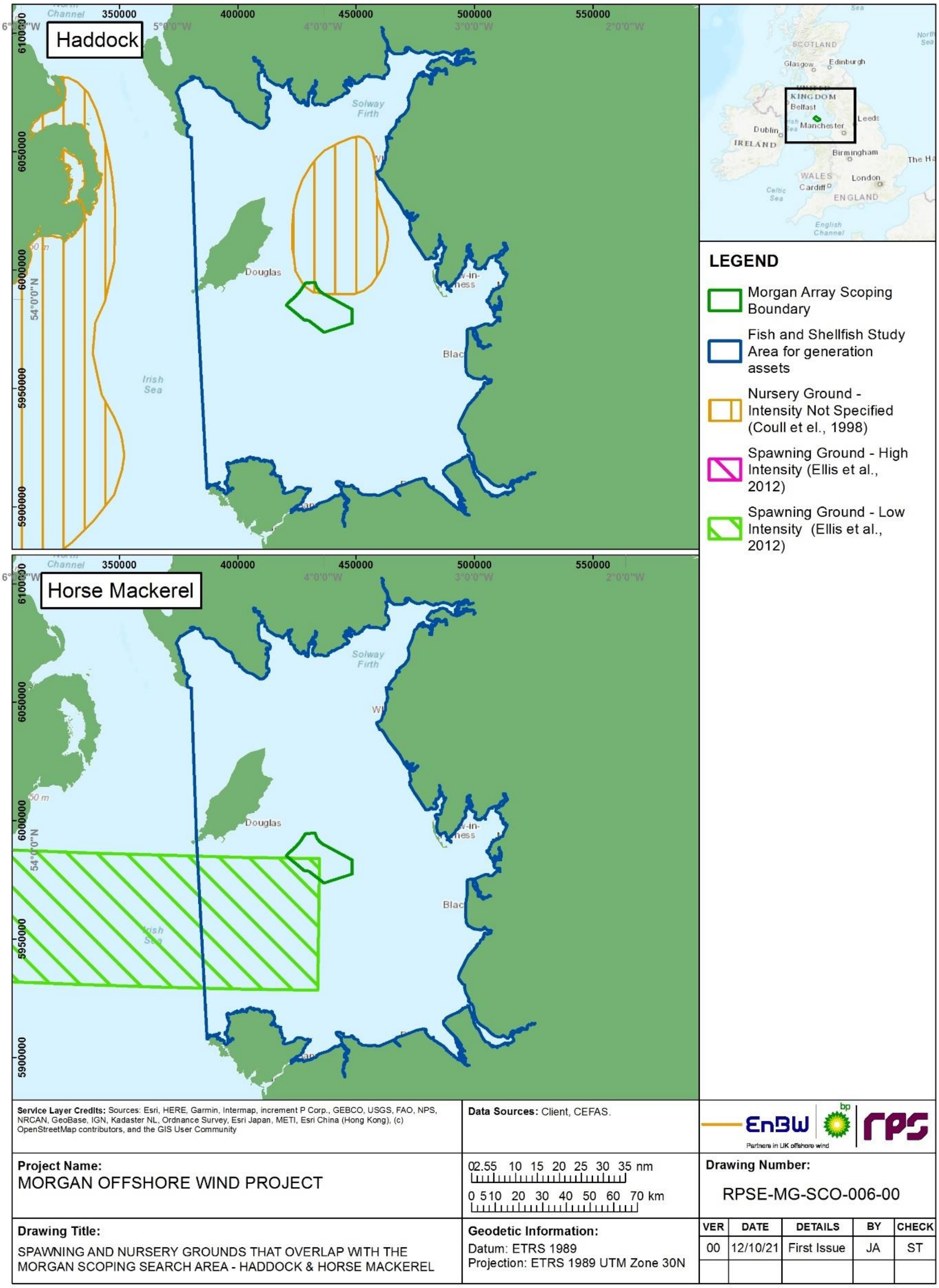


Figure 4.9: Haddock and horse mackerel spawning and nursery grounds in the vicinity of the Morgan Array Scoping Boundary (Coull *et al*., 1998 and Ellis *et al*., 2012).

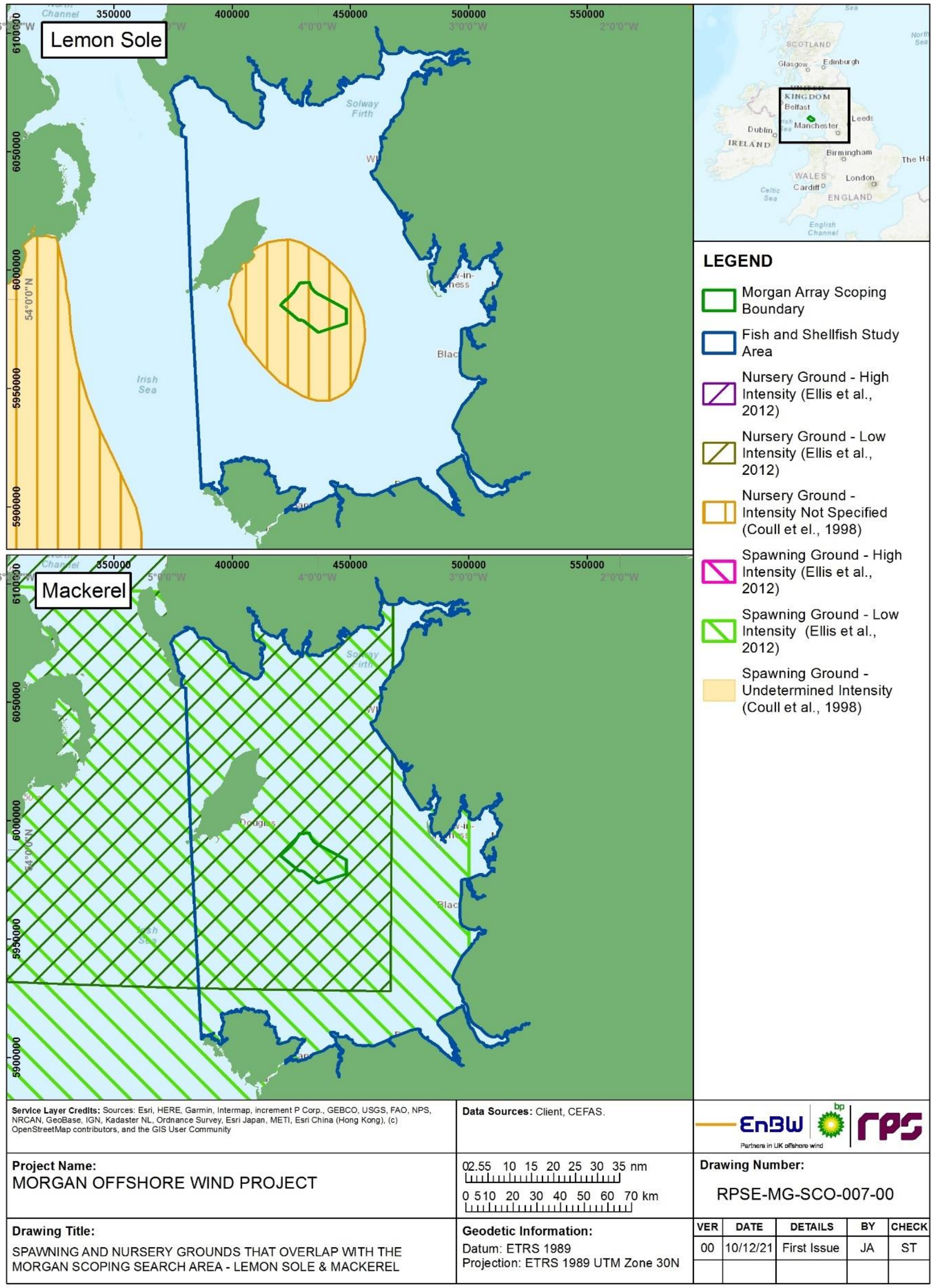


Figure 4.10: Lemon sole and mackerel spawning and nursery grounds in the vicinity of the Morgan Array Scoping Boundary (Coull *et al*., 1998 and Ellis *et al*., 2012).

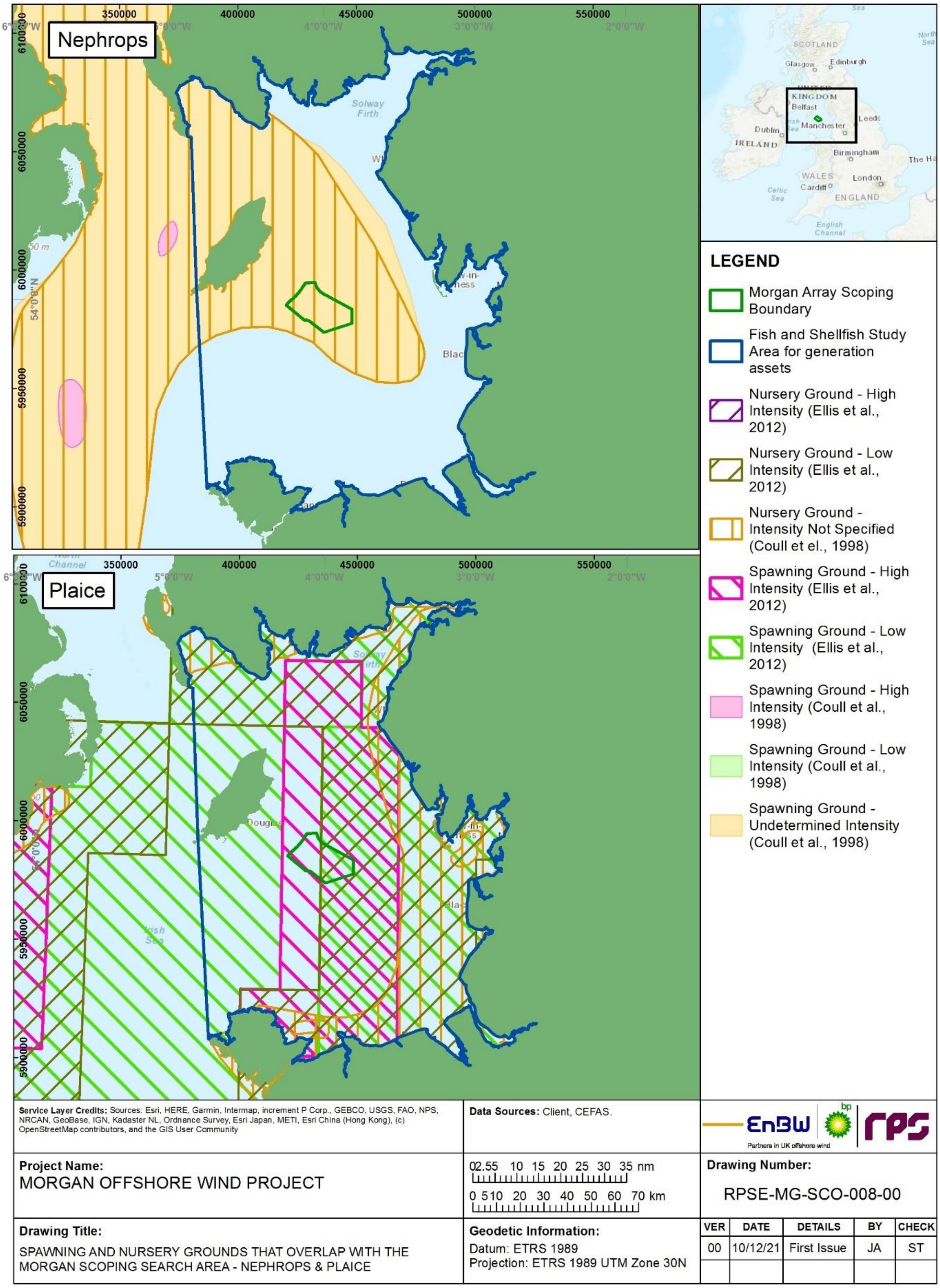


Figure 4.11: Nephrops and plaice spawning and nursery grounds in the vicinity of the Morgan Array Scoping Boundary (Coull *et al*., 1998 and Ellis *et al*., 2012).

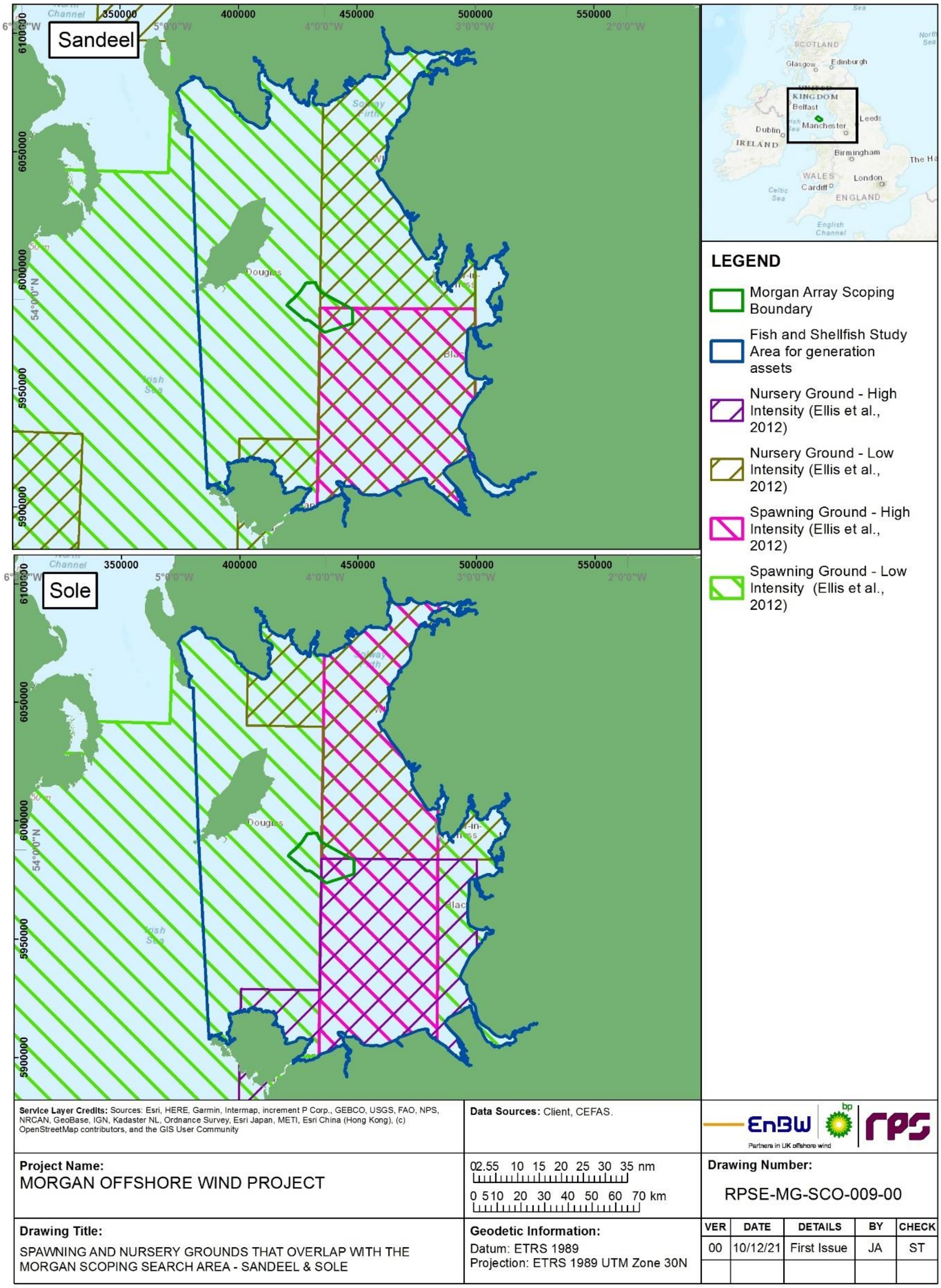


Figure 4.12: Sandeel and sole spawning and nursery grounds in the vicinity of the Morgan Array Scoping Boundary (Coull *et al*., 1998 and Ellis *et al*., 2012).

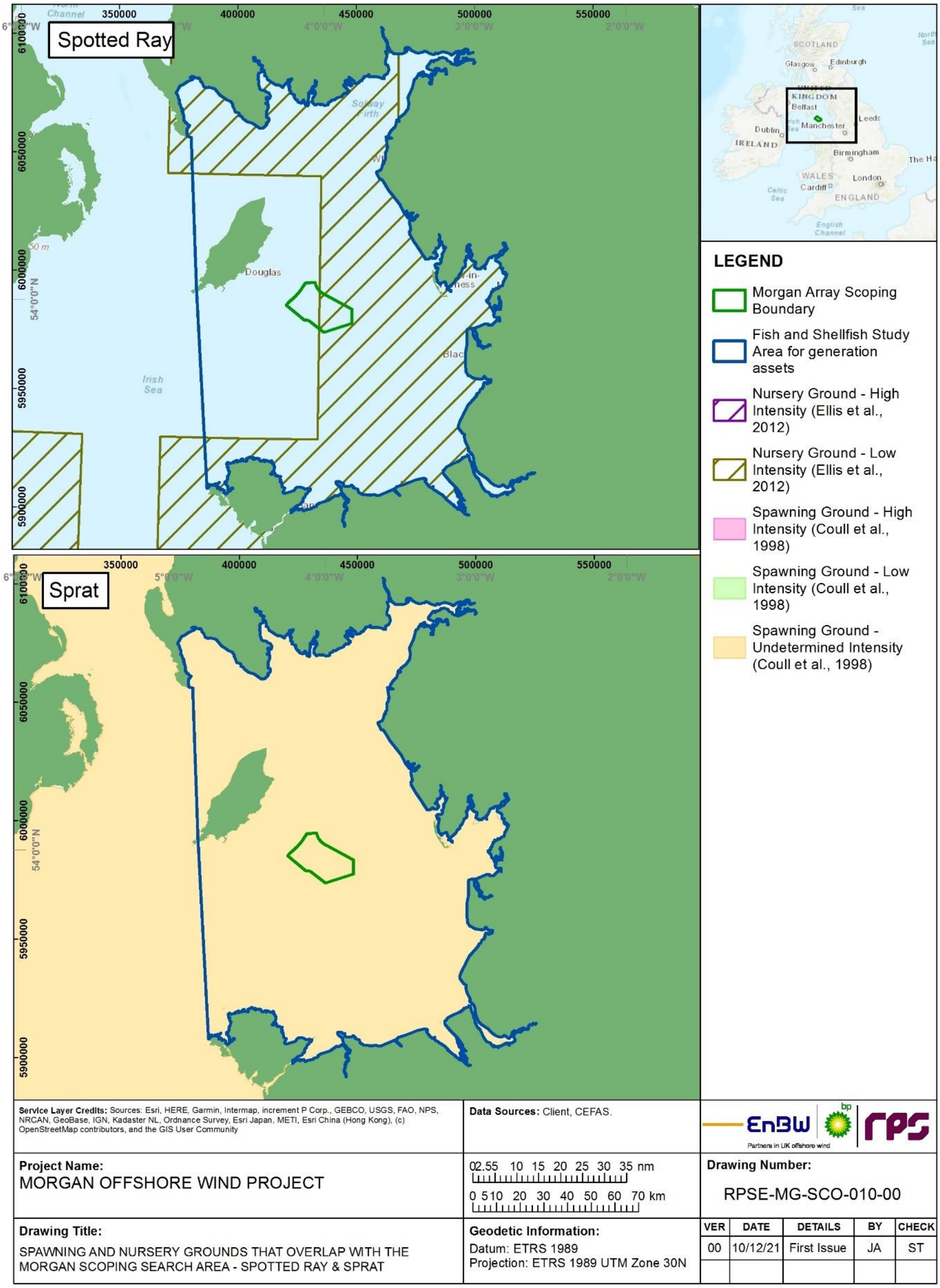


Figure 4.13: Spotted ray and sprat spawning and nursery grounds in the vicinity of the Morgan Array Scoping Boundary (Coull *et al*., 1998 and Ellis *et al*., 2012).

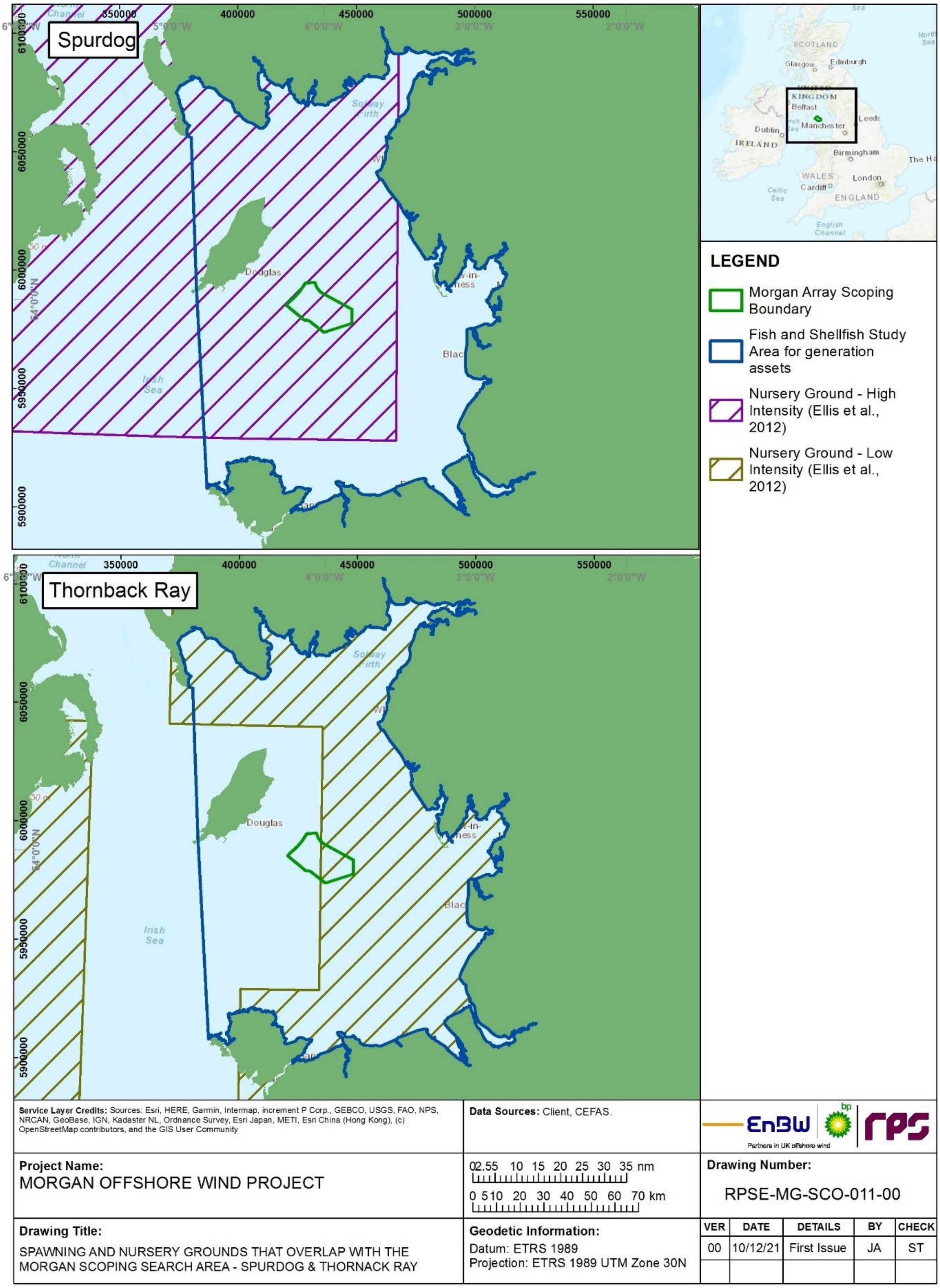


Figure 4.14: Spurdog and thornback ray spawning and nursery grounds in the vicinity of the Morgan Array Scoping Boundary (Coull *et al*., 1998 and Ellis *et al*., 2012).

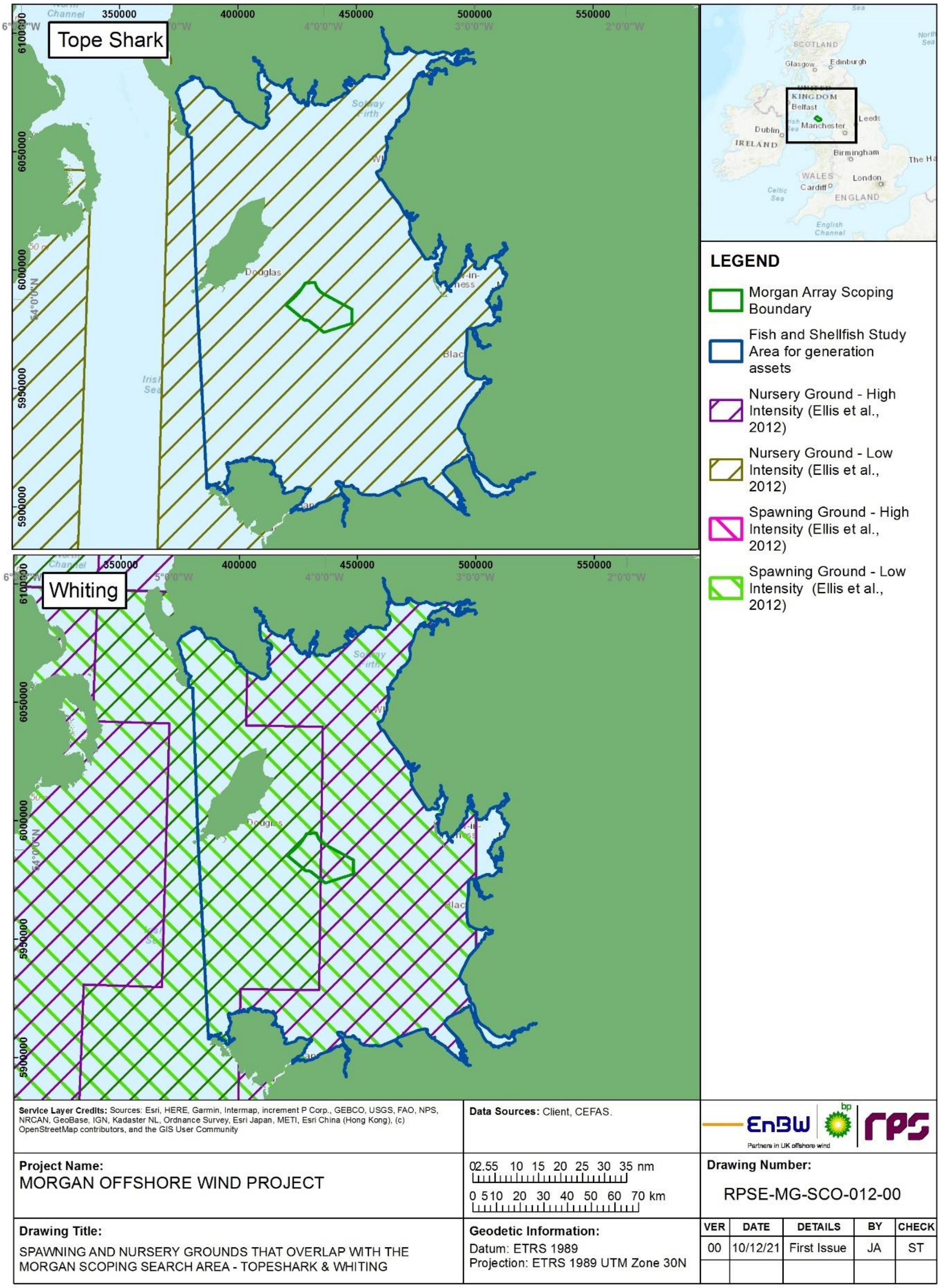


Figure 4.15: Tope shark and whiting spawning and nursery grounds in the vicinity of the Morgan Array Scoping Boundary (Coull *et al*., 1998 and Ellis *et al*., 2012).

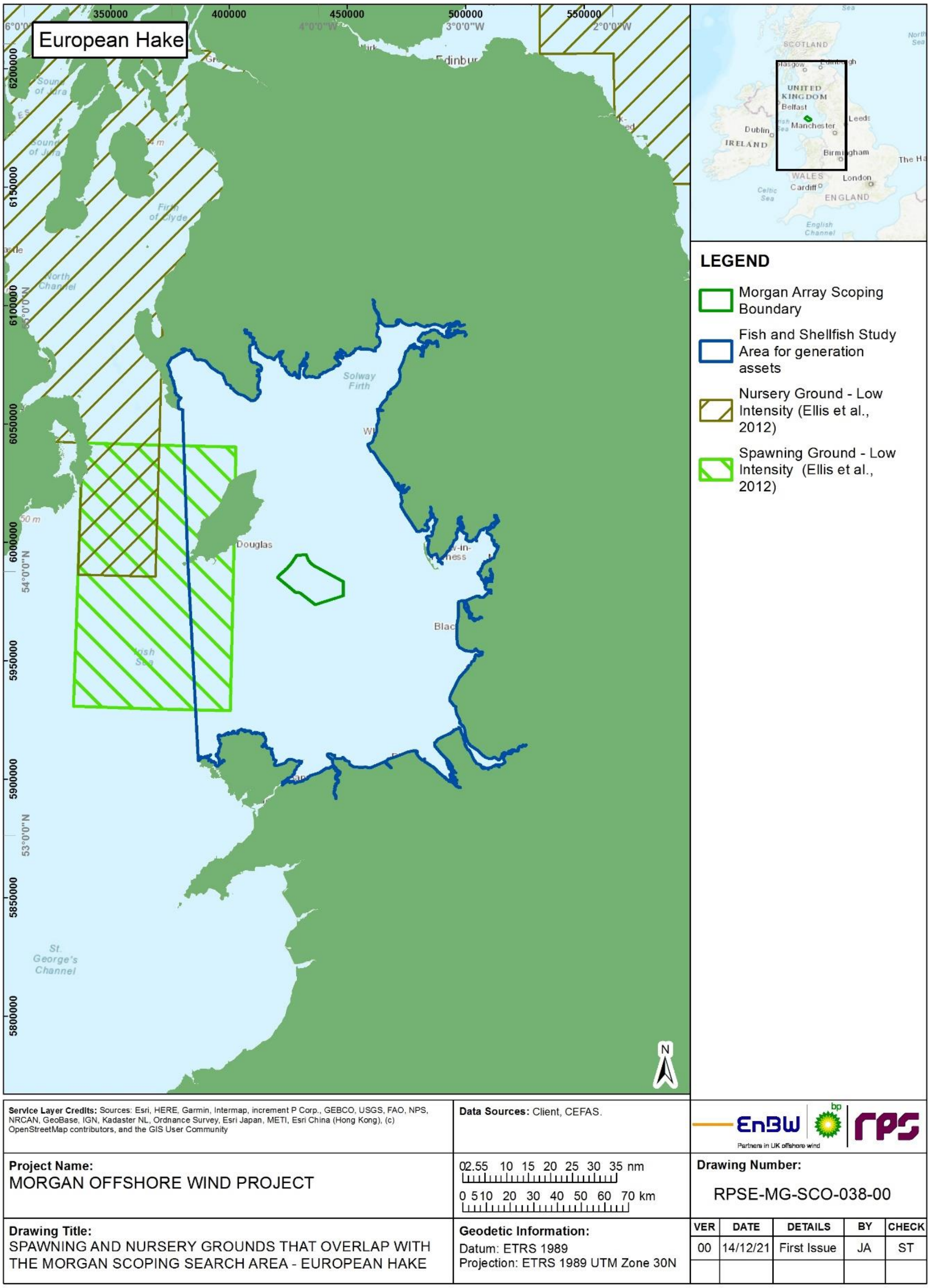


Figure 4.16: European Hake spawning and nursery grounds in the vicinity of the Morgan Array Scoping Boundary (Ellis *et al*., 2012).

Designated sites

4.2.4.22 Designated sites with relevant qualifying features (i.e. fish and shellfish species) which overlap with the Morgan fish and shellfish ecology study area for the generation assets are described in this section.

4.2.4.23 Table 4.9 and Figure 4.17 provide an indication of the designated sites (including migratory fish features) that may be considered within the EIA, Likely Significant Effects (LSE) Screening Report and potentially the Report to Inform Appropriate Assessment (RIAA) if an LSE is identified. This list of designated sites will be refined in the EIA to include sites that fall within the potential ZOI of the Morgan Offshore Wind Project generation assets. This will be determined as part of the EIA process as a more detailed understanding of the project activities and impact pathways develops.

4.2.4.24 A full screening of European sites with qualifying fish features will be undertaken in the LSE Screening Report for the Morgan Offshore Wind Project generation assets, as part of the HRA process. Relevant Annex II fish species of European designated sites screened into the fish and shellfish ecology assessment will be fully considered and assessed in the Fish and shellfish ecology ES chapter. The assessment on the European sites and effects on the site(s) conservation objectives will be undertaken in the RIAA.

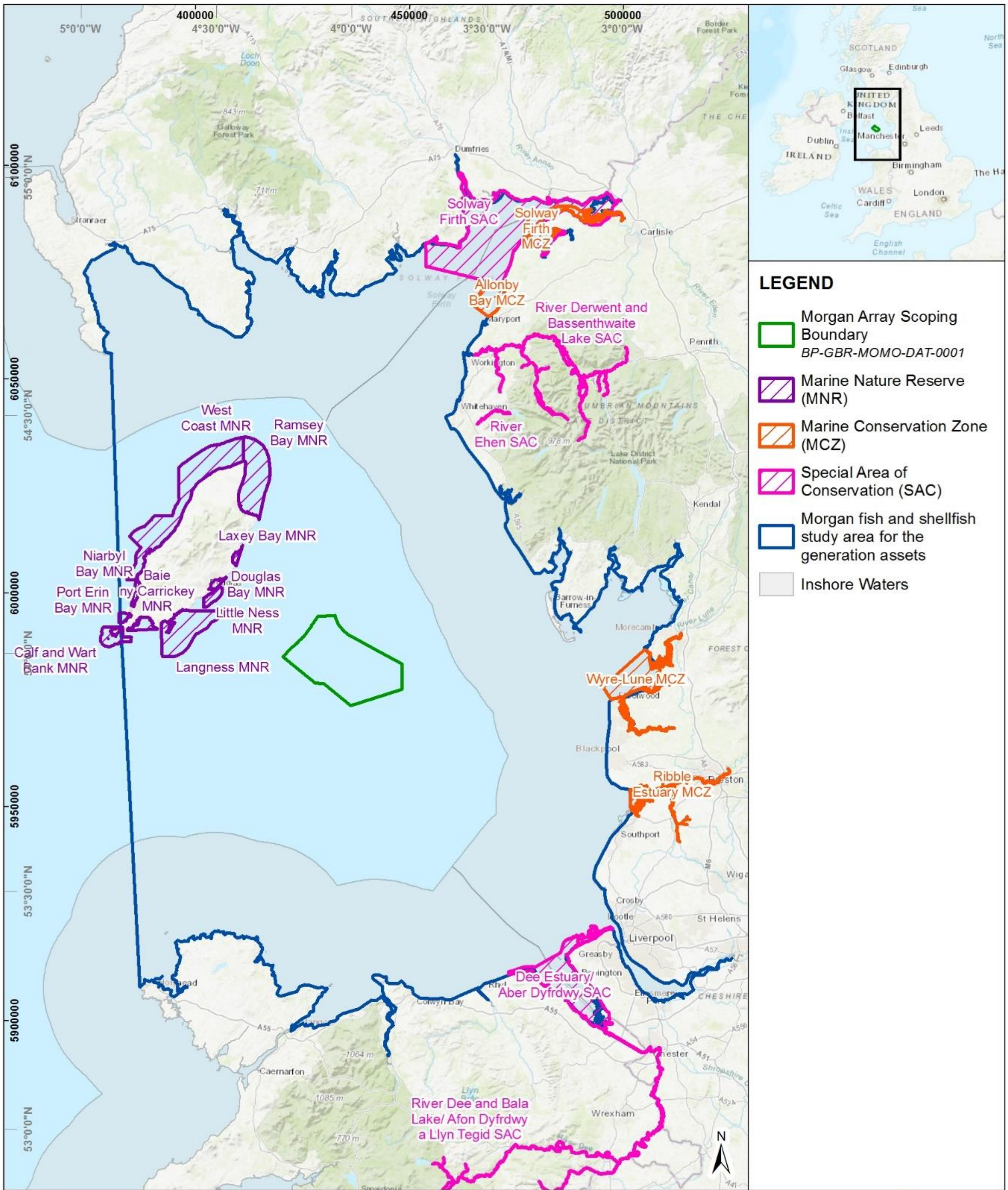
4.2.4.25 The Fish and shellfish ecology ES chapter will also include consideration of nationally designated sites (i.e. Marine Nature Reserves (MNR) and recommended and designated Marine Conservation Zones (MCZs)). Nationally designated sites and their relevant qualifying features will be fully considered and assessed in the Fish and shellfish ecology ES chapter, where there is potential for significant effects on these. MCZs and their features will be considered within a separate MCZ Assessment.

Table 4.9: Summary of designated sites with relevant fish and shellfish ecology features within the Morgan fish and shellfish ecology study area for the generation assets.

Designated Site	Distance to the Morgan Array Scoping Boundary (km)	Features
Langness MNR	16.8	• European eel (*Anguilla anguilla*) • Icelandic clam (*Arctica islandica*) • Cod (spawning/nursery)
Little Ness MNR	20.4	• European eel (*Anguilla anguilla*)
Laxey Bay MNR	22.4	• Icelandic clam (*Arctica islandica*)
Douglas Bay MNR	22.2	• European eel (*Anguilla anguilla*)
Ramsey Bay MNR	26.5	• European eel (*Anguilla anguilla*) • Icelandic clam (*Arctica islandica*)
Baie Ny Carrickey MNR	30.2	• European eel (Anguilla anguilla) • Spiny lobster (*Palinuridae*)
Calf and Wart Bank MNR	35.8	• Spiny lobster (*Palinuridae*) • Flame shell (*Limaria hians*) • Sand eel

Designated Site	Distance to the Morgan Array Scoping Boundary (km)	Features
Niarbyl MNR	36.7	• Icelandic clam (*Arctica islandica*)
Port Erin Bay MNR	36.9	• Flame shell (*Limaria hians*) • Icelandic clam (*Arctica islandica*)
West Coast MNR	38.2	• European eel (Anguilla anguilla) • Common skate (*Dipturus batis*) • Cod (spawning/nursery) • Sand eel • Seabass nursery
Wyre-Lune MCZ	47	• Smelt (*Osmeridae*)
Ribble Estuary MCZ	51.7	• Smelt (*Osmeridae*)
River Ehen SAC	55.7	• Atlantic salmon (*Salmo salar*)
River Derwent and Bassenthwaite Lake SAC	64.9	• Sea lamprey (*Petromyzon marinus*) • Atlantic salmon (*Salmo salar*) • River lamprey (*Lampetra fluviatilis*) • Brook lampreys (*Lampetra planeri*)
Dee Estuary/Aber Dyfrdwy SAC	70.1	• Sea lamprey (*Petromyzon marinus*) • River lamprey (*Lampetra fluviatilis*)
Allonby Bay MCZ	78.5	• Blue mussel (*Mytilus edulis*) beds
Solway Firth SAC	84.4	• Sea lamprey (*Petromyzon marinus*) • River lamprey (*Lampetra fluviatilis*)
River Dee and Bala Lake/Afon Dyfrdwy a Llyn Tegid SAC	92.4	• Sea lamprey (*Petromyzon marinus*) • Atlantic salmon (*Salmo salar*) • River lamprey (*Lampetra fluviatilis*) • Brook lampreys (*Lampetra planeri*) • Bullhead (*Cottus gobio*)*
Solway Firth MCZ	98.3	• Smelt (*Osmeridae*)

*****Bull head is a wholly freshwater species therefore there is no impact-pathway for this species.



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Project Name: MORGAN OFFSHORE WIND PROJECT	0 2.5 5 10 15 20 nm 0 5 10 20 30 40 km	**Drawing Number:** RPSE-MG-SCO-013-02
Drawing Title: MARINE NATURE CONSERVATION DESIGNATIONS OF RELEVANCE TO FISH AND SHELLFISH ECOLOGY	**Geodetic Information:** Datum: ETRS 1989 Projection: ETRS 1989 UTM Zone 30N	

VER	DATE	DETAILS	BY	CHECK
00	10/12/21	First Issue	JA	ST
02	04/04/22	Revision	NA	ST

Figure 4.17: Marine nature conservation designations of relevance to fish and shellfish ecology that overlap with the Morgan fish and shellfish ecology study area for the generation assets.

Protected species

4.2.4.26 Several species of conservation importance have been recorded or have the potential to occur within the Morgan fish and shellfish ecology study area for the generation assets. These are presented below in Table 4.10 and include those species protected under Annex II of the Habitats Regulations or listed as 'species of principal importance' under Section 41 in England of the Natural Environment and Rural Communities (NERC) Act 2006. Where species are afforded protection under other legislation, this has also been noted.

Table 4.10: Relevant protected fish and shellfish species within the Morgan fish and shellfish ecology study area for the generation assets.

Fish and Shellfish Species	Protection legislation
Salmon (*Salmo salar*)	• Annex II of the Habitats Regulations • Habitat of principal importance in England under the Natural Environment and Rural Communities Act 2006 (NERC 2006 Act)
European Eel (*Anguilla anguilla)*	• Annex II of the Habitats Regulations • Habitat of principal importance in England under the NERC 2006 Act • UK Biodiversity Action Plan (BAP) prioity habitat that continues to be regarded as conservation priorities in the subsequent UK Post-2010 Biodiversity Framework • Critically endangered on the International Union for Conservation of Nature (IUCN) Red List
Allis shad (*Alosa alosa*)	• Annex II of the Habitats Regulations • Habitat of principal importance in England under the NERC 2006 Act • Schedule 5 of the Wildelife and Countryside Act 1981
Twaite shad (*Alosa fallax)*	• Annex II of the Habitats Regulations • Habitat of principal importance in England under the NERC 2006 Act • Schedule 5 of the Wildelife and Countryside Act 1981
River lamprey (*Lampetra fluviatilis*)	• Annex II of the Habitats Regulations • Habitat of principal importance in England under the NERC 2006 Act
Sea lamprey (*Petromyzon marinus*)	• Annex II of the Habitats Regulations • Habitat of principal importance in England under the NERC 2006 Act
Sea trout (*Salmo trutta*)	• Habitat of principal importance in England under the NERC 2006 Act • UK BAP prioity habitat that continues to be regarded as conservation priorities in the subsequent UK Post-2010 Biodiversity Framework
Smelt (*Osmerus eperlanus*)	• Habitat of principal importance in England under the NERC 2006 Act • UK BAP prioity habitat that continues to be regarded as conservation priorities in the subsequent UK Post-2010 Biodiversity Framework
Basking shark (*Cetorhinus maximus*)	• Habitat of principal importance in Wales under Section 7 of the Environment (Wales) Act 2016

Fish and Shellfish Species	Protection legislation
	• Habitat of principal importance in England under the NERC 2006 Act • Schedule 5 of the Wildelife and Countryside Act 1981 • UK BAP prioity habitat that continues to be regarded as conservation priorities in the subsequent UK Post-2010 Biodiversity Framework
Angel shark (*Squatina squatina*)	• Habitat of principal importance in England under the NERC 2006 Act • Schedule 5 of the Wildelife and Countryside Act 1981 • UK BAP prioity habitat that continues to be regarded as conservation priorities in the subsequent UK Post-2010 Biodiversity Framework
Atlantic cod (*Gadus morhua*)	• Habitat of principal importance in England under the NERC 2006 Act • UK BAP prioity habitat that continues to be regarded as conservation priorities in the subsequent UK Post-2010 Biodiversity Framework • OSPAR threatened and/or declining species • Vulnerable on the IUCN Red List.
Whiting (*Merlangius merlangus*)	• Habitat of principal importance in England under the NERC 2006 Act • UK BAP prioity habitat that continues to be regarded as conservation priorities in the subsequent UK Post-2010 Biodiversity Framework
European hake (*Merluccius merluccius*)	• Habitat of principal importance in England under the NERC 2006 Act • UK BAP prioity habitat that continues to be regarded as conservation priorities in the subsequent UK Post-2010 Biodiversity Framework
Thornback ray (*Raja clavata*)	• Habitat of principal importance in England under the NERC 2006 Act

4.2.5 Potential project impacts

4.2.5.1 A range of potential impacts on fish and shellfish ecological receptors have been identified which may occur during the construction, operation and maintenance, and decommissioning phases of the Morgan Offshore Wind Project generation assets.

4.2.5.2 The impacts that have been scoped into the assessment are outlined in Table 4.11 together with a description of any additional data collection (e.g. site-specific surveys) and supporting analyses (e.g. modelling) that will be required to enable a full assessment of the impacts.

4.2.5.3 Potential impacts scoped out of the assessment are presented in Table 4.12, with justification.

Table 4.11: Impacts proposed to be scoped into the project assessment for fish and shellfish ecology (project phase refers to construction (C), operation and maintenance (O) and decommissioning (D)).

Impact	Project phase			Justification	Data collection and analysis required to characterise the baseline environment	Summary of proposed approach to assessment
	C	O	D			
Temporary habitat loss/disturbance.	✓	✓	✓	There is potential for temporary, direct habitat loss and disturbance as a result of site preparation activities in advance of foundation installation activities, cable installation activities (including unexploded ordnance (UXO) detonation, pre-cabling seabed clearance and anchor placements), and placement of spud-can legs from jack-up operations. Temporary habitat loss/disturbance may occur during the operation and maintenance phase as a result of operations (e.g. cable repair/reburial, use of jack-up vessels to facilitate wind turbine component repairs etc.). The impacts associated with these operations are likely to be similar in nature to those associated with the construction phase although of reduced magnitude. There is potential for temporary, direct habitat loss and disturbance due to decommissioning activities resulting in potential effects on fish and shellfish ecology.	There is wide-ranging and comprehensive desktop information and data sources available to characterise the Morgan fish and shellfish ecology study area for the generation assets (as set out in sections 4.2.3 and 4.2.4) therefore no site-specific surveys are proposed.	No specific modelling is required to inform this impact assessment, although the assessment will be quantitative in nature (i.e. clearly presenting the maximum spatial scale of impacts). This assessment will be based on information derived from the Project Design Envelope (PDE). The significance of effects upon fish and shellfish receptors will be determined by correlating the magnitude of the impact and the sensitivity of the receptor. Where possible, the magnitude of the impact will be quantified for the maximum design scenario (MDS). For example, the MDS for habitat loss/disturbance will be quantified and the assessment will present the areas of habitat potentially affected in the context of the size of the Morgan fish and shellfish ecology study area for the generation assets.
Underwater noise impacting fish and shellfish receptors.	✓	×	✓	There is potential for mortality, injury and/or disturbance to sensitive fish and shellfish species as a result of construction activities such as UXO detonation, pile-driving, pre-construction surveys and similar for decommissioning activities.	As above	Underwater noise modelling will be undertaken as set out in section 3.1.7 to inform the assessment of underwater noise impacts to fish and shellfish. This will use the most up to date best practice guidelines (i.e. Popper *et al.,* 2014) and other scientific literature to give consideration to the potential for injury and disturbance to fish and shellfish species, including disruption to spawning activity for marine fish species, disruption to migration of diadromous fish species, with a particular focus on potential barriers to migration. In particular, the hearing ability of fish species will be considered, and both sound pressure and particle motion will be considered.

Impact	Project phase			Justification	Data collection and analysis required to characterise the baseline environment	Summary of proposed approach to assessment
	C	O	D			
						Impacts during the decommissioning phase are anticipated to be less than or equal to the construction phase.
Increased suspended sediment concentrations (SSCs) and associated sediment deposition.	✓	✓	✓	Sediment disturbance arising from construction activities (e.g. foundation and cable installation including drilling and any deposits arising, UXO detonation, and seabed preparation), maintenance operations (e.g. cable repair/reburial etc.), and decommissioning activities (e.g. foundation removal) may result in indirect impacts on fish and shellfish communities due to temporary increases in SSCs and associated sediment deposition (i.e. smothering effects).	As above.	The outputs of numerical modelling undertaken for the physical processes assessment (section 3.1.7) will inform this impact assessment. This will include consideration of the potential for effects on spawning habitats (i.e. changes to sediment composition, smothering of eggs etc) and disturbance to migration of diadromous fish species. This will consider differing sensitivities of the identified receptors and life history stages to this impact. Impacts during the decommissioning phase are anticipated to be less than or equal to the construction phase.
Long term habitat loss.	✓	✓	✓	There is the potential for longterm habitat loss to occur directly under all foundation structures and associated scour protection, and under any cable protection required. As foundations are installed throughout the construction phase this impact is also relevant to the construction phase, although the impact will largely occur throughout the operation and maintenance phase. Permanent habitat loss may occur under any infrastructure that is not decommissioned at the end of the Morgan Offshore Wind Project generation assets lifetime.	As above.	No specific modelling is required to inform this impact assessment , although the assessment will be quantitative in nature (i.e. clearly presenting the maximum spatial scale of impacts). This assessment will be based on information derived from the PDE. The significance of effects upon fish and shellfish receptors will be determined by correlating the magnitude of the impact and the sensitivity of the receptor. Where possible, the magnitude of the impact will be quantified for the MDS.
Electromagnetic Fields (EMF) from subsea electrical cabling.	×	✓	×	EMF generated through the subsea electrical cabling may affect fish and shellfish prey/predator relationship by inhibiting/interfering with fish and shellfish behaviours due to changes in background EMFs.	As above.	No specific modelling is required to inform this impact assessment. A qualitative assessment will be undertaken and presented in the ES, based on a thorough review of the available scientific information on EMFs in the marine environment and effects on fish and shellfish ecology receptors. This assessment will be based on information derived from the PDE.

Impact	Project phase			Justification	Data collection and analysis required to characterise the baseline environment	Summary of proposed approach to assessment
	C	O	D			
						The significance of effects upon fish and shellfish receptors will be determined by correlating the magnitude of the impact and the sensitivity of the receptor.
Colonisation of hard structures.	✓	✓	✓	Artificial structures placed on the seabed (i.e. foundations and scour/cable protection) in the offshore environment are expected to be colonised by a range of marine organisms leading to localised increases in biodiversity and/or aggregation of fish and shellfish in the vicinity of structures.	As above.	No specific modelling is required to inform this impact assessment. A qualitative assessment will be undertaken and presented in the ES, based on a thorough review of the available scientific information on colonisation of hard structures, including from offshore wind farms. This assessment will be based on information derived from the PDE. Invasive non-native species (INNS) will be considered, particularly in relation to colonisation of hard structures. The significance of effects upon fish and shellfish receptors will be determined by correlating the magnitude of the impact and the sensitivity of the receptor. Where possible, the magnitude of the impact will be quantified for the maximum design scenario.

Table 4.12: Impacts proposed to be scoped out of the project assessment for fish and shellfish ecology.

Impact	Justification
Accidental pollution during construction, operation and maintenance and decommissioning phases.	There is a risk of pollution being accidentally released during the construction, operation and maintenance and decommissioning phases from sources including vessels / vehicles and equipment/machinery. However, the risk of such events is managed by the implementation of measures set out in standard post-consent plans (e.g. Environmental Management Plan, including Marine Pollution Contingency Plan (MPCP)). These plans include planning for accidental spills, address all potential contaminant releases and include key emergency contact details. It will also set out industry good practice and OSPAR (Oslo-Paris), International Maritime Organisation (IMO) and MARPOL (International Convention for the Prevention of Pollution from Ships) guidelines for preventing pollution at sea. Therefore, the likelihood of an accidental spill occurring is very low and in the unlikely event that such events did occur, the magnitude of these will be minimised through measures such as MPCP. As such, this impact will be scoped out of further consideration within the Fish and shellfish ecology ES chapter.
Underwater noise from wind turbine operation during operation and maintenance phase.	Noise generated by operational wind turbines is of a very low frequency and low sound pressure level (Andersson *et al*., 2011). Studies have found that sound levels are only high enough to possibly cause a behavioural reaction within metres from a wind turbine (Sigray and Andersson, 2011), and therefore such levels are not considered to have potentially significant effects on fish and shellfish receptors. The Marine Management Organisation (MMO, 2014) review of post-consent monitoring at offshore wind farms found that available data on the operational wind turbine noise, from the UK and abroad, in general showed that noise levels from operational wind turbines are low and the spatial extent of the potential impact of the operational

Impact	Justification
	wind turbine noise on marine receptors is generally estimated to be small, with behavioural response only likely at ranges close to the wind turbines. No significant effects on fish populations were detected from operational wind farms from the fish monitoring reviewed as part of the MMO (2014) review. As such, this impact will be scoped out of further consideration within the Fish and shellfish ecology ES chapter.
Underwater noise from vessels during all phases.	Operational underwater noise generated from vessels is likely to be low and effects would only occur if fish species remained within immediate vicinity of the vessel (i.e. within metres) for a number of hours which is highly unlikely. As such, this impact will be scoped out of further consideration within the Fish and shellfish ecology ES chapter.
Impacts from the release of sediment-bound contaminants.	Seabed disturbance associated with construction, maintenance and decommissioning activities (e.g. foundation and cable installation) could lead to the remobilisation of sediment-bound contaminants that may result in harmful and adverse effects on fish and shellfish communities. Historical sampling within the vicinity of the Morgan Array Scoping Boundary has shown levels of sediment contaminants are low. The risk of sediment-bound contaminants being present in concentrations likely to be harmful to benthic receptors is considered to be low. Site-specific sediment chemistry sampling will be undertaken across the Morgan Array Scoping Boundary during subtidal sampling. This potential impact is proposed to be scoped out of further consideration within the Fish and shellfish ecology ES chapter subject to the results of the site-specific surveys and consultation with the Statutory Nature Conservation Bodies (SNCBs) via the Evidence Plan process.

4.2.6 Measures adopted as part of the project

4.2.6.1 The following measures adopted as part of the project are relevant to fish and shellfish ecology. These measures may evolve as the engineering design and EIA progresses.

- Development and adherence to a Cable Specification and Installation Plan (CSIP) which will include cables to be buried to where possible and cable protection as necessary (the potential impact of this measure will be consulted upon with statutory consultees throughout the EIA process).
- Implementation of piling soft-start and ramp-up measures to reduce the risk of injury to fish species.
- Development and adherence to a Construction Method Statement (CMS).
- Development of, and adherence to, an Environmental Management Plan, an INNS Management Plan, and a MPCP which will include planning for accidental spills, address all potential contaminant releases and include key emergency details.

4.2.6.2 The requirement for and feasibility of any further mitigation will be dependent on the significance of effects and will be consulted upon with statutory consultees throughout the EIA process.

4.2.7 Proposed assessment methodology

4.2.7.1 The fish and shellfish ecology EIA will follow the methodology set out in part 1, section 4: EIA methodology, of the EIA Scoping Report. Specific to the fish and shellfish ecology EIA, the following guidance documents will also be considered:

- Guidelines for EcIA in the UK and Ireland. Terrestrial, Freshwater, Coastal and Marine (CIEEM, 2019).
- Offshore Wind Farms. Guidance Note for EIA in Respect of FEPA (Food and Environment Protection Act 1985) and CPA (Coast Protection Act 1949) Requirements (Cefas *et al*., 2004).
- Guidelines for Data Acquisition to Support Marine Environmental Assessments of Offshore Renewable Energy Projects (Judd, 2012).
- Guidance on Environmental Considerations for Offshore Wind Farm Development (OSPAR, 2008).
- Sound exposure guidelines for Fishes and Sea Turtles (Popper *et al*., 2014).

4.2.7.2 For the purposes of undertaking the EIA, fish and shellfish receptors identified as having the potential to occur in the Morgan fish and shellfish ecology study area for the generation assets will be grouped into broad ecological receptor groups, called Important Ecological Features (IEFs), in line with guidelines set out in CIEEM (2019). These IEFs will be those features against which impacts associated with the construction, operation and maintenance, and decommissioning phases of the Morgan Offshore

Wind Project generation assets will be assessed. Criteria defining the value of each IEF will be defined to reflect topic-specific interests.

4.2.7.3 The Fish and shellfish ecology ES chapter will include diadromous fish in the fish and shellfish ecology impact assessment, and a separate section presented discussing sensitivity of and implications of the impact on diadromous fish in each impact assessment. The approach and focus of these impact assessments will be discussed with stakeholders through the Benthic Ecology, Fish and Shellfish and Physical Processes Evidence Plan process.

4.2.7.4 The importance of fish species (such as herring, sandeels and sprat) as key prey species will be assessed in the relevant sections of other receptor groups (i.e. section 4.4: Offshore ornithology and section 4.3: Marine mammals). These will be informed by the Fish and shellfish ecology ES chapter which will provide clear outputs to inform these assessments.

4.2.7.5 Habitat suitability for sandeels and herring will be assessed using data collected as part of the site-specific benthic ecology survey in line with industry good practice guidelines and taking into account discussions with stakeholders via the Evidence Plan process.

4.2.7.6 A Fish and shellfish ecology technical report will present a detailed baseline characterisation for the Morgan Offshore Wind Project generation assets using site-specific survey data and the most recent desktop data for the Morgan fish and shellfish ecology study area for the generation assets. This report will inform the Fish and shellfish ecology ES chapter.

4.2.8 Potential cumulative effects

4.2.8.1 The majority of predicted effects of construction, operation and maintenance, and decommissioning of the Morgan Offshore Wind Project generation assets infrastructure within the Morgan Array Scoping Boundary on fish and shellfish communities are considered to be localised to within the footprint of the Morgan Offshore Wind Project generation assets. However, there is potential for cumulative effects to occur on fish and shellfish ecology from other projects or activities within the fish and shellfish ecology study area for the generation assets, where projects or plans could act collectively with the Morgan Offshore Wind Project generation assets to affect fish and shellfish receptors.

4.2.8.2 The cumulative effects assessment will follow the approach outlined in part 1, section 4: EIA methodology, of the EIA Scoping Report.

4.2.9 Potential inter-related effects

4.2.9.1 The assessment of potential inter-related effects will be considered within the Fish and shellfish ecology ES chapter. It will include consideration of project lifetime effects and receptor led effects, in line with the approach outlined in part 1, section 4: EIA methodology, of the EIA Scoping Report.

4.2.10 Potential transboundary impacts

4.2.10.1 A screening of transboundary impacts has been carried out and is presented in part 3, Annex A: Transboundary Impacts Screening, of the EIA Scoping Report. This screening exercise identified that there is potential for transboundary impacts upon fish and shellfish ecology due to construction, operation and maintenance, and decommissioning impacts of the Morgan Offshore Wind Project generation assets. These include:

- underwater noise impacting fish and shellfish receptors
- loss of habitat (in particular, spawning and nursery habitat)
- increased suspended sediment concentrations and associated sediment deposition

4.2.10.2 These activities have the potential to directly affect Annex II species and species that are of commercial importance for fishing fleets of states. Therefore, the potential for transboundary impacts will be considered within the ES.

4.3 Marine mammals

4.3.1 Introduction

4.3.1.1 This section of the Environmental Impact Assessment (EIA) Scoping Report identifies the marine mammal ecology receptors of relevance to the Morgan Offshore Wind Project generation assets and considers the potential impacts arising from the construction, operation and maintenance, and decommissioning of the generation assets.

4.3.2 Study area

4.3.2.1 For the purpose of the Environmental Statement (ES), two marine mammal study areas have been defined:

4.3.2.2 The Morgan marine mammal study area for the generation assets is defined as the area encompassing the Morgan Array Scoping Boundary plus a buffer of 10km. This is the area within which the site-specific aerial surveys have been undertaken and will provide fine scale data showing the spatial distribution and densities of marine mammals on a project specific basis. The data derived from these surveys will be used to underpin the quantitative assessment of impacts on marine mammal ecological receptors. A 10km buffer was recommended by the SNCBs during pre-application consultation. This buffer size was also considered appropriate as it provides better coverage for marine mammals, for the purpose of EIA and HRA baseline characterisation, than the existing best practice approach of a 4km buffer used for marine mammals on the majority of commissioned windfarms in the UK

4.3.2.3 The Morgan regional marine mammal study area for the generation assets extends over the Irish Sea geographic region. Marine mammals are highly mobile and may range over large distances and therefore the Morgan regional marine mammal study area for the generation assets provides wider context. The desktop review will consider the ecology, distribution and abundance of marine mammals within the wider Irish Sea region. The Morgan regional marine mammal study area for the generation assets also informs the assessment where the Zone of Influence (ZOI) for a given impact (e.g. underwater noise) may extend beyond the Morgan marine mammal study area for the generation assets.

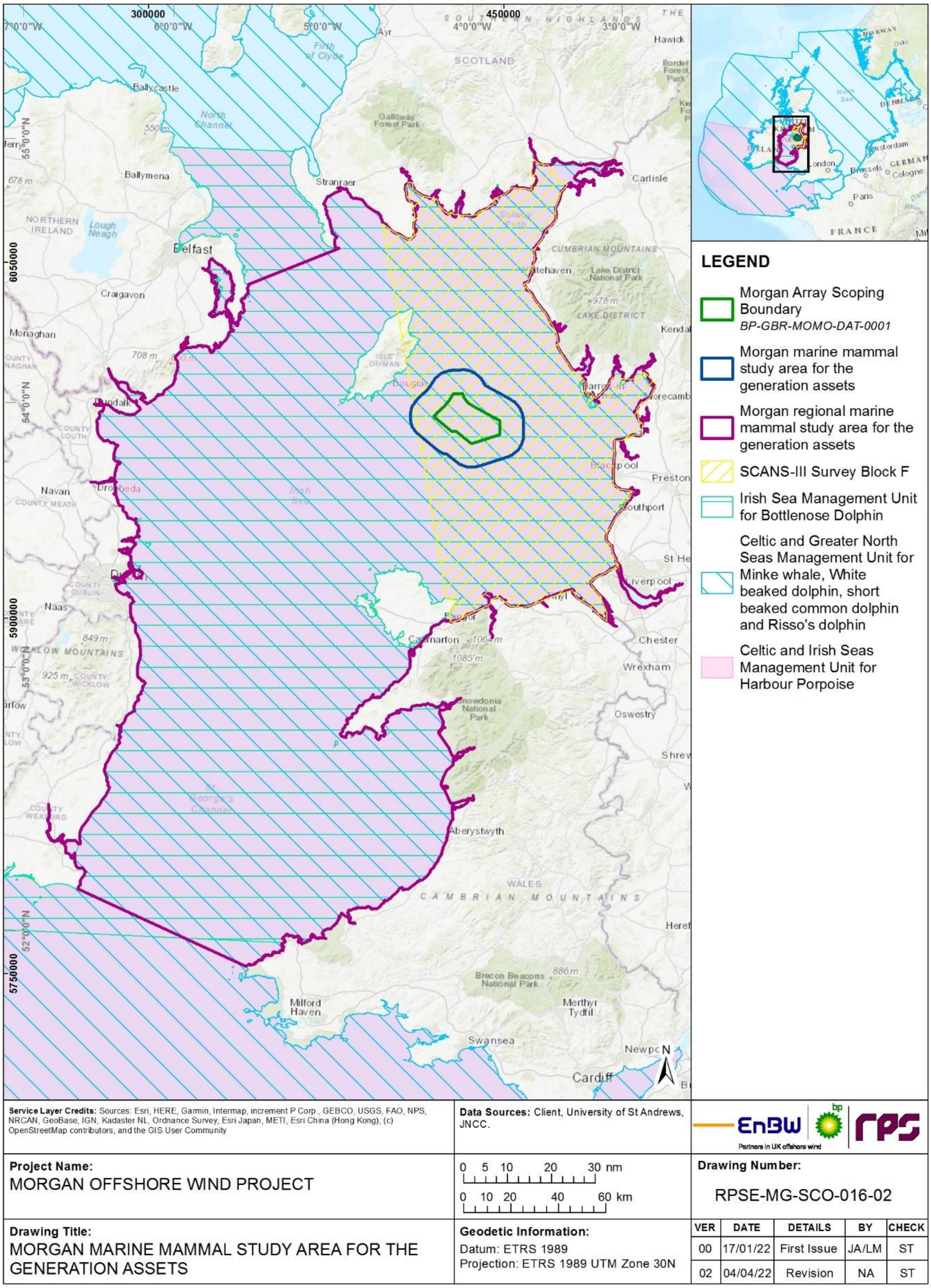


Figure 4.18: The Morgan marine mammal study areas for the generation assets.

4.3.3 Data sources

Desktop data

4.3.3.1 An initial desk-based review of literature and data sources to support this EIA Scoping Report has identified a number of data sources which provide coverage of the Morgan regional marine mammal study area for the generation assets. These are summarised in Table 4.13.

Table 4.13: Summary of key desktop datasets and reports.

Title	Source	Year	Author
Scientific advice on matters related to the management of seal populations: 2020	Sea Mammal Research Unit (SMRU), University of St Andrews	2021	Special Committee on Seals (SCOC)
Marine recorder public UK snapshot	Joint Nature Conservation Comittee (JNCC)	2020	JNCC
National Biodiversity Network (NBN) Atlas	NBN Atlas	2019	NBN Atlas
SCANS-III	SMRU, University of St Andrews	2016	Hammond *et al*.
Seal habitat preference maps	SMRU, University of St Andrews	2020	Carter *et al.*
JNCC Report 544: Harbour Porpoise Density	JNCC	2010-2011	Heinänen and Skov
Updated abundance estimates for cetacean management units in UK waters	JNCC	2021	Inter-Agency Marine Mammal Working Group (IAMMWG)
Joint cetacean protocol phase III	JNCC	2009-2010	Paxton *et al*.
Background information on marine mammals for Strategic Environmental Assessment 6	SMRU, Gatty Marine Laboratory, University of St Andrews	2005	Hammond *et al*.
Atlas of the Marine Mammals of Wales	Countryside Council for Wales (CCW)	2012	Baines and Evans
Atlas of the distribution and relative abundance of marine mammals in Irish offshore waters	Irish Whale and Dolphin Group	2005-2011	Wall *et al*.
Barrow offshore wind farm (BOW) construction monitoring report	Marine Data Exchange	2006	BOW Wind
Ormonde offshore wind farm construction (Year 1) environmental monitoring	Marine Data Exchange	2010	RPS Energy
Walney and West of Duddon Sands Environmental Impact Assessment - marine mammals in the NW3 Area, Irish Sea	Marine Data Exchange	2006	DHI Water and Environment
Marine recorder public UK snapshot	Joint Nature Conservation Comittee (JNCC)	2010	RPS Energy
National Biodiversity Network (NBN) Atlas	NBN Atlas	2010-2011	Centre for Marine and Coastal Studies Ltd (CMACS)

Title	Source	Year	Author
Burbo Bank Exensions offshore wind farm environmental statement	Marine Data Exchange	2013	Dong Energy
Skerries tidal stream array marine mammal monitoring	Marine Data Exchange	2014	SMRU Marine
JNCC MPA mapper	JNCC	2019	JNCC
Zone 9 Celtic Array Ltd, Bird Mammal Survey	Marine Data Exchange	2010-2012	Ecological Consultancy Ltd. (ECON)
Zone 9 Celtic Array Ltd, Hidef Aerial Bird Survey	Marine Data Exchange	2012-2013	HiDef
Morlais Tidal Array Scoping Report	Morlais Energy	2018	Morlais Energy
Manx whale and dolphin watch	Manx whale and dolphin watch	Various	Various
Cefas Pelagic ecosystem in the western English Channel and eastern Celtic Sea (PELTIC) surveys	Cefas	Various	Cefas

Site-specific surveys

4.3.3.2 Aerial digital surveys for marine mammal have been undertaken across the Morgan marine mammal study area for the generation assets including a buffer. Aerial surveys commenced in March 2021 and are planned to continue until March 2023. One flight will be undertaken per month over the two years.

4.3.3.3 The survey method was designed to optimise the data collection for marine mammals by using a grid-based collection method with 30% of the sea surface collected and 12% analysed. APEM's bespoke camera system was fitted into a twin engine aircraft. The camera system captured still imagery along 18 survey lines spaced approximately 2km between tracks. The images were analysed to enumerate marine mammals to species level, where possible.

4.3.3.4 Results of the site-specific surveys will be discussed through the Evidence Plan process to the Expert Working Group as described in part 1, section 5: Consultation, of the EIA Scoping Report. Initial observations are taken from site-specific surveys undertaken from April to September 2021. The following section provides an overview of the initial observations from the site-specific surveys and other sources of data available for the Morgan Offshore Wind Project generation assets. Further details of site-specific data will be presented in the PEIR and ES.

4.3.4 Baseline environment

Initial site-specific survey results

4.3.4.1 Initial results from six months of survey (April 2021 to September 2021) provided sightings of harbour porpoise and grey seal within the Morgan marine mammal study area for generation assets. Details on the number and seasonality of individuals recorded is presented for each species below. A number of individuals could not be identified to species level. For example, the surveys recorded unidentified dolphin species in April, May, June, July and September 2021. Peak numbers of unidentified dolphins were recorded in April 2021 when ten individuals were recorded. Similarly, unidentified seal species were recorded in April, June, July and September 2021. Peak numbers of unidentified seals were recorded in June, July and September 2021 when two individuals were recorded. In addition, one unidentified marine mammal species was recorded in April and May 2021.

Harbour porpoise Phocoena phocoena

4.3.4.2 Harbour porpoise are widespread and common in the Irish Sea throughout the year with potential for breeding (Baines and Evans, 2012). Long-term sightings between 1990 to 2009 show an average of 1.1 to 15 harbour porpoise counts per hour around Anglesey (Baines and Evans, 2012). Suitable habitat is available within the east of the Morgan regional marine mammal study area for the generation assets and harbour porpoise have been recorded there regularly (RPS Energy, 2012; CMACS, 2011; DHI Water and Environment, 2006). The most recent assessment of harbour porpoise in UK waters concluded that the overall trend in Conservation Status was unknown, highlighting that there was insufficient data to establish a trend for the population size or to assess the potential future prospects for the population (JNCC, 2019b).

4.3.4.3 The Morgan Offshore Wind Project generation assets is within the Celtic and Irish Sea management unit (MU) for harbour porpoise (Figure 4.18; IAMMWG, 2021), which is estimated to have an abundance of 62,517 individuals (CV (coefficient of variation): 0.13, 955 CI (confidence interval) 48,324 – 80,877) based on estimates from the Small Cetaceans in the European Atlantic and North Seas (SCANS) III survey (Hammond *et al*., 2017; Hammond *et al.,* 2021). The SCANS III density estimate for the relevant survey block (Block F) was estimated to be 0.086 porpoise per km^2 (CV: 0.383).

4.3.4.4 The Joint Cetacean Protocol (JCP) has undertaken analysis of 18 years of data to inform the identification of discrete and persistent areas of relatively high harbour porpoise density in the United Kingdom (UK) marine area (Heinänen and Skov, 2015). Areas of persistent high density include coastal areas off west Wales (Pembrokeshire and Cardigan Bay), and northwest Wales (Anglesey, Llŷn Peninsula), within the Morgan regional marine mammal study area for the generation assets (Heinänen and Skov, 2015). The densities of harbour porpoise are seasonal with large reductions during winter in the areas of high densities predicted for the northern Irish Sea and Cardigan Bay (Heinänen and Skov, 2015). Densities within the Morgan regional marine mammal study area for the generation assets are up to three individuals per km^2 (Heinänen and Skov, 2015).

4.3.4.5 Monitoring surveys were undertaken in 2010 for the Ormonde offshore wind farm year 1 post-construction surveys. They recorded harbour porpoise at an encounter rate of 0.014 per hour within the Ormonde offshore wind farm which is within the northeast of the Morgan regional marine mammal study area for the generation assets (RPS Energy, 2012). Monitoring surveys were undertaken during the construction of the Walney offshore wind between 2009 and 2010. These recorded harbour porpoise within and to the northeast of the Walney offshore wind farm which is within the Morgan regional marine mammal study area for the generation assets (CMACS, 2011). Ten harbour porpoise were also recorded by marine mammal observers during the 2021 site-specific geophysical site investigation survey.

4.3.4.6 Baseline characterisation surveys undertaken in 2012 to 2013 for the Rhiannon offshore wind farm recorded a total of 227 harbour porpoise across the wider Irish Sea Zone (as defined by The Crown Estate (TCE) Round 3 leasing process). Recording an overall density of 0.09 per km^2 for the Irish Sea Zone over the entire year. Distribution varied across the season however the greatest numbers of sightings occurred in the west of the Rhiannon offshore wind farm, outside the Morgan marine mammal study area for generation assets (Celtic Array Ltd., 2014c). Harbour porpoise are regularly recorded around the Isle of Man by the Manx whale and dolphin watch (Manx whale and dolphin watch, 2022).

4.3.4.7 Initial results from the aerial surveys undertaken across the Morgan Array Scoping Boundary show that harbour porpoise were recorded within Morgan marine mammal study area for the generation assets in April, May, June, July, August and September 2021. Peak numbers of harbour porpoise were recorded in August 2021 when 36 individuals were recorded.

4.3.4.8 Based on the review of literature including previous surveys in this region, it is considered likely that harbour porpoise occur year round within the Morgan regional marine mammal study area for the generation assets. It is therefore proposed that harbour porpoise are scoped into the EIA.

Minke whale Balaenoptera acutorostrata

4.3.4.9 Minke whale are an occasional visitor to the Irish Sea where it occurs annually in small numbers, mainly in July and August (Baines *et al*., 2012). Records of long term sightings between 1990 to 2007 show that most minke whale encounters are in the east Irish Sea (Baines and Evans, 2012). This species is rarely recorded east of the Isle of Man and are rare in Liverpool Bay (Dong Energy, 2013). The most recent assessment of minke whales in UK waters concluded that the overall trend in Conservation Status was unknown, highlighting that there was insufficient data to establish a trend for the population size or to assess the potential future prospects for the population (JNCC, 2019c).

4.3.4.10 All minke whales in UK waters are considered to be part of the Celtic and Greater North Seas MU (Figure 4.18; IAMMWG, 2021) which is estimated to have an abundance of 20,118 mink whale (CV: 0.18, 95% CI: 14,061 – 28,786) based on estimates from the SCANS III survey (Hammond *et al*., 2017; Hammond *et al.,* 2021) and the ObSERVE survey (Rogan *et al.,* 2018). The SCANS III survey did not record minke whale within the relevant survey block (Block F).

4.3.4.11 Minke whale were not recorded in the Ormonde offshore wind farm year 1 post-construction surveys or the Walney offshore wind farm construction surveys (RPS Energy, 2012; CMACS, 2011). Minke whale are not regularly recorded around the Isle of Man by the Manx whale and dolphin watch however individuals were recorded in November, October and September 2021 (Manx whale and dolphin watch, 2022).

4.3.4.12 Boat-based surveys for the Rhiannon offshore wind farm recorded 19 minke whale over the two-year survey, within and to the west of the Rhiannon offshore wind farm, outside the Morgan marine mammal study area for generation assets (Celtic Array Ltd, 2014c). One minke whale were recorded by marine mammal observers during the 2021 site-specific geophysical site investigation survey.

4.3.4.13 Initial results from the aerial surveys undertaken across the Morgan Array Scoping Boundary show that minke whale were not recorded within the Morgan marine mammal study area for the generation assets throughout April 2021 to September 2021.

4.3.4.14 Based on the review of literature including previous surveys in this region, it is considered likely that minke whale occur within the Morgan regional marine mammal study area for the generation assets. It is therefore proposed that minke whale are scoped into the EIA.

White beaked dolphin Lagenorhynchus albirostris

4.3.4.15 White beaked dolphin are common in British and Irish waters, especially to the north around Scotland. This species is also common around the west coast of Ireland, Iceland and west Norway although it is only an occasional visitor to the Irish Sea (Seawatch, 2012). The most recent assessment of white beaked dolphin in UK waters concluded that the overall trend in Conservation Status was unknown, highlighting that there was insufficient data to establish a trend for the population size or to assess the potential future prospects for the population (JNCC, 2019d).

4.3.4.16 All white beaked dolphin in UK waters are considered to be part of the Celtic and Greater North Seas MU (Figure 4.18; IAMMWG, 2021), which has an estimated population size of 43,951 dolphins (CV: 0.22, 95% CI: 28,439 – 67,924) based on estimates from the SCANS III survey (Hammond *et al*., 2017; Hammond *et al.*, 2021) and the ObSERVE survey (Rogan *et al*., 2018). The SCANS III did not record any white beaked dolphin within the relevant survey block (Block F).

4.3.4.17 White beaked dolphin were not recorded in the Ormonde offshore wind farm year 1 post-construction surveys or the Walney offshore wind farm construction surveys (RPS Energy, 2012; CMACS, 2011). A small number of unidentified dolphins were recorded during the recent site-specific aerial surveys, although these were considered unlikely to be white beaked dolphin based on the known distribution and occurrence of this species within the Morgan regional marine mammal study area for the generation assets. Based on the review of literature including previous surveys in this region, it is considered unlikely that white beaked dolphin are a key species within the Morgan regional marine mammal study area for the generation assets. It therefore proposed that white beaked dolphin are scoped out of the EIA.

Bottlenose dolphin Tursiops truncatus

4.3.4.18 Bottlenose dolphin use both coastal and offshore waters in the UK. One of the main coastal areas is around Cardigan Bay in the southeast of the Irish Sea. The population size in Cardigan Bay has been estimated at between 130-350 individuals (UKBAP, 1999), although the JNCC has estimated that the total UK population is less than 300 (Reid *et al*., 2003). Bottlenose dolphin have also been recorded occurring off the north coast of Wales, particularly north and east of Anglesey (Baines and Evans, 2012). Casual records also show that bottlenose dolphin are present sporadically off the Isle of Man and elsewhere in the northeast Irish Sea (Manx Whale and Dolphin Group unpublished data; Sea Watch Foundation unpublished data). Long term sightings between 1990 to 2009 show an average of 2.5-5 bottlenose dolphin counts per hour around Anglesey (Baines and Evans, 2012).

4.3.4.19 The most recent assessment of bottlenose dolphin in UK waters concluded that the overall trend in Conservation Status was unknown, highlighting that although the population size appears to be stable, there were too few datapoints to confidently draw conclusions on current and future population trends (JNCC, 2019e).

4.3.4.20 The Morgan Offshore Wind Project generation assets is within the Irish Sea MU for bottlenose dolphin (Figure 4.18; IAMMWG, 2021), which is estimated to have an abundance of 293 individuals (CV: 0.54, 95% CI: 108 - 793) based on surveys undertaken for the Cardigan Bay Special Area of Conservation (SAC) (Lohrengel *et al.* 2018). The SCANS III did not record any bottlenose dolphin within the relevant survey block (Block F) (Hammond *et al*., 2017).

4.3.4.21 Bottlenose dolphins were not recorded in the Ormonde offshore wind farm year 1 post-construction surveys or the Walney offshore wind farm construction surveys (RPS Energy, 2012; CMACS, 2011). A small number of unidentified dolphins were recorded during the recent site-specific aerial surveys and these may potentially have been bottlenose dolphin based on the known distribution and occurrence of this species within the Morgan regional marine mammal study area for the generation assets. Two bottlenose dolphin sightings (one of a pod of six) were recorded by marine mammal observers during the 2021 site-specific geophysical site investigation survey.

4.3.4.22 Aerial surveys for the Rhiannon offshore wind farm recorded bottlenose dolphin, to the east of the Rhiannon offshore wind farm, outside the Morgan marine mammal study area for generation assets. Insufficient sightings were recorded to produce a local abundance (Celtic Array Ltd, 2014c). Bottlenose dolphin are regularly recorded around the Isle of Man by the Manx whale and dolphin watch (Manx whale and dolphin watch, 2022).

4.3.4.23 Given the presence of bottlenose dolphin within coastal waters in the Irish Sea, it is considered likely that bottlenose dolphin occur within the Morgan regional marine mammal study area for the generation assets. It is therefore proposed that bottlenose dolphin are scoped into the EIA.

Short beaked common dolphin Delphinus delphis

4.3.4.24 The short beaked common dolphin are the most numerous offshore cetacean species in the temperate northeast Atlantic. Off the western coasts of Britain and Ireland, the species is found in continental shelf waters, notably in the Celtic Sea and Western Approaches to the Channel, and off southern and western Ireland (Reid, 2003).

4.3.4.25 The most recent assessment of short beaked common dolphin in UK waters concluded that the overall trend in Conservation Status was unknown, highlighting that although the future trend for the range is stable, there were too few datapoints to confidently draw conclusions on the current and future population trends (JNCC, 2019g).

4.3.4.26 There is a relatively low population of short-beaked common dolphin in the Irish Sea, however they are regularly seen off the south of the Isle of Man. Long term sightings between 1990 to 2009 show an average of 0.5-1 short-beaked common dolphin counts per hour around the south of the Isle of Man and the Pembroke Peninsula (Baines and Evans, 2012).

4.3.4.27 All short beaked common dolphins in UK waters is considered to be part of the Celtic and Greater North Seas MU (Figure 4.18; IAMMWG, 2021), which has an estimated population size of 102,656 dolphins (CV: 0.29, 95% CI: 58,932 –178,822). The SCANS III did not record any short beaked common dolphin within the relevant survey block (Block F) (Hammond *et al*., 2017).

4.3.4.28 Short beaked common dolphin were not recorded in the Ormonde offshore wind farm year 1 post-construction surveys or the Walney offshore wind farm construction surveys (RPS Energy, 2012; CMACS, 2011). A small number of unidentified dolphins were recorded during the recent site-specific aerial surveys and these may potentially have been short beaked common dolphin based on the known distribution and occurrence of this species within the Morgan regional marine mammal study area for the generation assets.

4.3.4.29 Aerial surveys for the Rhiannon offshore wind farm recorded a single sighting of a pod of six short beaked common dolphin, to the west of the Rhiannon offshore wind farm, outside the Morgan marine mammal study area for generation assets (Celtic Array Ltd, 2014c).

4.3.4.30 Given the presence of short beaked common dolphin within coastal waters in the Irish Sea, it is considered likely that short beaked common dolphin occur within the Morgan regional marine mammal study area for the generation assets. It is therefore proposed that short beaked common dolphin are scoped into the EIA.

Risso's dolphin Grampus griseus

4.3.4.31 Risso's dolphin are most common around northern Scotland however they have been sighted around Ireland and in the Irish Sea. Most sightings from the Irish Sea occurred between July and September. Near shore records off southwest Ireland were obtained primarily between May and August (Reid, 2003). Coastal areas of the Isle of Man and north Anglesey have a low sighting rate for Risso's dolphin (Baines and Evans, 2012). Long term sightings between 1990 to 2009 show an average of 0.26-0.5 Risso's dolphin counts per hour around the south of the Isle of Man and an average of 0.04-0.1 Risso's dolphin counts per hour around the north of Anglesey (Baines and Evans, 2012).

4.3.4.32 The most recent assessment of Risso's dolphin in UK waters concluded that the overall trend in Conservation Status was unknown, highlighting that although the future trend for the range is stable, there were too few datapoints to confidently draw conclusions on the current and future population trends (JNCC, 2019h).

4.3.4.33 All Risso's dolphin in UK waters are considered to be part of the Celtic and Greater North Seas MU (Figure 4.18; IAMMWG, 2021), which has an estimated population size of 12,262 Risso's dolphin (CV: 0.46, 95% CI: 5,227 – 28,764). The SCANS III did not record any Risso's dolphin within the relevant survey block (Block F) (Hammond *et al*., 2017).

4.3.4.34 Risso's dolphin were not recorded in the Ormonde offshore wind farm year 1 post-construction surveys or the Walney offshore wind farm construction surveys (RPS Energy, 2012; CMACS, 2011). A small number of unidentified dolphins were recorded during the recent site-specific aerial surveys and may potentially have been Risso's dolphin based on the known distribution and occurrence of this species within the Morgan regional marine mammal study area for the generation assets.

4.3.4.35 Boat-based surveys for the Rhiannon offshore wind farm recorded three sightings of Risso's dolphin, outside the Rhiannon offshore wind farm, outside the Morgan marine mammal study area for generation assets (Celtic Array Ltd, 2014c). Risso's dolphin are not regularly recorded around the Isle of Man by the Manx whale and dolphin watch however individuals were recorded in September 2021 (Manx whale and dolphin watch, 2022).

4.3.4.36 Given the presence of Risso's dolphin within coastal waters in the Irish Sea, it is considered likely that Risso's dolphin occur within the Morgan regional marine mammal study area for the generation assets. It is therefore proposed that Risso's dolphin are scoped into the EIA.

Grey seal Halichoerus grypus

4.3.4.37 Grey seal have a wide distribution in the seas around Wales and are present in coastal areas throughout the year. Grey seal have been recorded at the River Dee estuary, Walney Island at the southern tip of the Isle of Man and around Cardigan Bay (SCOS, 2021). Long term sightings between 1990 to 2007 show an average of 0.5-1 grey seal counts per hour around the north coast of Wales. The most recent assessment of grey seal in UK waters concluded that the overall trend in Conservation Status was Favourable, with an overall trend in Conservation Status assessed as Improving (JNCC, 2019f).

4.3.4.38 Grey seal typically forages within 100km of a haul-out site and foraging trips can last for 30 days; however, individual tracks have shown that some grey seal can make trips several hundred kilometres offshore (SCOS, 2021). The estimated adult class population size in the regularly monitored national colonies at the start of the 2019 breeding season was 133,900 (95% CI 115,300-156,500) (SCOS, 2021). Over 400 grey seal individuals were recorded on the east Irish coast in 2017/2018 (Morris and Duck, 2019). Pup production of grey seal in Ireland (the east coast of which is within the Morgan regional marine mammal study area for the generation assets) was estimated at 2,100 pups with an increasing population trend. Pup production of grey seals in the UK was estimated at 68,050 pups with an increasing population trend (SCOS, 2021). However, the Morgan regional marine mammal study area for the generation assets does not contain any of the main UK grey seal breeding colonies, the majority of which are in Scotland.

4.3.4.39 There are two main grey seal haul-outs in the Morgan regional marine mammal study area for the generation assets: the Dee Estuary and Walney Island. In 2019 and 2020, the August count at Walney Island was 248 and 300 adults, respectively. It has been a pupping site since 2015 but numbers are currently still low (2-10 per year). Less extensive monitoring has occurred at the Dee Estuary haul-out site (SCOS, 2021).

4.3.4.40 Grey seals at-sea distribution maps have been produced by Carter *et al* (2020) based on a Global Positioning System (GPS) telemetry tagging programme by The Department for Business, Energy and Industrial Strategy (BEIS), through their Offshore Energy Strategic Environmental Assessment (OESEA) programme. This data shows that grey seal do not occur in high densities within the Morgan regional marine mammal study area for the generation assets. Densities are higher around the coasts and around the River Dee Estuary, the River Mersey Estuary and the southern tip of the Isle of Man (Figure 4.19; Russell *et al*., 2017; Carter *et al.* 2020).

4.3.4.41 Monitoring surveys were undertaken in 2010 for the Ormonde offshore wind farm year 1 post-construction surveys. Grey seal were recorded at an encounter rate of 0.007 per hour within the Ormonde offshore wind farm which is within the Morgan regional marine mammal study area for the generation assets (RPS Energy, 2012).

4.3.4.42 Monitoring surveys were undertaken during the construction of the Walney offshore wind from in 2010-2009. They recorded regular grey seal sightings at the southern end of Walney Island and around the Walney and Ormonde offshore wind farms which are within the Morgan regional marine mammal study area for the generation assets (CMACS, 2011).

4.3.4.43 Aerial and boat-based surveys for the Rhiannon offshore wind farm consistently recorded grey seal particularly between February and August. across the Rhiannon offshore wind farm, outside the Morgan marine mammal study area for generation assets (Celtic Array Ltd, 2014c).

4.3.4.44 Initial results from the aerial surveys undertaken across the Morgan Array Scoping Boundary show that grey seal were recorded in low numbers in all months from April to September 2021. Peak numbers were recorded in August 2021 when two individuals were recorded. One dead grey seal was recorded by marine mammal observers during the 2021 site-specific geophysical site investigation survey.

4.3.4.45 Based on the review of literature including previous surveys in this, it is considered likely that grey seal occur within the Morgan regional marine mammal study area for the generation assets. It is therefore proposed that grey seal are scoped into the EIA.

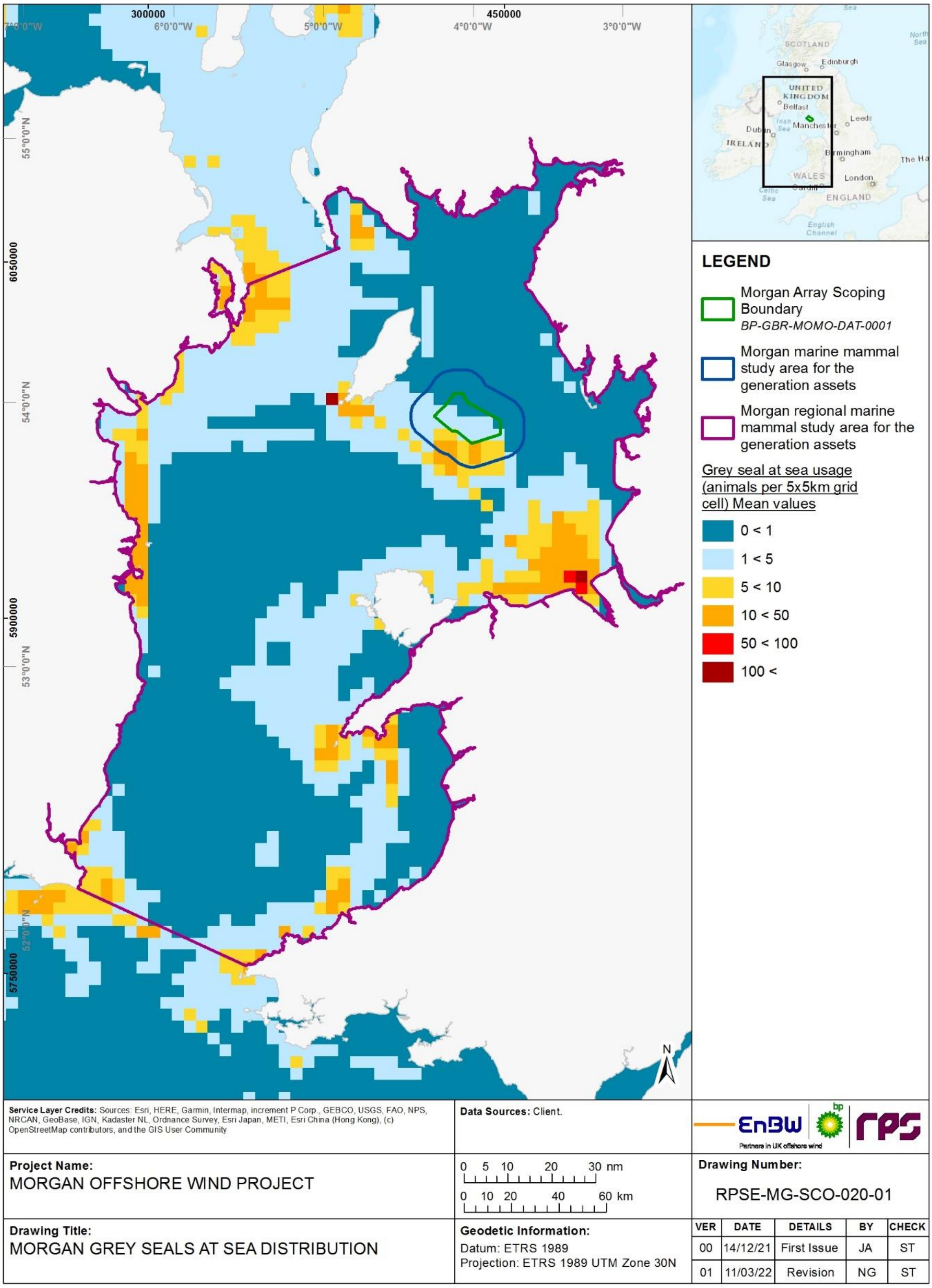


Figure 4.19: Grey seal at-sea distribution (from Russell *et al.*, 2017).

Harbour seal Phoca vitulina

4.3.4.46 Harbour seal are present around the UK with a higher abundance around Scotland; approximately 80% of the UK population resides around the Scottish coast. Low numbers are also encountered along the south and west coast of England and along the coasts of Wales (JNCC, 2019i). The most recent assessment of harbour seal in UK waters concluded that the overall trend in Conservation Status was unknown, highlighting that although the future trend for the range is stable and the population trend is good, there were too few datapoints to confidently draw conclusions on the current and future population trends (JNCC, 2019i).

4.3.4.47 Harbour seal populations around northern Ireland and Wales have been estimated at 1,000 and <10 individuals respectively (SCOS, 2021). Over 130 harbour seal individuals were recorded on the east Irish coast in 2017/2018 (Morris & Duck, 2019). Harbour seals at sea distribution maps have been produced by Carter *et al* (2020) and Russell *et al*. (2017). This data shows that harbour seal do not occur in high densities within the Morgan regional marine mammal study area for the generation assets. Area of high density are present around the east coast of Northern Ireland (Figure 4.20; Russell *et al.,* 2017; Carter *et al*. 2020; SCOS, 2021).

4.3.4.48 The population from Carlingford Lough to Copeland Islands has been monitored more frequently from 2002 to 2018. This subset of the Irish Sea population declined slowly over the period 2002 to 2011 at an average rate of 2.7% p.a. (95% CIs: 1.8, 3.5). However, the 2018 survey suggests that since that time period there has been no significant change since (SCOS, 2021).

4.3.4.49 Monitoring surveys were undertaken during the construction of the Walney offshore wind from in 2010-2009. They recorded a single harbour seal within the Ormonde offshore wind farm during the monitoring survey which is within the Morgan regional marine mammal study area for the generation assets (CMACS, 2011). Harbour seals were not recorded in the initial site-specific survey results from April 2021 to September 2021.

4.3.4.50 Harbour seal were not recorded during the aerial or boat-based surveys for the Rhiannon offshore wind farm (Celtic Array Ltd, 2014c). Four harbour seal were recorded by marine mammal observers during the 2021 site-specific geophysical site investigation survey.

4.3.4.51 Based on the review of literature including previous surveys in this region, it is considered unlikely that harbour seal is a key species within the Morgan regional marine mammal study area for the generation assets. It therefore proposed that harbour seal are scoped out of the EIA.

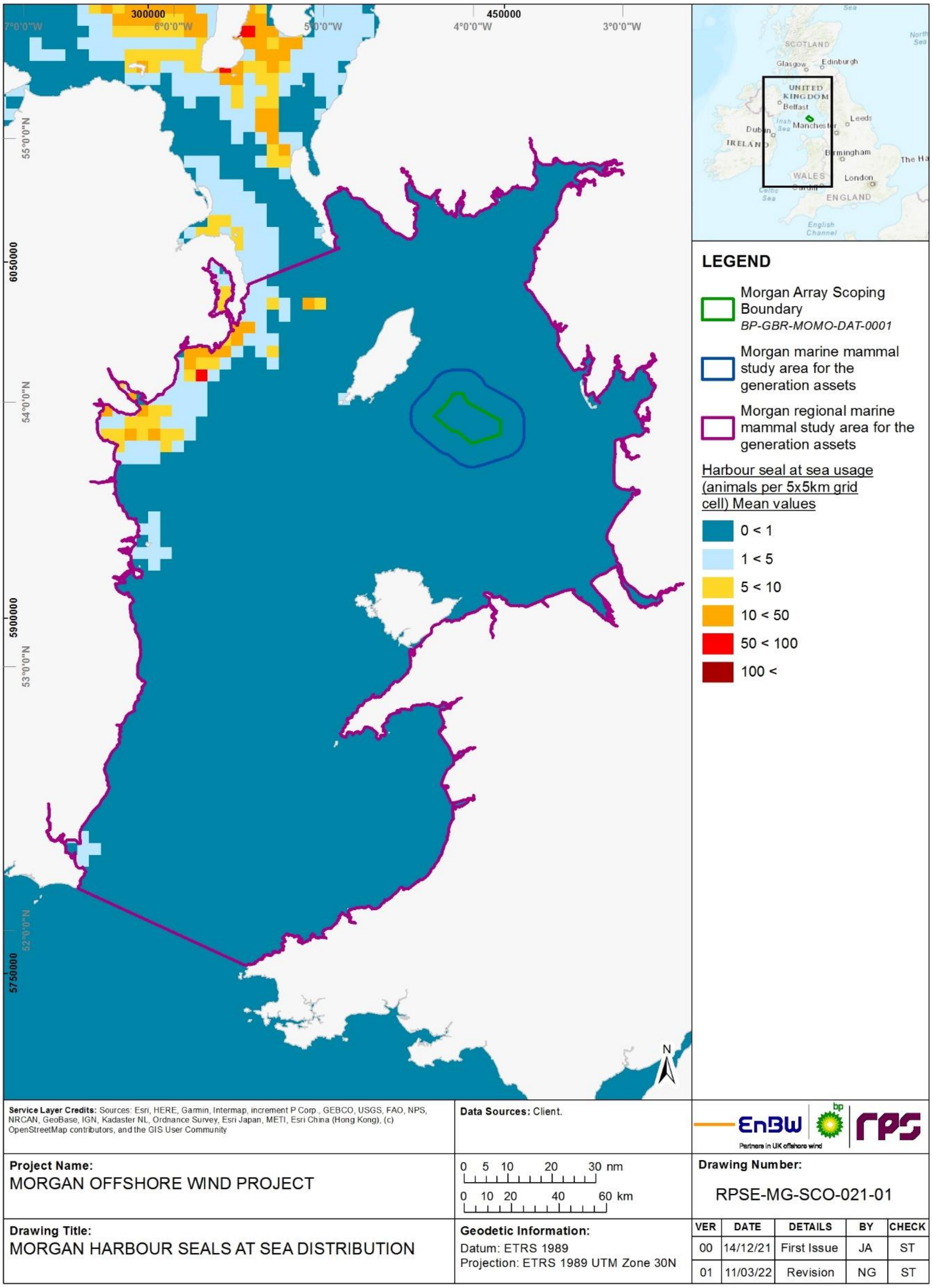


Figure 4.20: Harbour seal at-sea distribution (from Russell *et al.,* 2017).

Designated sites

4.3.4.52 Designated sites with relevant qualifying features which overlap with the Morgan regional marine mammal study area for the generation assets are described in this section.

4.3.4.53 Table 4.14 provides an early indication of the designated sites that may be considered within the EIA Likely Significant Effects (LSE) Screening Report and potentially the Report to Inform Appropriate Assessment (RIAA) if an LSE is identified. The list of designated sites, which includes all marine mammal SACs within the Morgan regional marine mammal study area for the generation assets, will be presented in the Marine mammal ES chapter. As a more detailed understanding of the project activities and impact pathways develops the EIA will consider potential impacts on relevant Annex II marine mammal species of European designated sites.

4.3.4.54 A full screening of European sites with qualifying marine mammal features will be undertaken in the LSE Screening Report for the Morgan Offshore Wind Project generation assets, as part of the HRA process. The assessment on the European sites and effects on the site(s) conservation objectives will be undertaken in the RIAA.

Table 4.14: Summary of designated sites with relevant marine mammal features within the Morgan regional marine mammal study area for the generation assets.

Designated Site	Distance to the Morgan Array Scoping Boundary (km)	Features
Lambay Island SAC	13.5	• Harbour seal *Phoca vitulina* • Grey seal *Halichoerus grypus*
Langness MNR	16.8	• Harbour seal *Phoca vitulina* • Grey seal *Halichoerus grypus* • Basking Shark *Cetorhinus maximus* • Harbour porpoise *Phocena phocoena* • Risso's dolphin *Grampus griseus*
Douglas Bay MNR	22.2	• Bottlenose dolphin *Tursiops truncates* • Risso's dolphin *Grampus griseus*
Laxey Bay MNR	22.4	• Harbour porpoise *Phocena phocoena* • Minke whale *Balaenoptera acutorostrata*
Ramsey Bay MNR	26.5	• Harbour seal *Phoca vitulina* • Grey seal *Halichoerus grypus*
North Anglesey Marine/Gogledd Môn Forol SAC	28.2	• Harbour porpoise *Phocena phocoena*
Baie Ny Carrickey MNR	30.2	• Risso's dolphin *Grampus griseus* • Harbour porpoise *Phocena phocoena* • Bottlenose dolphin *Tursiops truncatus* • Basking Shark *Cetorhinus maximus*
Calf and Wart Bank MNR	35.8	• Risso's dolphin *Grampus griseus* • Harbour porpoise *Phocena phocoena*

Designated Site	Distance to the Morgan Array Scoping Boundary (km)	Features
		• Basking Shark *Cetorhinus maximus*
Niarbyl MNR	36.7	• Harbour porpoise *Phocena phocoena* • Basking Shark *Cetorhinus maximus* • Grey seal *Halichoerus grypus*
Port Erin Bay MNR	36.9	• Harbour porpoise *Phocena phocoena* • Basking Shark *Cetorhinus maximus*
West Coast MNR	38.2	• Harbour porpoise *Phocena phocoena* • Basking Shark *Cetorhinus maximus* • Harbour seal *Phoca vitulina* • Grey seal *Halichoerus grypus*
North Channel SAC	60.6	• Harbour porpoise *Phocena phocoena*
Strangford Lough SAC	91.1	• Harbour seal *Phoca vitulina*
Murlough SAC	97.6	• Harbour seal *Phoca vitulina*
Murlough SAC	97.6	• Harbour seal *Phoca vitulina*
Pen Llyn a`r Sarnau/ Llŷn Peninsula and the Sarnau SAC	106.8	• Bottlenose dolphin *Tursiops truncatus* • Grey seal *Halichoerus grypus*
West Wales Marine/Gorllewin Cymru Forol SAC	112.7	• Harbour porpoise *Phocena phocoena*
Rockabill to Dalkey Island SAC	123.4	• Harbour porpoise *Phocena phocoena*
Cardigan Bay/Bae Ceredigion SAC	168.2	• Bottlenose dolphin *Tursiops truncatus* • Grey seal *Halichoerus grypus*
Slaney River Valley SAC	189.2	• Harbour seal *Phoca vitulina*
Pembrokeshire Marine/Sir Benfro Forol SAC	233.9	• Grey seal *Halichoerus grypus*

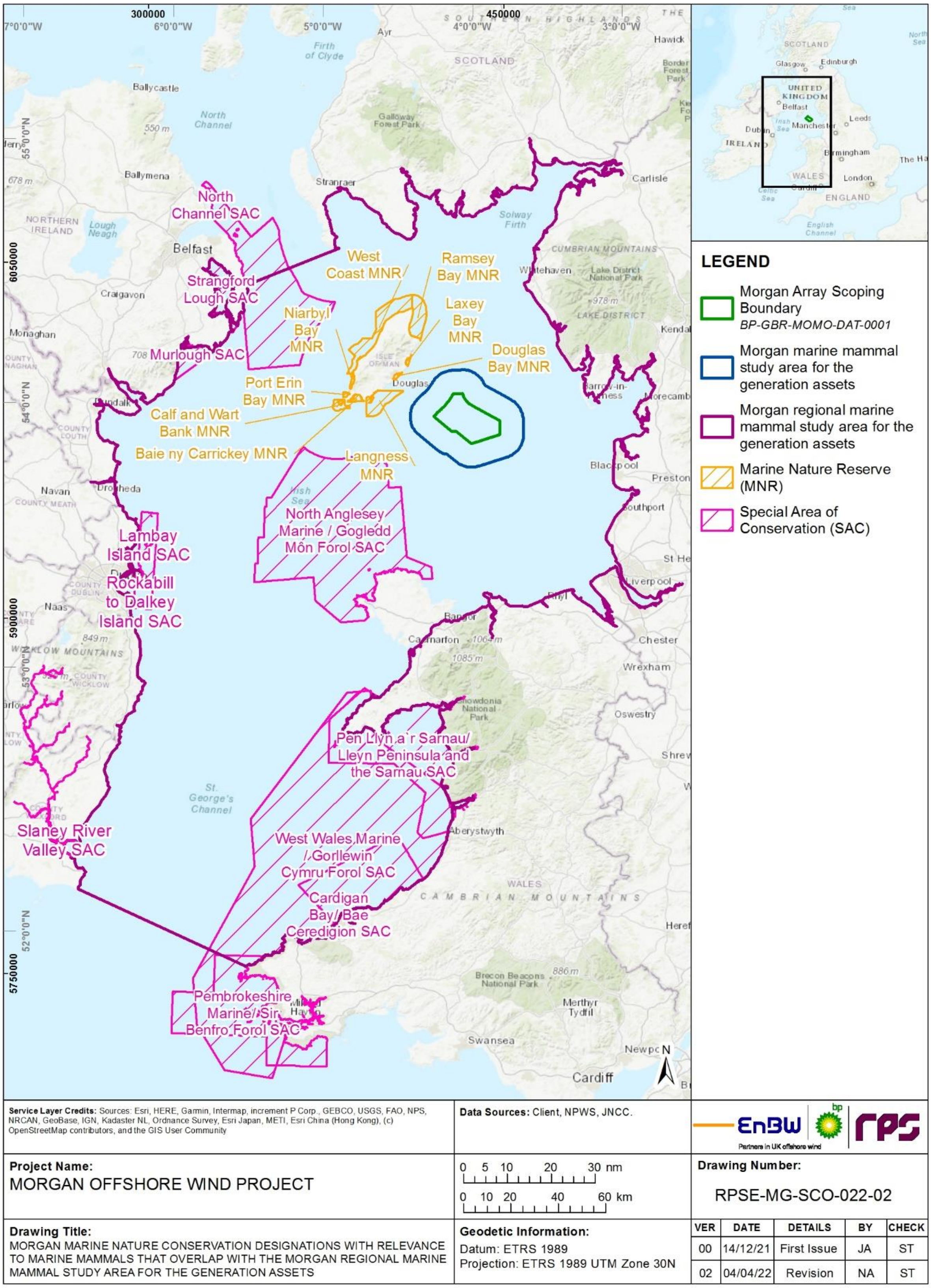


Figure 4.21: Marine nature conservation designations of relevance to marine mammal ecology that overlap with the Morgan regional marine mammal study area for the generation assets.

Protected species

4.3.4.55 Several species and habitats of conservation importance have been recorded or have the potential to occur within the Morgan marine mammal study area for the generation assets. These are presented below in Table 4.15 and include those species and habitats protected under Annex II of the Habitats Regulations. Where species are afforded protection under other legislation, this has also been noted.

Table 4.15: Relevant protected marine mammal species which have the potential to occur within the Morgan marine mammal study area for the generation assets.

Marine mammal species	Protection legislation
Bottlenose dolphin (*Tursiops truncatus*)	• Annex II of the Habitats Regulations • UK Biodiversity Action Plan (BAP) prioity habitat that continues to be regarded as conservation priorities in the subsequent UK Post-2010 Biodiversity Framework • Habitat of principal importance in England under the Natural Environment and Rural Communities (NERC) Act 2006 • European Protected Species under Annex IV of the European Comission habitats directive • Part II Section 28 of the Wildlife and Countryside Act 1981
Harbour porpoise (*Phocoena phocoena*)	• Annex II of the Habitats Regulations • Annex V of the OSPAR (Oslo-Paris) convention • UK BAP prioity habitat that continues to be regarded as conservation priorities in the • European Protected Species under Annex IV of the European Comission habitats directive subsequent UK Post-2010 Biodiversity Framework • Schedule 6 of the Wildlife and Countryside Act 1981
Grey seal (*Halichoerus grypus*)	• Annex II of the Habitats Regulations • European Protected Species under Annex IV of the European Comission habitats directive • Annex V of the European Comission habitats directive • Part II Section 28 of the Wildlife and Countryside Act 1981 • Conservation of Seals Act 1970
Harbour seal (*Phoca vitulina*)	• Annex II of the Habitats Regulations • UK BAP prioity habitat that continues to be regarded as conservation priorities in the subsequent UK Post-2010 Biodiversity Framework • Habitat of principal importance in England under the NERC 2006 Act • European Protected Species under Annex IV of the European Comission habitats directive • Annex V of the European Comission habitats directive • Conservation of Seals Act 1970
Minke whale (*Balaenoptera acutorostrata*)	• UK BAP prioity habitat that continues to be regarded as conservation priorities in the subsequent UK Post-2010 Biodiversity Framework • Habitat of principal importance in England under the NERC 2006 Act • European Protected Species under Annex IV of the European Comission habitats directive • Schedule 5 of the Wildlife and Countryside Act 1981

Marine mammal species	Protection legislation
Short beaked common dolphin (*Delphinus delphis*)	• UK BAP prioity habitat that continues to be regarded as conservation priorities in the subsequent UK Post-2010 Biodiversity Framework • European Protected Species under Annex IV of the European Comission habitats directive • Schedule 6 of the Wildlife and Countryside Act 1981
Risso's dolphin (*Grampus griseus*)	• UK BAP prioity habitat that continues to be regarded as conservation priorities in the subsequent UK Post-2010 Biodiversity Framework • Habitat of principal importance in England under the NERC 2006 Act • European Protected Species under Annex IV of the European Comission habitats directive • Schedule 5 of the Wildlife and Countryside Act 1981

4.3.5 Potential project impacts

4.3.5.1 A range of potential impacts on marine mammals have been identified which may occur during the construction, operation and maintenance, and decommissioning phases of the Morgan Offshore Wind Project.

4.3.5.2 The impacts that have been scoped into the assessment are outlined in Table 4.16 together with a description of any additional data collection (e.g. site-specific surveys) and supporting analyses (e.g. modelling) that will be required to enable a full assessment of the impacts.

4.3.5.3 Potential impacts scoped out of the assessment are presented in Table 4.17, with justification.

Table 4.16: Impacts proposed to be scoped into the project assessment for marine mammals (project phase refers to construction (C), operation and maintenance (O) and decommissioning (D)).

Impact	Project phase			Justification	Data collection and analysis required to characterise the baseline environment	Summary of proposed approach to assessment
	C	O	D			
Injury and disturbance from underwater noise generated from piling.	✓	×	×	Impact piling during construction may result in hearing damage/auditory injury or behavioural disturbance/displacement (including barrier effects) of marine mammals.	Aerial surveys to obtain density estimates, where data allows, for each species within the relevant impact footprint. Desktop data sources will also be used where appropriate.	Underwater noise modelling will be undertaken (as set out in section 3.1.7) to quantitatively assess the risk of auditory injury. Unless any new guidance is published prior to the impact assessment, the Southall *et al*. (2019) thresholds will be used to assess the risk of a permanent auditory injury. The risk of injury will be based on both of the dual criteria: cumulative sound exposure level (SEL_{cum}) and peak sound pressure level (SPL^{peak}). The assessment of disturbance will be based on the good practice methodology available at the time of assessment and, making use of the best available scientific evidence. Noise contours at appropriate intervals will likely be generated by noise modelling and overlaid on species density surfaces to predict the number of animals potentially affected.
Injury and disturbance from underwater noise generation from unexploded ordnance (UXO) detonation.	✓	×	×	UXO detonation may result in hearing damage/auditory injury or behavioural disturbance/displacement (including barrier effects) of marine mammals	Aerial surveys to obtain density estimates, where data allows, for each species within the relevant impact footprint. Desktop data sources will also be used where appropriate.	Underwater noise modelling will be undertaken for UXO detonation activities (as set out in section 3.1.7) will be used to inform this assessment and determine the extent of noise contours and whether these could lead to injury/disturbance effects.
Disturbance to marine mammals from vessel use and other (non-piling) noise producing activities.	✓	✓	✓	The impact of vessel use during all phases of the project may result in behavioural disturbance/ displacement (including barrier effects) of marine mammals. Other (non-piling) related noise-producing activities could also result in disturbance including construction activities (e.g. seabed preparation, trenching, and rock placement), operation and maintenance activities and decommissioning activities.	Aerial surveys to obtain density estimates, where data allows, for each species within the relevant impact footprint. Desktop data sources will also be used where appropriate.	Comparative noise modelling for non-piling 'noisy' activities will be undertaken to inform a qualitative assessment of non-piling noise-generating activities, e.g. rock placement, vessel movement.
Injury to marine mammals due to collision with vessels.	✓	✓	✓	Increased vessel traffic during construction activities, operation and maintenance activities and decommissioning activities may	N/A	A qualitative assessment will be undertaken, based on best available literature at the time of writing.

Impact	Project phase			Justification	Data collection and analysis required to characterise the baseline environment	Summary of proposed approach to assessment
	C	O	D			
				result in collisions with marine mammals.		
Effects on marine mammals due to changes in prey availability.	✓	✓	✓	Changes in prey abundance and distribution resulting from construction activities, operation and maintenance activities and decommissioning activities may impact on the ability of marine mammals to forage in the area.	N/A	No specific modelling required for this impact although the assessment will be based on the results of the underwater noise modelling assessment (section 3.2) and physical processes assessment (section 3.1), and the resulting impact assessment carried out fish and shellfish receptors (section 4.2).
Disturbance to marine mammals from pre-construction surveys.	✓	×	×	Geophysical surveys in the construction phase may result in behavioural disturbance/ displacement of marine mammals.	Aerial surveys to obtain density estimates, where data allows, for each species within the relevant impact footprint. Desktop data sources will also be used where appropriate.	Comparative noise modelling for non-piling 'noisy' activities will be undertaken to inform a qualitative assessment of non-piling noise-generating activities.

Table 4.17: Impacts proposed to be scoped out of the project assessment for marine mammals.

Impact	Justification
Accidental pollution during all phases.	There is a risk of pollution being accidentally released during the construction, operation and maintenance and decommissioning phases from sources including vessels / vehicles and equipment/machinery. This may lead to direct mortality of marine mammals or a reduction in prey availability, either of which may affect species' survival rates. However, the risk of such events is managed by the implementation of measures set out in standard post-consent plans (e.g. Environmental Management Plan (EMP), including Marine Pollution Contingency Plans (MPCP)). These plans include planning for accidental spills, address all potential contaminant releases and include key emergency contact details. It will also set out industry good practice and OSPAR (Oslo-Paris), International Maritime Organisation (IMO) and MARPOL (International Convention for the Prevention of Pollution from Ships) guidelines for preventing pollution at- sea. Therefore, the likelihood of an accidental spill occurring is very low and in the unlikely event that such events did occur, the magnitude of these will be minimised through measures such as marine pollution contingency planning (MPCP). The impact of pollution including accidental spills and contaminant releases associated with the construction of infrastructure and use of supply/service vessels may lead to direct mortality of marine mammals or a reduction in prey availability, either of which may affect species' survival rates. With implementation of an appropriate pollution prevention plan, and based on evidence from other offshore wind farm consent applications, that significant impact within the equivalent extent of a windfarm's array plus buffer area is considered very unlikely to occur, and a major incident that may impact any species at a population level is considered very unlikely. It was predicted that any impact would be of local spatial extent, short-term duration, intermittent and medium reversibility within the context of the regional populations and therefore not significant in EIA terms. This is considered to be equally applicable to the Morgan Offshore Wind Project generation assets for which construction will be comparable in scale and operation within the same environment, whilst implementing an appropriate pollution prevention plan. As such, this impact will be scoped out of further consideration within the Marine mammal ES chapter.
Increased suspended sediment concentrations	Disturbance to water quality as a result of construction operations can have both direct and indirect impacts on marine mammals. Indirect impacts would include effects on prey species (which is scoped in). Direct impacts include the impairment of visibility and therefore foraging ability which might be expected to reduce foraging

Impact	Justification
(SSC) and associated sediment deposition during all phases.	success. Marine mammals are well known to forage in tidal areas where water conditions are turbid and visibility conditions poor. For example, harbour porpoise and harbour seal in the UK have been documented foraging in areas with high tidal flows (e.g. Pierpoint, 2008; Marubini *et al*., 2009; Hastie *et al*., 2016); therefore, low light levels, turbid waters and suspended sediments are unlikely to negatively impact marine mammal foraging success. When the visual sensory systems of marine mammals are compromised, they are able to sense the environment in other ways, for example, seals can detect water movements and hydrodynamic trails with their mystacial vibrissae; while odontocetes primarily use echolocation to navigate and find food in darkness. Whilst elevated levels of SSC arising during construction of the Morgan Offshore Wind Project generation assets may decrease light availability in the water column and produce turbid conditions, the maximum impact range is expected to be localised with sediments rapidly dissipating over one tidal excursion. In addition, there is a large natural variability in the SSC within the Morgan marine mammal study area for the generation assets, so marine mammals living here will be tolerant of any small scale increases, such as those associated with the construction activities. As such, this impact will be scoped out of further consideration within the Marine mammal ES chapter.
Impact of EMF (from surface lain or buried cables) during the operation and maintenance phase.	Based on the data available to date, there is no evidence of EMF related to marine renewable devices having any impact (either positive or negative) on marine mammals (Copping, 2018). There is no evidence that seals can detect or respond to EMF, however, some species of cetaceans may be able to detect variations in magnetic fields (Normandeau *et al*., 2011). To date, the only marine mammal known to show any response to EMF is the Guiana dolphin (*Sotalia guianensis*) which has been shown to possess an electroreceptive system, which uses the vibrissal crypts on their rostrum to detect electrical stimuli similar to those generated by small to medium sized fish (Czech-Damal *et al.,* 2013). However, this has not been shown in any other species of marine mammal and this species does not occur within the Morgan marine mammal study area for the generation assets. As such, this impact will be scoped out of further consideration within the Marine mammal ES chapter.
Disturbance to marine mammals from operational noise from wind turbine operation during the operation and maintenance phase.	The Marine Management Organisation (MMO, 2014) review of post-consent monitoring at offshore wind farms found that available data on the operational wind turbine noise, from the UK and abroad, in general showed that noise levels from operational wind turbines are low and the spatial extent of the potential impact of the operational wind turbine noise on marine receptors is generally estimated to be small, with behavioural response only likely at ranges close to the wind turbines. This is supported by several published studies which provide evidence that marine mammals are not displaced from operational wind farms. At the Horns Rev and Nysted offshore wind farms in Denmark, long term monitoring showed that both harbour porpoise and harbour seal were sighted regularly within the operational offshore wind farms, and within two years of operation, the populations had returned to levels that were comparable with the wider area (Diederichs *et al.*, 2008). Similarly, a monitoring programme at the Egmond aan Zee offshore wind farm in the Netherlands reported that significantly more porpoise activity was recorded within the offshore wind farm compared to the reference area during the operational phase (Scheidat *et al*., 2011). Other studies at Dutch and Danish offshore wind farms (Lindeboom *et al*., 2011) also suggest that harbour porpoise may be attracted to increased foraging opportunities within operating offshore wind farms. In addition, recent tagging work by Russell *et al*. (2014) found that some tagged harbour and grey seals demonstrated grid like movement patterns as these animals moved between individual wind turbines, strongly suggestive of these structures being used for foraging. Other reviews have also concluded that operational wind farm noise will have negligible effects (Madsen *et al*.,2006; Teilmann *et al*., 2006a; Teilmann *et al*., 2006b; CEFAS, 2010; Brasseur *et al*., 2012). As such, this impact will be scoped out of further consideration within the Marine mammal ES chapter.

4.3.6 Measures adopted as part of the project

4.3.6.1 The following measures adopted as part of the project are relevant to marine mammals. These measures may evolve as the engineering design and the EIA progresses.

- Development of, and adherence to, an appropriate Construction Method Statement (CMS).
- Development of, and adherence to, an Environmental Management Plan (EMP), including a Marine Pollution Contingency Plan (MPCP) which will include planning for accidental spills, address all potential contaminant releases and include key emergency details.
- Development of, and adherence to, a Marine Mammal Mitigation Protocol (MMMP) which would include implementation of piling soft start and ramp up measures.

4.3.6.2 The requirement for and feasibility of any further mitigation will be dependent on the significance of effect and will be consulted upon with statutory consultees throughout the EIA process.

4.3.7 Proposed assessment methodology

4.3.7.1 The marine mammal offshore EIA will follow the methodology set out in part 1, section 4: EIA methodology, of the EIA Scoping Report. Specific to the marine mammal EIA, the following guidance documents will also be considered:

- Guidelines for EcIA in the UK and Ireland. Terrestrial, Freshwater, Coastal and Marine (CIEEM, 2019) European Union Guidance on Wind Energy Developments and Natura 2000 legislation (European Commission, 2010).
- Oslo Paris Convention (OSPAR) Guidance on Environmental Considerations for Offshore Wind Farm Development (OSPAR, 2008).
- Marine mammal noise exposure criteria: Updated scientific recommendations for residual hearing effects (Southall *et al.*, 2019).
- National Oceanic and Atmospheric Administration (NOAA) technical guidance for assessing the effects of anthropogenic sound on marine mammal hearing (NMFS, 2016).
- Underwater acoustic thresholds for onset of permanent and temporary threshold shifts (NMFS, 2018).
- Marine mammal noise exposure criteria: assessing the severity of marine mammal behavioural response to human noise (Southall *et al*., 2021)
- Statutory nature conservation agency protocol for minimising the risk of injury to marine mammals from piling noise (JNCC, 2010).
- JNCC guidelines for minimising the risk of injury to marine mammals from geophysical surveys (JNCC, 2017).
- Guidance on noise management in harbour porpoise SACs (JNCC, 2020b).

- The European Union (EU) Marine Strategy Framework Directive (Directive 2008/56/EC). This seeks to achieve good environmental status (GES) in Europe's seas by 2020. The qualitative descriptors for determining GES include "Introduction of energy, including underwater noise, is at levels that do not adversely affect the marine environment." This Directive was transposed into United Kingdom (UK) law by the Marine Strategy Regulations 2010.

4.3.7.2 The impact assessment will consist of a detailed quantitative assessment for underwater noise (impulsive and non-impulsive). The assessment will include permanent auditory injury and behavioural disturbance. The risk of injury will be based on both of the dual criteria: cumulative sound exposure level (SEL_{cum}) and peak sound pressure level (peak SPL). To assess the SEL_{cum} criterion, the predictions of received sound level over 24 hours are frequency weighted, to reflect the hearing sensitivity of each functional hearing group. The peak SPL criterion is for unweighted received sound level. The assessment of disturbance will be based on the good practice methodology available at the time of assessment, and, where possible, will include consideration of species-specific dose-response curves. Noise contours at appropriate intervals will be generated by noise modelling and overlaid on species density surfaces to predict the number of animals potentially disturbed. This will allow the quantification of the number of animals that will potentially respond.

4.3.7.3 The densities to be used in the assessment process for assessing potential impacts on marine mammals, and agreement of correction factors for availability bias will be discussed with stakeholders as part of the marine mammal Evidence Plan process.

4.3.7.4 For the purposes of undertaking the EIA, marine mammal receptors identified as having the potential to occur in the Morgan marine mammal study area for the generation assets will be grouped into broad ecological receptor groups, known as Important Ecological Features (IEFs), in line with guidelines set out in CIEEM (2019). These IEFs will be those features against which impacts associated with the construction, operation and maintenance and decommissioning phases of the Morgan Offshore Wind Project generation assets will be assessed. Criteria defining the value of each IEF will be defined to reflect topic-specific interests.

4.3.8 Potential cumulative effects

4.3.8.1 For marine mammal receptors, the approach to cumulative effects assessment will be holistic and combine all potential sources of underwater noise from other plans and projects including:

- pile driving
- disturbance from vessels
- UXO clearance
- seismic surveys
- other construction developments.

4.3.8.2 The key cumulative effect is likely to come from underwater noise from pile driving. A range of realistic scenarios for cumulative underwater noise effects will be developed for the cumulative effects assessment, based on publicly available information, liaison with other developers where possible, as well as consultation with the regulators and stakeholders.

4.3.8.3 The impacts of fishing and existing shipping activity will not be considered in the cumulative effects assessment since these activities occur throughout the baseline and are therefore already accounted for in the existing marine mammal baseline characterisation abundance and density estimates.

4.3.8.4 The cumulative effects assessment will follow the approach outlined in part 1, section 4: EIA methodology, of the EIA Scoping Report. The cumulative study area (within which the screening for other plans/projects is undertaken) will be defined as the Morgan regional marine mammal study area for the generation assets (see section 4.3.2).

4.3.9 Potential inter-related effects

4.3.9.1 The assessment of potential inter-related effects will be considered within the Marine mammals ES chapter. It will include consideration of project lifetime effects and receptor-led effects, in line with the approach outlined in part 1, section 4: EIA methodology, of the EIA Scoping Report.

4.3.10 Potential transboundary impacts

4.3.10.1 A screening of transboundary impacts has been carried out and is presented in part 3, Annex A: Transboundary Impacts Screening, of the EIA Scoping Report. This screening exercise identified that there is potential for transboundary impacts upon marine mammals due to construction, operation and maintenance, and decommissioning impacts of the Morgan Offshore Wind Project generation assets. These include:

- Injury and disturbance from underwater noise generated from piling.
- Injury and disturbance from underwater noise generation from UXO detonation.
- Disturbance to marine mammals from vessel use and other (non-piling) noise-producing activities.
- Effects on marine mammals due to changes in prey availability.

4.3.10.2 These activities have the potential to directly affect Annex II marine mammal species that are associated with European sites of other states. Therefore, the potential for transboundary impacts will be considered within the ES.

4.4 Offshore ornithology

4.4.1 Introduction

4.4.1.1 This section of the Environmental Impact Assessment (EIA) Scoping Report identifies the offshore ornithology receptors of relevance to the Morgan Offshore Wind Project generation assets and considers the potential impacts arising from the construction, operation and maintenance, and decommissioning of the generation assets on offshore (marine) ornithology receptors below Mean High Water Springs (MHWS).

4.4.2 Study area

4.4.2.1 The Morgan offshore ornithology study area for the generation assets is presented in Figure 4.22 and described below.

4.4.2.2 The Morgan offshore ornithology study area for the generation assets comprises the Morgan Array Scoping Boundary with a 10km buffer and represents the Morgan aerial bird survey area.

4.4.2.3 Current Statutory Nature Conservation Body (SNCB) guidance regarding displacement (SNCBs, 2017) advises a displacement buffer of 2km for auk species (e.g. guillemot *Uria aalge*, razorbill *Alca torda*). Diver species are perceived to be more sensitive, and displacement has typically been assessed for the area within 4km of an offshore wind farm array boundary; however, there is recent evidence of displacement effects at substantially larger distances (Mendel *et al.*, 2019; Heinänen *et al.*, 2020) and emerging guidance (Natural England, in prep.) suggests that buffer areas around offshore wind farm arrays should cover 10km when wintering divers are present and may be connected to a nearby designated site. Therefore, the Morgan offshore ornithology study area for the generation assets is considered to be suitable for characterising the offshore ornithology features and for considering potential impacts from the Morgan Offshore Wind Project generation assets.

4.4.2.4 Seabirds and migratory birds are highly mobile species and there is potential for birds occurring within the Morgan Array Scoping Boundary to have originated from more distant locations (e.g. breeding colony). Published foraging ranges (Woodward *et al.,* 2019) and regional population scales (Furness, 2015) will be reviewed to determine the potential connectivity of breeding and non-breeding populations with the Morgan Offshore Wind Project generation assets.

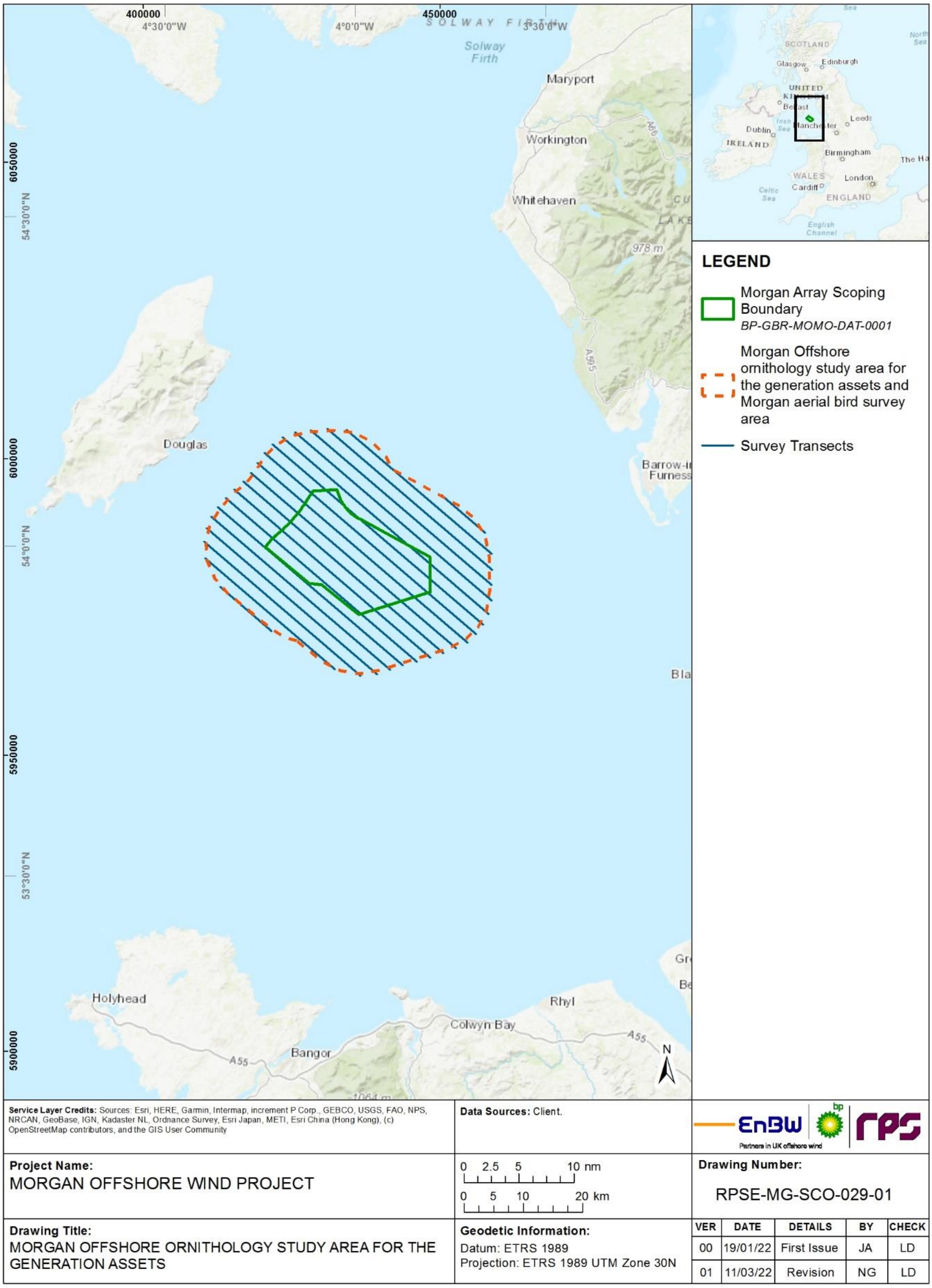


Figure 4.22: The Morgan offshore ornithology study area for the generation assets.

4.4.3 Data sources

Desktop data

4.4.3.1 An initial desk-based review of literature and data sources to support this EIA Scoping Report has identified a number of sources which provide coverage of the Morgan offshore ornithology study area for the generation assets. These are summarised in Table 4.18.

Table 4.18: Summary of key desktop datasets and reports.

Title	Source	Year	Author
Seabird Population Trends and Causes of Change	Joint Nature Conservation Committee (JNCC)	2021	JNCC
Seabirds Count and the Seabird Monitoring Programme	JNCC	2021	JNCC
Protected site networks	JNCC, NatureScot SiteLink (Scotland), Natural England GOV.UK (England), Natural Resources Wales (NRW) GOV.WALES (Wales), Department of Agriculture, Environment and Rural Affairs (DAERA) (Northern Ireland), National Parks and Wildlife Service (NPWS) (Ireland), Isle of Man GOV.IM (DEFA)	2021	Statutory Nature Conservation Bodies (SNCBs)
National Biodiversity Network (NBN) Atlas	NBN Atlas	2021	NBN Atlas
Identifying important at-sea areas for seabirds using species distribution models and hotspot mapping	Biological Conservation	2020	Cleasby *et al*.
Desk-based revision of seabird foraging ranges used for Habitats Regulation Asssessment (HRA) screening	BTO Research Report	2019	Woodward *et al*.
Seabird Mapping and Sensitivity Tool (SeaMAST)	Natural England GOV.UK	2019	Natural England
Distribution maps of cetacean and seabird populations in the North-East Atlantic	Journal of Applied Ecology	2019	Waggitt *et al*.
Breeding density, fine-scale tracking, and large-scale modelling reveal the regional distribution of four seabird species	Ecological Applications	2017	Wakefield *et al*.
Report to Inform Appropriate Assessment: Offshore Wind Leasing Round 4. Plan Level HRA	The Crown Estate	2021/ 2022	Niras
Awel y Mor aerial digital surveys (2019 to 2021)	Awel y Mor Preliminary Environmental Information Report (PEIR), Volume 2, Chapter 4: Offshore	2019-2021	RWE

Title	Source	Year	Author
	Ornithology https://awelymor.cymru/		
Morlais Project baseline boat-based seabird survey results	Morlais Project Environmental Statement	2019	Natural Power/Royal Haskoning
Walney offshore wind farm year 3 post-construction monitoring	Marine Data Exchange	2014	CMACS
Rhiannon offshore wind farm Preliminary Environmental Information Report (PEIR)	Marine Data Exchange	2012	Celtic Array Ltd
West of Duddon Sands pre-construction offshore wind farm boat-based ornithology samples	Marine Data Exchange	2012	Centre for Marine and Coastal Studies Ltd (CMACS)
Rhiannon offshore wind farm PEIR	Marine Data Exchange	2012	Celtic Array Ltd
Ormonde and Walney offshore wind farm ornithology surveys	Marine Data Exchange	2011-2012	Aarhus University
Round 3 Irish Sea Offshore Wind Farm Development ornithology surveys	Marine Data Exchange	2010-2012	Ecological Consultancy Ltd. (ECON)
SEA678 Data Report for offshore seabird populations	University College Cork	2006	Mackey and Giménez

Site-specific surveys

4.4.3.2 Aerial digital surveys for seabirds and marine mammals are currently being undertaken across the Morgan offshore ornithology study area for the generation assets. Surveys commenced in April 2021 and are planned to continue until March 2023, completing a suite of 24 surveys spanning two years.

4.4.3.3 The surveys follow APEM's grid-based method for collecting seabird and marine mammal data, with approximately 30% of the sea surface collected and 12% analysed, conforming with guidance in Thaxter *et al*. (2016). APEM's bespoke camera system was fitted into a twin-engine aircraft and custom flight planning software allowed each flight line to be accurately mapped for use before and during the flight. The camera system captures abutting still imagery along 18 survey lines spaced approximately two kilometres (km) between-track and aligned northwest to southeast.

4.4.3.4 The aircraft collects the data at an altitude of approximately 396 metres (m), and a speed of approximately 120 knots. The data collected are 1.5 centimetre (cm) Ground Sampling Distance (GSD) digital still images, and target coverage has been met for each survey. All surveys are undertaken in weather conditions that do not compromise the ability to provide data on the identification, distribution and abundance of bird species and marine megafauna within the Morgan aerial bird survey area. Favourable conditions for surveying are defined as a cloud base of >396m, visibility of > 5km, wind speed of <30 knots and a sea state of no more than 4 (moderate). For health and safety reasons, no surveys are undertaken in icing conditions. Measures are taken to minimise glint and glare (strong reflected light off the sea), that makes finding and identifying bird species and marine megafauna more difficult. On days with minimal cloud, surveys avoid the period for two hours around midday. This reduces the risk of collecting images that are difficult to analyse.

4.4.3.5 The images are analysed to enumerate bird and marine mammals to species level, where possible. Each animal and anthropogenic object located in the imagery is geo-referenced, allowing the locations to be related to the boundary of the survey area. Internal quality assurance is undertaken to check for missed targets and to ensure the correct species are identified. Birds and marine mammals identified from the images are 'snagged' (i.e. located within the images) and categorised to the lowest taxonomic level possible.

4.4.3.6 The site-specific survey data will be used to generate density and spatial abundance estimates for the most frequently recorded bird species within the Morgan offshore ornithology study area for the generation assets, using either a modelling application (e.g. MRSea) or design-based abundance estimation methods. The method used will be discussed and agreed in consultation with the Evidence Plan Expert Working Group for offshore and coastal ornithology.

4.4.3.7 The direction of birds in flight are recorded from all digital still images. This is undertaken by measuring the axis of bill to tail, within APEM's bespoke image analysis software, taking the bearing relative to the bird's head. This bearing is linked to the geo-referenced image and thus provides an accurate representation of bird orientation at time of image capture. This data can be used to explore the predominant flight direction of each species during a survey or during a season by the creation of circular statistic outputs termed 'rose diagrams'.

4.4.3.8 Further details on the site-specific surveys will be presented in the Environmental Statement (ES) and are being consulted on with the SNCBs through the Evidence Plan Expert Working Group for offshore and coastal ornithology.

4.4.4 Baseline environment

4.4.4.1 This section provides a high-level overview of the offshore ornithology baseline environment within the Morgan offshore ornithology study area for the generation assets in the context of the Irish Sea bird populations.

4.4.4.2 The primary data source used to inform the offshore ornithology EIA for the Morgan Offshore Wind Project generation assets will be the 24 months of digital aerial transect surveys conducted between April 2021 and March 2023.

Irish Sea

4.4.4.3 A review of ornithology surveys in the Irish Sea from 1980 to 2003 was undertaken for the Strategic Environmental Assessment (SEA) area 6 which covers the Irish Sea. Manx shearwater *Puffinus puffinus* have been recorded at densities of up to eight birds per km^2 in the Irish Sea during the breeding season and post-breeding season. Northern gannet *Morus bassanus* have also been recorded at densities in the Irish Sea of up to 2.5 birds per km^2 during the post-breeding season. Herring gull *Larus argentatus* have been recorded at densities of 5 birds per km^2 during the winter, breeding season and autumn. Kittiwake *Rissa tridactyla* were recorded at densities of up to 2 birds per km^2 across all seasons. The great cormorant *Phalacrocorax carbo*, northern fulmar *Fulmarus glacialis*, European shag *Phalacrocorax aristotelis*, arctic skua *Stercorarius parasiticus*, great skua *Stercorarius skua*, black headed gull *Chroicocephalus ridibundus*, common gull *Larus canus*, long-tailed skua *Stercorarius longicaudus*, Pomarine Skua *Stercorarius pomarinus*, lesser black-backed gull *Larus fuscus*, great black-backed gull *Larus marinus*, common tern *Sterna hirundo*, arctic tern *Sterna paradisaea*, black guillemot *Cepphus grylle*, common guillemot, razorbill and Atlantic puffin *Fratercula arctica* are also identified as being present within the Irish Sea (Mackey and Giménez, 2006).

4.4.4.4 Boat-based ornithology surveys were carried out within the east Irish Sea (to the southwest of the Morgan offshore ornithology study area for the generation assets) from March 2010 to April 2012 to support the Environmental Impact Assessment (EIA) for the Rhiannon offshore wind farm. The species assemblage recorded was primarily composed of petrel *Procellariiformes*, shearwater *Procellariidae*, northern gannet *M. bassanus*, skuas *Stercorarius*, gulls *Laridae*, terns *Sternidae* and auks *Alcidae*. Manx shearwater dominated the recorded individuals, making up 44% of all birds recorded. Guillemot and razorbill were the second and third most common species recorded. Seasonal variation was also recorded with many of the more numerous species recorded in higher numbers throughout the spring and summer months (Celtic Array Ltd, 2012).

4.4.4.5 Boat-based ornithology surveys were carried out within the east Irish Sea (to the east of the Morgan offshore ornithology study area for the generation assets) in 2014 as part of pre-construction and post-construction monitoring for the West of Duddon Sands and Walney offshore wind farms. Manx shearwater and guillemot were the most frequently recorded species and were recorded in all surveys. Kittiwake, lesser black-backed gull and gannet were also recorded frequently. The abundance of birds recorded within the offshore wind farms peaked in June and July. There were low numbers of birds in May and August across both survey campaigns (CMACS, 2012; 2014).

Morgan offshore ornithology study area for the generation assets

4.4.4.6 Interim analysis of the aerial digital survey data collected between April 2021 and June 2021 indicates that the five most frequently recorded species occurring within the Morgan offshore ornithology study area for the generation assets over this period were guillemot, razorbill, kittiwake, Manx shearwater and northern gannet. Herring gull, fulmar, 'commic' tern and other gull species were recorded regularly but in lower numbers.

4.4.4.7 A summary of the most frequently recorded species in the site-specific surveys from April 2021 to June 2021 across the Morgan offshore ornithology study area for the generation assets is presented below:

- Guillemot: 1,107 guillemot were recorded in April, 289 were recorded in May and 177 were recorded in June within the Morgan offshore ornithology study area for the generation assets. Guillemot were recorded throughout this area.

- Razorbill: 48 razorbill were recorded in April, 9 were recorded in May and 17 were recorded in June within the Morgan offshore ornithology study area for the generation assets. Razorbill were recorded throughout the Morgan offshore ornithology study area for the generation assets. However, they showed a higher density within the centre and east of this area.
- Unidentified guillemot/razorbill: guillemot and razorbill cannot be reliably identified to species level in some images and such incidences are therefore snagged as ‘unidentified guillemot/razorbill’. During the 2021 aerial surveys, 192 unidentified guillemot/razorbill were recorded in April, 42 were recorded in May and 26 were recorded in June within the Morgan offshore ornithology study area for the generation assets. Guillemot/razorbill were recorded throughout this area.
- Kittiwake: 161 kittiwake were recorded in April, 57 were recorded in May and 26 were recorded in June within the Morgan offshore ornithology study area for the generation assets. Kittiwake were recorded across the Morgan offshore ornithology study area for the generation assets, however they were more frequently recorded in the east of this area.
- Manx shearwater: 66 Manx shearwater were recorded in April, 9 were recorded in May and 94 were recorded in June. Manx shearwater were recorded throughout the Morgan offshore ornithology study area for the generation assets.
- Gannet: 40 gannets were recorded in April, 32 were recorded in May and 16 were recorded in June within the Morgan offshore ornithology study area for the generation assets. Gannets were most frequently recorded in the east and north of this area.

4.4.4.8 Further analysis of density and abundance results using 12 months of aerial digital survey data will be undertaken and presented in the PEIR. Analysis of the full 24 months of aerial survey data will be presented in the ES chapter.

Designated sites

4.4.4.9 There are no Special Protection Areas (SPAs) within 10km of the Morgan Array Scoping Boundary. As part of the site selection process (see part 2, section 2: Site selection and alternatives, of the EIA Scoping Report), a 10km buffer was applied to the Liverpool Bay SPA, to minimise impacts on offshore ornithology receptors.

4.4.4.10 Nature conservation designations with relevance to seabirds comprise SPAs within the National Site Network in the UK and Natura 2000 network of European sites in the Republic of Ireland, Ramsar sites, national (e.g. Sites of Special Scientific Interest (SSSI)) and regional designations. There are no current or proposed designated sites within the Morgan Array Scoping Boundary. There are, however, a number of SPAs along the western British coastline and eastern and northern coastlines of Ireland and Northern Ireland that support qualifying species that have been recorded during the site-specific surveys for the Morgan Offshore Wind Project generation assets. Figure 4.23 provides an initial indication of the designated sites (international and national) with relevant ornithology features that are within 100km of the Morgan Array Scoping Boundary and likely to be given consideration within the EIA and HRA. This is not an exhaustive representation of all designated sites with potential connectivity to the Morgan Offshore Wind Project generation assets.

4.4.4.11 It is considered that there is the potential for an impact on a breeding seabird colony if a wind farm is located within the regular foraging range of the species. In the absence of specific information on the foraging patterns of breeding birds, Natural England (2015) has previously advised that the 'mean maximum' range (i.e. the maximum range reported in each study averaged across studies per species) as reported by Thaxter *et al*. (2012) is used as a guide to establish likely connectivity between breeding seabird colonies and an offshore wind farm development. However, emerging English guidance (Natural England *in prep.*) and advice for more recent UK offshore wind applications recommend that connectivity is established by the mean maximum (plus one standard deviation (+1 S.D.)) foraging range reported in Woodward *et al.* (2019). This approach will be adopted for the Morgan Offshore Wind Project generation assets EIA. Use of this metric takes into account different maxima having been quantified by tracking studies for the same species, and the mean maximum (+1 S.D.) range incorporates this variability without relying on single values that might be unrepresentative of all colonies.

4.4.4.12 SPAs and proposed SPAs (pSPAs) designated for breeding seabird interests will be identified by a search for sites within the species-specific foraging range distances, defined by the mean maximum +1 S.D. distance. The assessment will identify a likely significant effect of the Morgan Offshore Wind Project generation assets on those breeding seabird SPAs within range that have recorded presence of the qualifying interests within the Morgan offshore ornithology study area for the generation assets. Consideration will also be given to the potential for impacts on wetland SPAs that host important wintering waterbird features that may interact with the Morgan Offshore Wind Project generation assets when in flight outside the respective SPA boundary. This process will generate a 'long-list' of designated sites with potential connectivity to the Morgan Offshore Wind Project generation assets.

4.4.4.13 This long list will be refined in the EIA to include sites that fall within the potential Zone of Influence (ZoI) of the Morgan Offshore Wind Project generation assets, which will be determined as part of the EIA process to include consideration of migratory bird species.

4.4.4.14 A full screening of the National Site Network and European sites with qualifying ornithology features will be undertaken in the HRA Screening Report for the Morgan Offshore Wind Project generation assets. Relevant qualifying interests of these designated sites screened into the offshore ornithology assessment will be fully considered and assessed in the Offshore ornithology chapter of the EIA, with the assessment on the designated sites deferred to the Report to Inform Appropriate Assessment (RIAA).

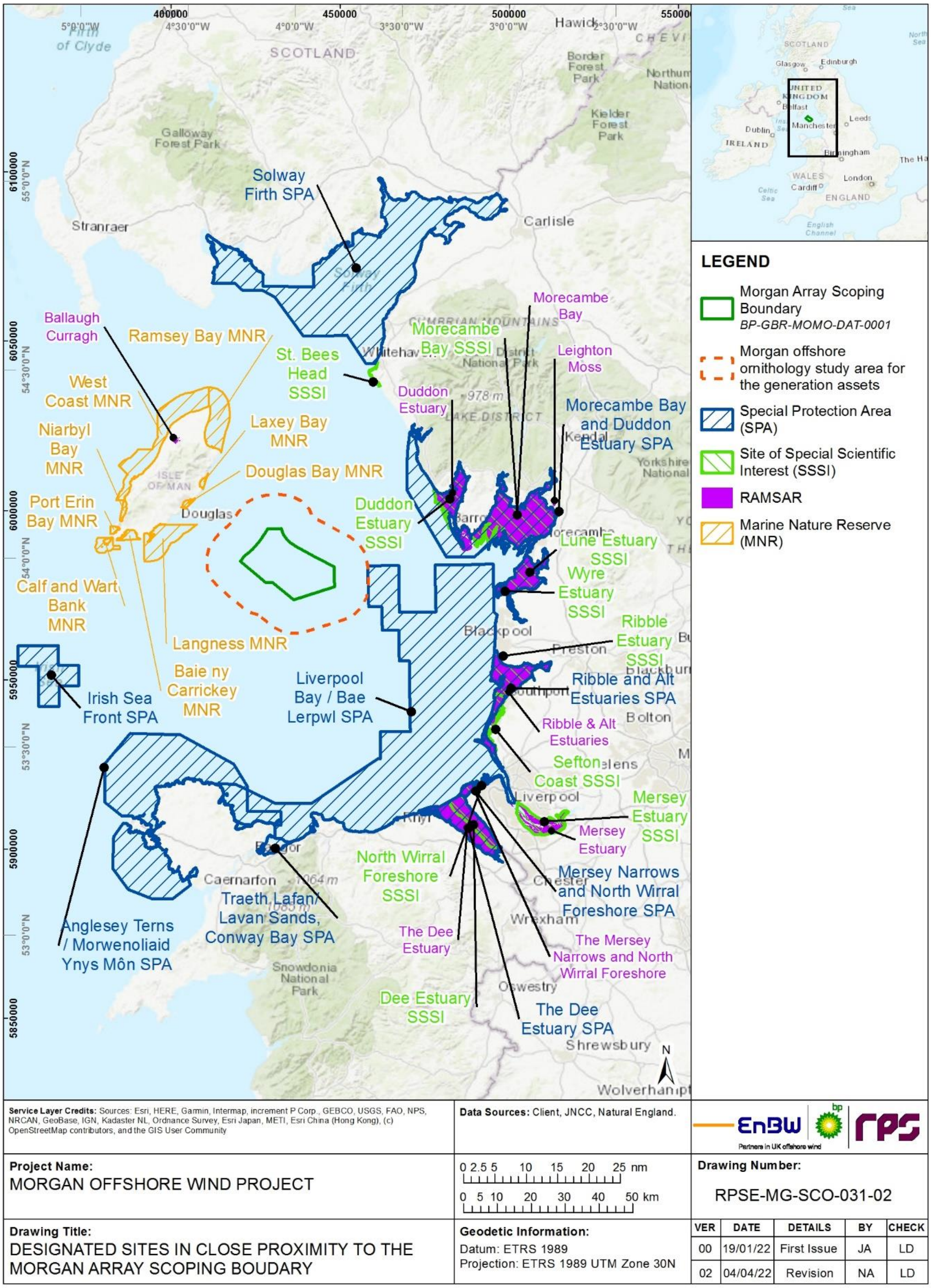


Figure 4.23: Marine nature conservation designations with relevance to offshore ornithology within the proximity of the Morgan Array Scoping Boundary.

4.4.5 Potential project impacts

4.4.5.1 A range of potential impacts on offshore ornithology receptors have been identified which may occur during the construction, operation and maintenance, and decommissioning phases of the Morgan Offshore Wind Project generation assets. The impacts that have been scoped into the assessment are outlined in Table 4.19, together with a description of any additional data collection (e.g. site-specific surveys) and supporting analyses (e.g. modelling) that will be required to enable a full assessment of the impacts.

4.4.5.2 On the basis of the baseline information currently available and the project description outlined in part 1, section 3: Project description, of the EIA Scoping Report, potential impacts proposed to be scoped out of the assessment are presented in Table 4.20, with justification.

Table 4.19: Impacts proposed to be scoped into the project assessment for offshore ornithology (project phase refers to construction (C), operation and maintenance (O) and decommissioning (D)).

Impact	Project phase			Justification	Data collection and analysis required to characterise the baseline environment	Summary of proposed approach to assessment
	C	O	D			
Disturbance and displacement from airborne noise, underwater noise and presence of vessels and infrastructure.	✓	✓	✓	Airborne noise and underwater noise generated during construction activities (such as pile-driving), and the presence of vessels, may temporarily disturb/displace birds from foraging areas. Presence of operational wind turbines and associated maintenance activities may disturb birds and displace them from their foraging or resting areas. The presence of vessels during the decommissioning phase may temporarily disturb birds from foraging areas.	Desk study, ornithological baseline surveys and data analysis.	Quantified assessment based on area disturbed during the construction and decommissioning phases and the impacts from vessels on birds. The extent of disturbance from vessels and the species' sensitivities will be based on published literature, e.g. Furness *et* al. (2013) and Wade *et al.* (2016). Displacement modelling and population viability analysis will be undertaken to quantify the estimated level of impact arising from displacement impacts during the operation and maintenance phase. Section 4.4.7 presents details of the proposed approach to be undertaken for displacement modelling, apportioning and population viability analysis.
Indirect impacts from underwater noise affecting prey species.	✓	×	✓	There is potential for mortality, injury and/or disturbance to sensitive fish and shellfish species as a result of construction activities such as pre-construction geophysical surveys, Unexploded Ordnance (UXO) detonation, and pile-driving. Similar impacts may arise during the decommissioning phase (although piling will not be required during the decommissioning phase). This may cause reduced energy intake affecting the productivity or survival of birds. This does not apply to the operation and maintenance phase when underwater noise emissions would not cause significant disruption to prey species.	Ornithological baseline surveys and data analysis, supported by information presented in the Fish and shellfish ecology chapter of the ES.	The assessment of potential effects on birds will draw upon the results from the Fish and shellfish ecology chapter and a qualitative assessment will be undertaken based on predicted extent of impact and known behaviour of fish to noise using the latest published literature.
Temporary habitat loss/disturbance and increased suspended sediment concentrations (SSCs).	✓	✓	✓	There is potential for temporary, direct benthic habitat loss and disturbance to sediments as a result of activities during all phases (e.g. seabed preparation, UXO	Ornithological baseline surveys and data analysis, supported by information presented in the Benthic subtidal and intertidal ecology	The assessment of potential effects on birds will draw upon the results from the Benthic subtidal and intertidal ecology and Fish and shellfish ecology chapters of the ES and a

Impact	Project phase			Justification	Data collection and analysis required to characterise the baseline environment	Summary of proposed approach to assessment
	C	O	D			
				detonation, drilling, cable installation and repair/reburial, removal of infrastructure) (see part 2, section 4.1: Benthic subtidal and intertidal ecology, of the EIA Scoping Report). This has potential to affect the foraging efficiency of diving birds as well as indirect effects from impacts on fish and shellfish prey.	and Fish and shellfish ecology chapters of the ES.	qualitative assessment will be undertaken based on predicted extent of impact on habitats.
Collision risk.	×	✓	×	Presence of operational wind turbines may lead to collision risk. Additional mortality may cause a decrease in seabird populations.	Ornithological baseline surveys and desktop data.	Collision risk modelling and population viability analysis will be undertaken to quantify the estimated level of impact arising from collisions. Section 4.4.7 presents details of the proposed approach to the collision risk modelling, apportioning and population viability analysis.
Barrier to movement.	×	✓	×	Presence of operational wind turbines may result in additional energy expenditure as migrating or commuting birds fly longer distances around the wind farm.	Ornithological baseline surveys and data analysis.	Barrier effects will be assessed alongside displacement impacts using the recommended and emerging SNCB approaches and Population Viability Analysis (PVA) analysis.

Table 4.20: Impacts proposed to be scoped out of the project assessment for offshore ornithology.

Impact	Justification
Direct disturbance and displacement impacts from underwater noise during operation and maintenance and decommissioning phases.	Underwater noise as a result of operation of the wind turbines is extremely unlikely to result in noise levels that would harm birds. In the unlikely event that such low levels of noise emission result in displacement of birds away from wind turbines, this impact would already be accounted for by the above-water operational displacement assessment. Underwater noise generated during the decommissioning phase will be lower than that generated during the construction phase, as piling will not be required during the decommissioning phase. As such, it is proposed that this impact is scoped out of the EIA.
Accidental pollution during all phases of the Morgan Offshore Wind Project generation assets.	Pollution impacts (accidental oil/fuel spills) during all phases of the Morgan Offshore Wind Project relating to the generation assets are scoped out on the basis that the implementation of a Marine Pollution Contingency Plan will avoid the risk of significant pollution events. Consequently, seabirds and shorebirds are extremely unlikely to be significantly affected by any such pollution impacts.

4.4.6 Measures adopted as part of the project

4.4.6.1 The following measures adopted as part of the project are relevant to offshore ornithology, and may evolve over the development process as the EIA progresses.

- The Applicant has committed to a minimum lower blade tip height (air draught) of 34m above Lowest Astronomical Tide (LAT) (see part 1, section 3: Project description, of the EIA Scoping Report). Air draught is known to be an important factor for collision risk, with typically fewer collisions predicted with increasing air draught.
- The development of and adherence to a Vessel Management Plan (VMP) which will include measures to minimise disturbance to rafting seabirds.
- Implementation of an Environmental Management Plan (EMP) including a Marine Pollution Contingency Plan (MPCP).

4.4.6.2 The requirement for and feasibility of any further mitigation will be dependent on the significance of effects and will be consulted upon with statutory consultees throughout the EIA process.

4.4.7 Proposed assessment methodology

Overview

4.4.7.1 The offshore ornithology EIA will follow the methodology set out in part 1 section 4: EIA methodology, of the EIA Scoping Report. The offshore ornithology EIA will be supported by a number of technical appendices, including:

- aerial survey report
- baseline characterisation report
- seabird Collision Risk Modelling
- migratory bird Collision Risk Modelling
- displacement analysis
- apportioning
- population Viability Analysis
- cumulative impact analysis.

4.4.7.2 The EIA will use the source-pathway-receptor method, where likely impacts will be identified on offshore ornithology receptors resulting from the construction operation and maintenance and decommissioning of the Morgan Offshore Wind Project generation assets. This method is defined as follows:

- Source: The origin of a potential impact, for example foundation installation and a resultant impact such as underwater noise.

- Pathway: The method by which the effects of the activity could impact ornithology receptors. For example, underwater noise disturbing prey species.
- Receptor: The baseline environment/species present that are impacted by the activity (e.g. prey species are unavailable for feeding birds).

4.4.7.3 The site-specific aerial surveys will provide data on the species present within the Morgan offshore ornithology study area for the generation assets, as well as abundance, distribution, behaviour, location, sex and age, flight height and direction (all where possible). The EIA will identify the usage of the Morgan Array Scoping Boundary and relevant buffer areas by bird species recorded in order to determine its importance relative to the wider area. The sensitivity of each species will be determined based on the size of its population, its conservation status and any known sensitivity to offshore wind farms.

4.4.7.4 Sources of guidance and information to inform the ornithological assessment will be identified within the Offshore ornithology ES chapter. Emerging guidance will be monitored and applied as appropriate to the assessment and in discussion with consultees, including as part of the ornithology Evidence Plan process.

Baseline characterisation and analytical framework

4.4.7.5 The results of the aerial surveys will be presented in the accompanying technical appendices. Aerial survey data will be analysed using design-based or model-based methods (e.g. MRSea package) to produce abundance and density estimates for each species, with associated confidence intervals. The estimates will take account of availability bias for diving birds, and species apportioning of individuals not identified to species level. Abundance and density estimates will be produced for assessment within various areas in accordance with guidance, including the Morgan Array Scoping Boundary, the Morgan Array Scoping Boundary plus 2km buffer, the Morgan Array Scoping Boundary plus 4km buffer and the Morgan Array Scoping Boundary plus 10km buffer. Seasonality will be incorporated so that abundance and density estimates are available for the different breeding, non-breeding and migratory seasons, based on Furness (2015).

4.4.7.6 Disturbance and displacement impacts will be assessed following the recommended matrix approach (SNCB, 2017) based on the abundance estimates within the appropriate species-specific site plus buffer areas. This will be completed using the site mean peak population estimates including lower and upper confidence intervals. Consideration will be given to model-based approaches, such as SeabORD, Searle *et al*. (2018), through discussion with the Evidence Plan Expert Working Group for offshore and coastal ornithology. The additional estimated mortality will be apportioned to breeding colonies within species-specific foraging ranges.

4.4.7.7 Collision risk will be quantified using the deterministic Band model approach (Band, 2012), although model runs will be carried out accounting for variation in parameters and upper and lower confidence limits in the population estimates. The collision risk models will incorporate currently recommended avoidance rates and nocturnal activity factors (Cook *et al.,* 2014; SNCB, 2014), although these will be presented alongside estimates based on other rates if emerging evidence from monitoring studies indicates any likely updates to the previously published rates. Other physical modelling parameters, including bird size, flight speed, flight type etc, will follow best practice and will be set out and agreed through the Evidence Plan process. SNCBs are currently working on new guidance regarding the use of the stochastic Collision Risk Modelling (sCRM) approach (McGregor *et al.,* 2018), which incorporates variability in several parameters. However, there are currently technical issues with the sCRM that undermine the confidence that can be placed in the outputs; hence the deterministic approach is currently recommended.

4.4.7.8 The potential impacts arising from collision risk and displacement will be summed to estimate overall additional mortality in seabird populations. Where there is an increase of more than 1% in the baseline mortality rate in the population, this will trigger more detailed investigation of population effects. Below this 1% threshold, there is not likely to be a significant effect; however the impact will still be quantified and considered in the cumulative impact assessment. The population under consideration will be defined by Biologically Defined Minimum Population Scales (BDMPS). Non-breeding season populations will be derived from Furness (2015), while breeding season populations will be derived from estimates of abundance at colonies within foraging range of the Morgan Array Scoping Boundary.

4.4.7.9 Where given further consideration, the impact will be apportioned appropriately to breeding colonies following the latest available guidance (in preparation by Natural England). Impacts given further consideration will be analysed using PVA (Searle *et al.*, 2019), with model parameterisation agreed through close consultation with the Evidence Plan Expert Working Group for offshore and coastal ornithology. The results will be considered in the context of the counterfactuals of population size and growth.

4.4.8 Potential cumulative effects

4.4.8.1 Seabirds range over large distances and as a result, individuals and populations may interact with a number of other developments within the wider area. There is therefore potential for cumulative effects to arise where other projects or plans could act collectively with the Morgan Offshore Wind Project generation assets to affect offshore ornithology receptors.

4.4.8.2 The cumulative effects assessment will follow the approach outlined in part 1, section 4: EIA methodology, of the EIA Scoping Report. Where necessary, other project impacts may be standardised to allow like-for-like accumulation of impacts for assessment. The developing Cumulative Effect Framework (CEF) approach may be used if it becomes available within the Morgan Offshore Wind Project generation assets timescales (UK Centre for Ecology and Hydrology, no date).

4.4.9 Potential inter-related effects

4.4.9.1 The assessment of potential inter-related effects will be considered within the Offshore ornithology ES chapter. It will include consideration of project lifetime effects and receptor-led effects, in line with the approach outlined in part 1, section 4: EIA methodology, of the EIA Scoping Report.

4.4.10 Potential transboundary impacts

4.4.10.1 A screening of transboundary impacts has been carried out and is presented in part 3, Annex A: Transboundary Impacts Screening, of the EIA Scoping Report. This screening exercise identified that there is potential for transboundary impacts upon offshore ornithology due to construction, operation and maintenance, and decommissioning impacts of the Morgan Offshore Wind Project generation assets. These include:

- disturbance and displacement from airborne noise, underwater noise, and presence of vessels and infrastructure
- indirect impacts from underwater noise
- collision risk
- barrier to movement.

4.4.10.2 The potential for transboundary effects will be considered within the ES.

5 Offshore human environment

5.1 Commercial fisheries

5.1.1 Introduction

5.1.1.1 This section of the Environmental Impact Assessment (EIA) Scoping Report identifies the commercial fisheries receptors of relevance to the Morgan Offshore Wind Project generation assets and considers the potential impacts arising from the construction, operation and maintenance, and decommissioning of the generation assets on commercial fisheries receptors.

5.1.2 Study area

5.1.2.1 For the purpose of identifying commercial fisheries receptors for the Morgan Offshore Wind Project generation assets, a broad study area has been defined. The Morgan commercial fisheries study area for the generation assets is presented in Figure 5.1 and described below.

5.1.2.2 The Morgan Offshore Wind Project generation assets is located within the International Council for the Exploration of the Sea (ICES) Division VIIa (Irish Sea) statistical area. For the purpose of recording fisheries landings, ICES Division VIIa is divided into statistical rectangles which are consistent across all states operating in the Irish Sea. The Morgan commercial fisheries study area for the generation assets is defined by the ICES statistical rectangles that contain the Morgan Array Scoping Boundary. These are ICES statistical rectangles 36E5, 36E6, 37E5 and 37E6.

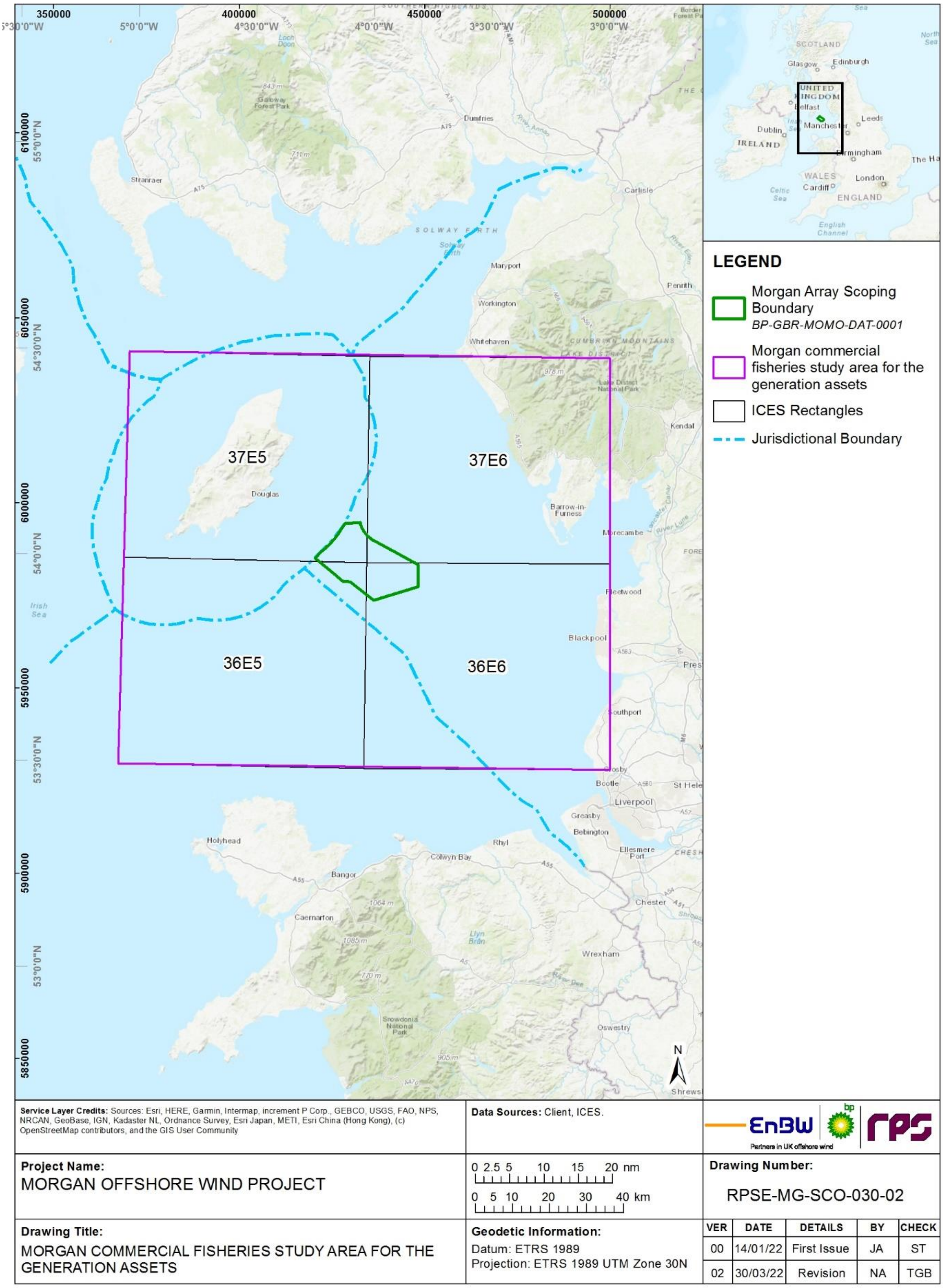


Figure 5.1: The Morgan commercial fisheries study area for the generation assets.

5.1.3 Data sources

5.1.3.1 An initial desk-based review of literature and data sources to support this EIA Scoping Report has identified a number of sources to inform the identification of commercial fisheries receptors within the Morgan commercial fisheries study area for the generation assets. These are summarised in Table 5.1.

5.1.3.2 It should be noted that individual datasets do not cover all fishing activity in the Morgan commercial fisheries study area for the generation assets. For instance, the Marine Management Organisation (MMO) landing and effort statistics datasets generally only record data for UK and Isle of Man vessels landing in the UK and at European ports and non-UK vessels landing in the UK. As a result, landings taken by non-UK vessels landing into ports in Europe are not captured, therefore data from the European Commission's Scientific, Technical and Economic Committee for Fisheries (STECF) will also be collated to inform the EIA.

5.1.3.3 It is acknowledged that a range of data limitations exist for the various datasets. For example, smaller vessels are excluded from Vessel Monitoring Systems (VMS) data, as only vessels with a length of ≥15m (MMO) or >12m (ICES) are captured. To ensure that smaller vessels are included within the assessment, consultation will be held with fisheries stakeholders, and further datasets will be obtained, such as the generalised fishing activity maps from the Welsh National Marine Plan and FishMap Môn.

Table 5.1: Summary of key desktop datasets and reports.

Title	Source	Year	Author
Landing Statistics from 2010 to 2020	MMO	2021	MMO
Effort Statistics from 2010 to 2020	MMO	2021	MMO
Landings data by port	MMO	2020	MMO
Landing Statistics for EU vessels	EU STECF	2021	EU STECF
VMS Data for UK and Isle of Man vessels (≥15m)	MMO	2020	MMO/
VMS Data for EU mobile bottom contacting gear vessels (>12m)	ICES	2018	ICES
Estimated relative fishing activity (Welsh waters)	Welsh National Marine Plan	2019	Welsh National Marine Plan
Generalised fishing intensity (Welsh waters)	FishMap Môn	2021	FishMap Môn
Data from site-specific 2 x 14-day Marine Vessel Traffic Surveys	NASH Maritime (commissioned by the Applicant)	2021/ 2022	NASH Maritime

5.1.3.4 The key regional and national fishing organisations that will be consulted during this assessment are listed below:

- West Coast Sea Products Ltd (WCSP Ltd)
- Scottish White Fish Producers Association (SWFPA)

- Scottish Fishermen's Federation (SFF)
- Scottish Creel Fishermen's Federation
- National Federation of Fishermen's Organisations (NFFO)
- Whitehaven Fishermen's Cooperative Ltd
- Irish South and East Fish Producers Organisation (ISEFPO)
- Federation of Irish Fishermen (FIF)
- Irish South and West Fish Producers Organisation (ISWFPO)
- Manx Fish Producers Organisation (Manx FPO)
- Northern Irish Fish Producers Organisation (NIFPO)
- Anglo Northern Irish Fish Producers Organisation (ANIFPO)
- Welsh Fishermen's Association (WFA)
- Western Fish Producers Organisation (WFPO)
- North Devon Fisheries Association (NDFA)
- Cornish Fish Producers Organisation (CFPO)
- South West Fish Producers Organisation (SWFPO)
- Rederscentrale (Belgium fisheries)[17]
- North Western Inshore Fisheries and Conservation Authority (NWIFCA).

5.1.3.5 Initial engagement has taken place with a number of fisheries stakeholders. Two rounds of meetings (in June/July 2021 and February 2022) have been held to date with regional fisheries organisations and offshore commercial fisheries operators. Outputs from these initial consultations have been used to develop further understanding of existing fishing activity in the region.

5.1.4 Baseline environment

5.1.4.1 The baseline environment for commercial fisheries is constantly evolving, as the fishing industry is dynamic with frequent and sometimes unpredictable changes in fish abundance and distribution, climatic conditions, management regulations and fuel costs, all of which affect activity (DECC, 2016). Anticipated trends to the baseline environment will be considered within the EIA, including changes as a result of the new EU-UK Trade and Cooperation Agreement.

5.1.4.2 The Morgan commercial fisheries study area for the generation assets is located within the ICES Division VIIa (Irish Sea) statistical area. As stated in section 5.1.2, it is defined by the ICES statistical rectangles that contain the Morgan Array Scoping Boundary. These are ICES statistical rectangles 36E5, 36E6, 37E5 and 37E6. The annual average value of landings for

[17] Following review of official landings/activity data, commercial fishing vessels from Belgium were identified as being active within the east Irish Sea. This was confirmed by the Fishing Industry Representative. Rederscentrale (a fish producer organisation in Belgium) is recognised as representing these vessels.

these ICES rectangles is £4.60 million per rectangle for all UK and Isle of Man vessels for the years 2010 to 2020 (MMO, 2021).

5.1.4.3 The average total tonnage of historical landings across the Morgan commercial fisheries study area for the generation assets is presented in Figure 5.2 and the average annual value across the Morgan commercial fisheries study area for the generation assets is presented in Figure 5.3. It is important to note that this data only covers landings by UK and Isle of Man-registered vessels into the UK and abroad, and foreign vessels into the UK. There may also be landings from the Morgan commercial fisheries study area for the generation assets by foreign vessels into foreign ports which would not be represented by this data.

5.1.4.4 Figure 5.4 shows the top eight species landed from the Morgan commercial fisheries study area for the generation assets by weight from 2010 to 2020. Figure 5.5 shows the top eight species by value from the same area over the same period. The key species in terms of both value and weight are queen scallop *Aequipecten opercularis* and king scallop *Pecten maximus*, with a particularly large weight of queen scallop being landed in 2011, 2012 and 2013. Comparatively, a very high value of king scallop was landed in 2016.

5.1.4.5 Herring *Clupea harengus* catches were comparable with king scallop in terms of weight landed in some years. Whelk *Buccinum undatum* and Nephrops *Nephrops norvegicus* were the most valuable species after king scallop and queen scallop. Other key species include edible crab *Cancer pagurus*, lobster *Homarus Gammarus* and razor clam *Solen spp.*

5.1.4.6 While catches of king scallop are lower by weight than catches of queen scallop in most years, their value is similar or higher owing to a higher market price. Nephrops and lobster also have higher market prices compared to other species.

5.1.4.7 The data suggests that king scallop and queen scallop are important in the Morgan commercial fisheries study area for the generation assets and are the most valuable landings in every year other than from 2018 to 2020, when whelk had a similar or higher value landed than queen scallop.

5.1.4.8 In addition to landings and effort data, data on the type of fishing activity in the Morgan commercial fisheries study area for the generation assets has also been obtained. This is presented in Figure 5.6 for the years 2017 and 2018, and Figure 5.7 for the years 2019 and 2020. The data suggests that ≥15m mobile gear vessels are active across a larger spatial extent with higher levels of activity than ≥15m static gear vessels within the Morgan commercial fisheries study area for the generation assets.

5.1.4.9 Higher levels of static gear activity by ≥15m vessels occur in the southwest of the Morgan commercial fisheries study area for the generation assets, with higher levels of mobile gear activity by ≥15m vessels generally recorded in the western half of the Morgan commercial fisheries study area for the generation assets. Within the Morgan Array Scoping Boundary, the highest levels of ≥15m static gear activity were in the east and central area whereas the highest levels of ≥15m mobile gear activity were in the west and central area. It should be noted that the spatial extent of mobile and static gear activity fluctuates across years. This data is only for vessels 15m in length and over from the UK and the Isle of Man, so does not capture vessels that are smaller or from other nationalities.

5.1.4.10 The data in Figure 5.6 and Figure 5.7 is for UK and Isle of Man vessels only. There are vessels from other nations, including the Republic of Ireland and Belgium, conducting fishing activity within the Morgan commercial fisheries study area for the generation assets. Data will be analysed further through collation of landings and VMS data from non-UK organisations, consultation, AIS data and site-specific marine vessel traffic survey data to provide a full baseline characterisation for commercial fisheries.

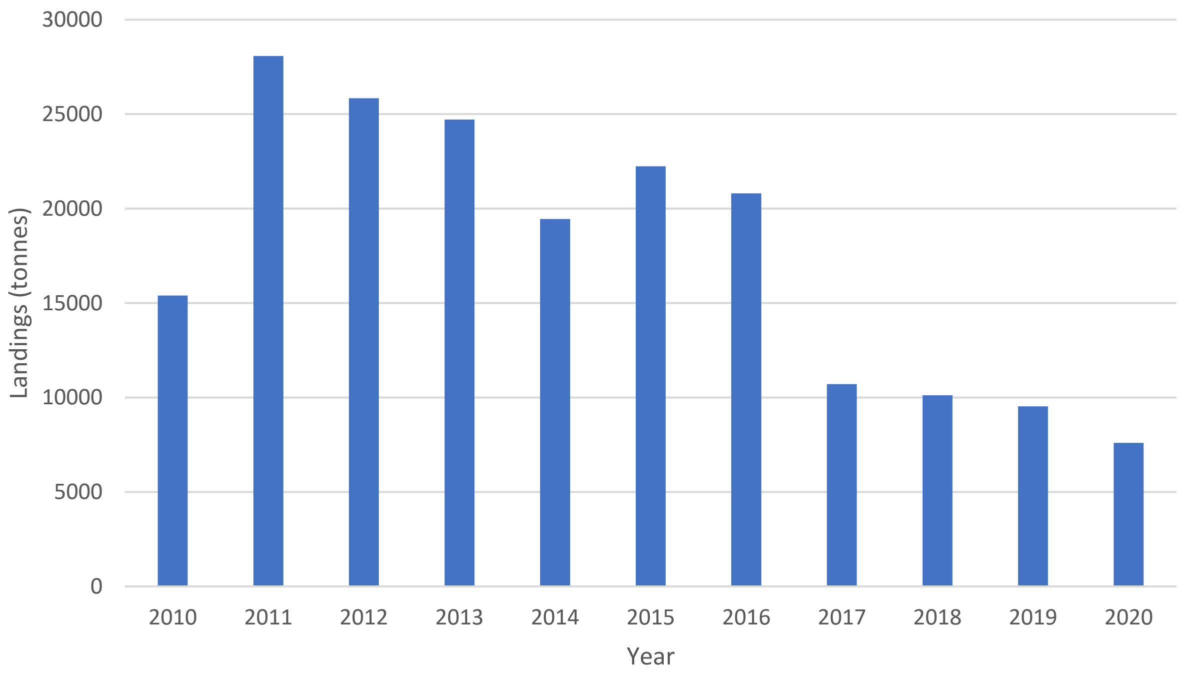


Figure 5.2: Total volume (tonnes) of landings from 2010 to 2020 from the Morgan commercial fisheries study area for the generation assets (UK and Isle of Man vessels ≥15m and foreign vessels ≥15m into the UK) (MMO, 2021).

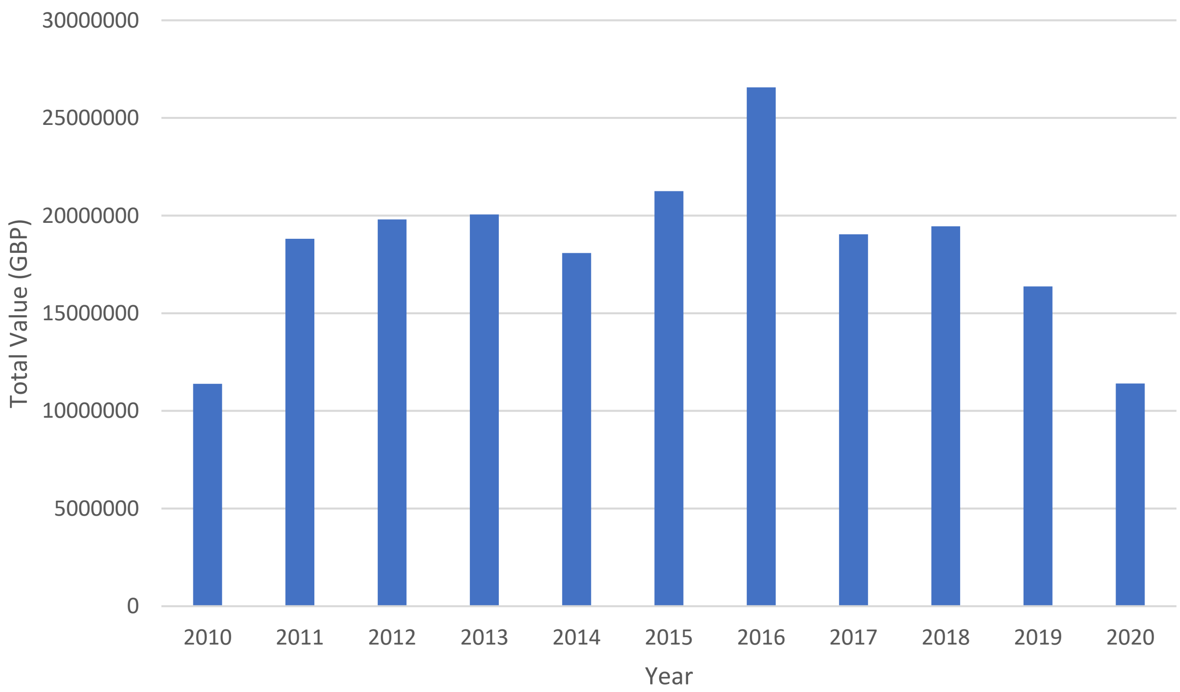


Figure 5.3: Total value (GBP) of landings from 2010 to 2020 from the Morgan commercial fisheries study area for the generation assets (UK and Isle of Man vessels ≥15m and foreign vessels ≥15m into the UK) (MMO, 2021).

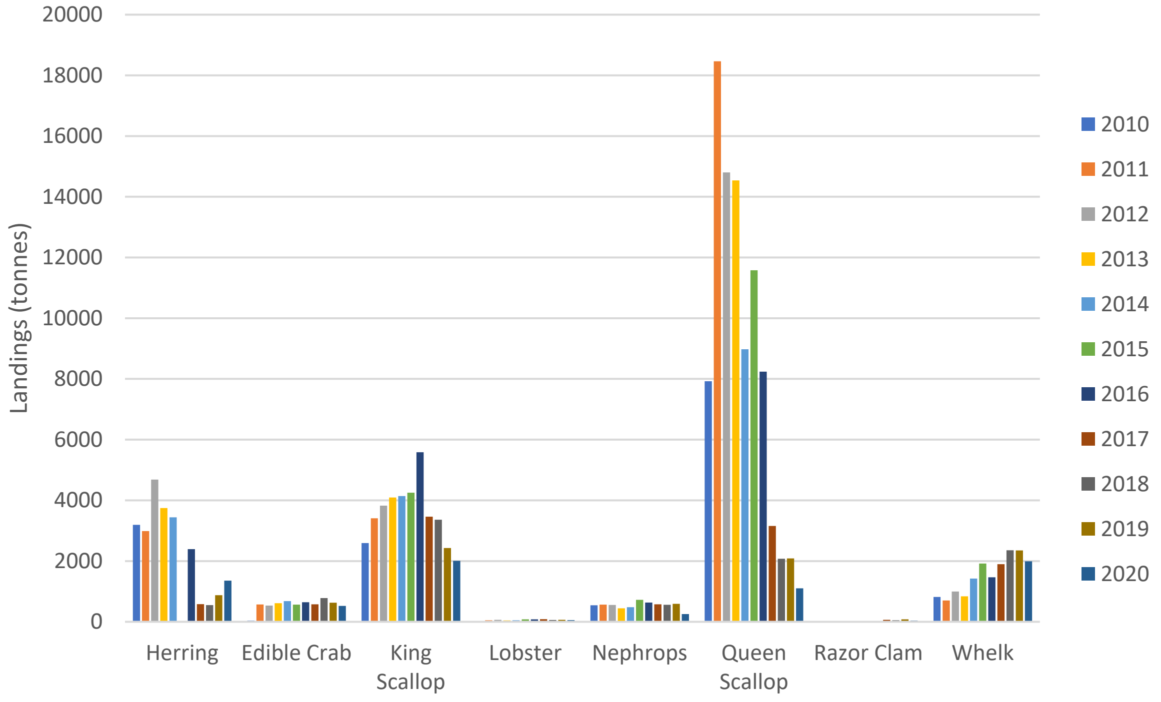


Figure 5.4: Top eight species by weight (tonnes) from 2010 to 2020 landed from the Morgan commercial fisheries study area for the generation assets (UK and Isle of Man vessels ≥15m and foreign vessels ≥15m into the UK) (MMO, 2021).

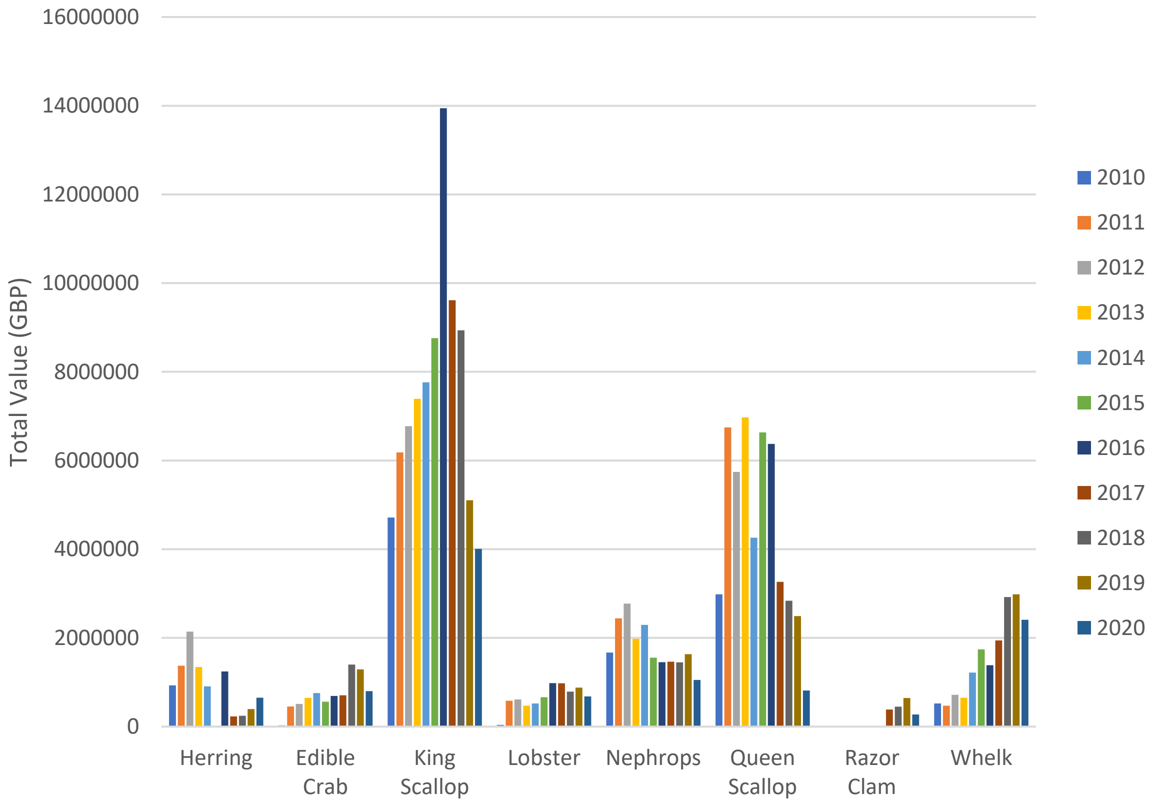


Figure 5.5: Top eight species by value (GBP) from 2010 to 2020 landed from the Morgan commercial fisheries study area for the generation assets (UK and Isle of Man vessels ≥15m and foreign vessels ≥15m into the UK) (MMO, 2021).

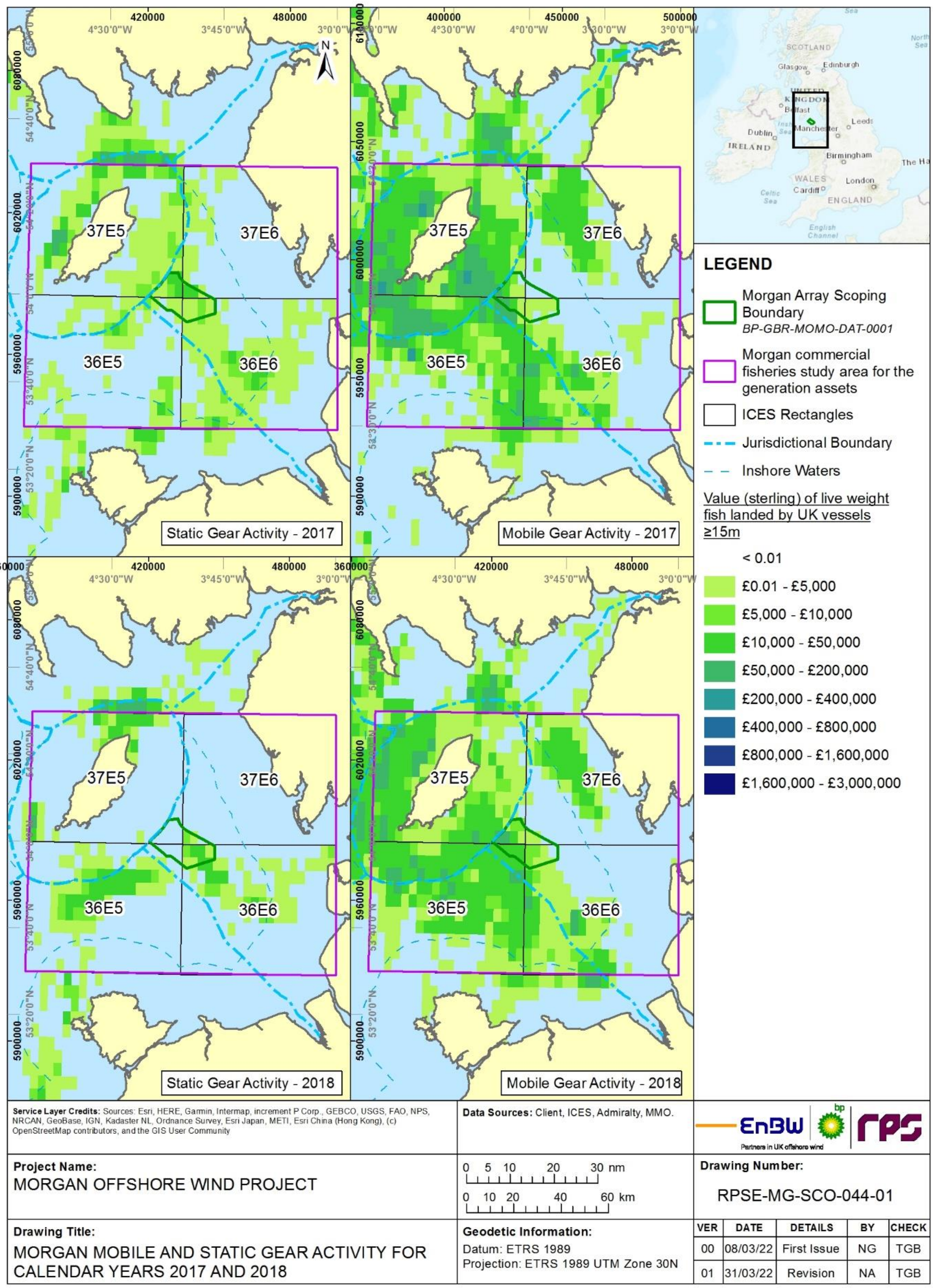


Figure 5.6: Value of landings for static and mobile gear activity in the vicinity of the Morgan commercial fisheries study area for the generation assets (UK and Isle of Man vessels ≥15m and foreign vessels ≥15m into the UK) (2017 and 2018) (MMO, 2020).

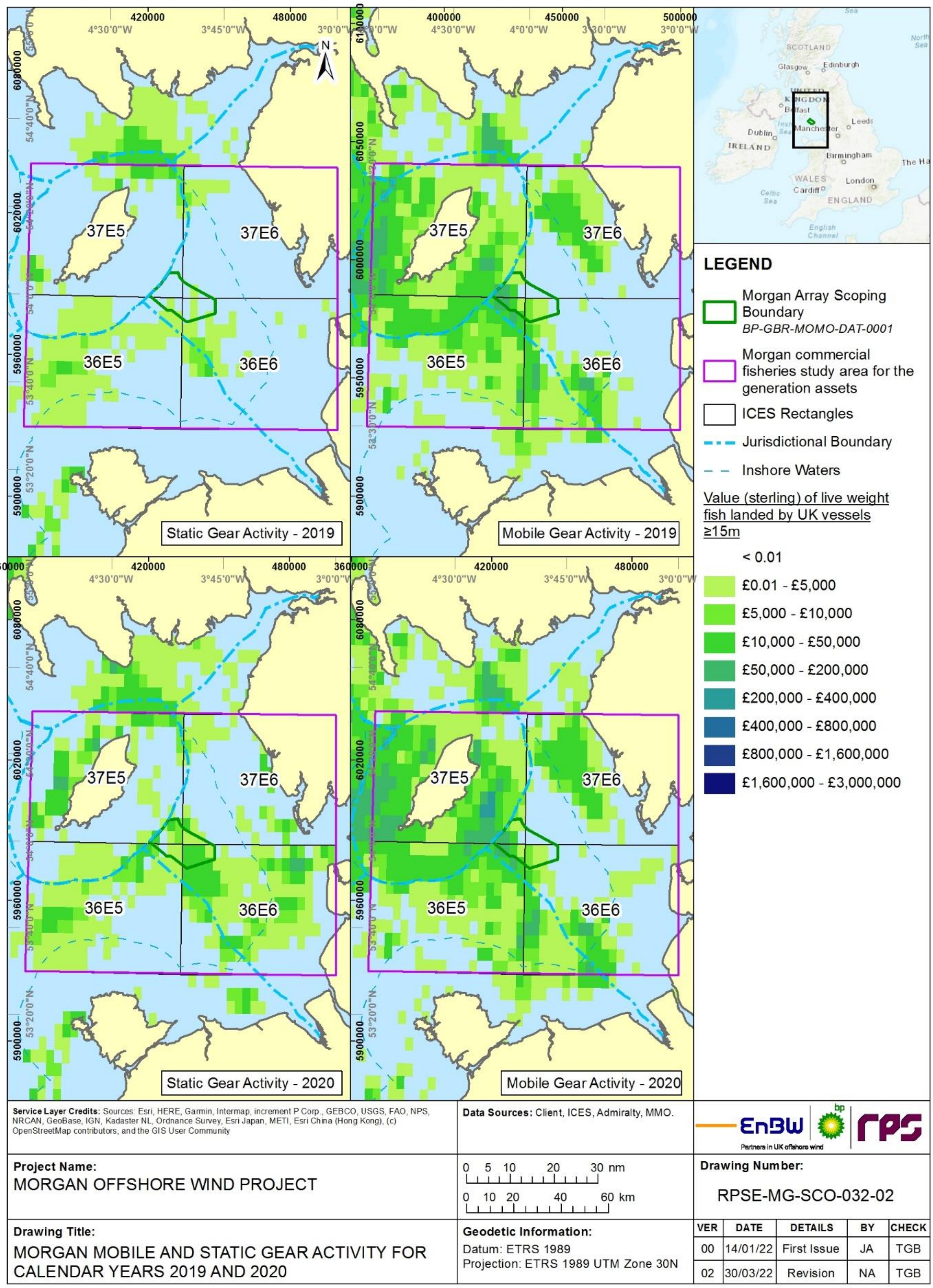


Figure 5.7: Value of landings for static and mobile gear activity in the vicinity of the Morgan commercial fisheries study area for the generation assets (UK and Isle of Man vessels ≥15m and foreign vessels ≥15m into the UK) (2019 and 2020) (MMO, 2020).

5.1.5 Potential project impacts

5.1.5.1 A range of potential impacts on commercial fisheries receptors have been identified which may occur during the construction, operation and maintenance, and decommissioning phases of the Morgan Offshore Wind Project generation assets. The impacts that have been scoped into the assessment are outlined in Table 5.2 together with a description of any additional data collection and supporting analyses that will be required to enable a full assessment of the impacts.

5.1.5.2 On the basis of the baseline information currently available and the project description outlined in part 1, section 3: Project description, of the EIA Scoping Report, potential impacts proposed to be scoped out of the assessment are presented in Table 5.3, with justification.

Table 5.2: Impacts proposed to be scoped in to the project assessment for commercial fisheries (project phase refers to construction (C), operation and maintenance (O) and decommissioning (D)).

Impact	Project phase			Justification	Data collection and analysis required to characterise the baseline environment	Summary of proposed approach to assessment
	C	O	D			
Loss or restricted access to fishing grounds.	✓	✓	✓	The implementation of safety zones around construction, maintenance and decommissioning works may result in temporary loss or restricted access to fishing grounds within the Morgan Array Scoping Boundary. The presence of wind farm infrastructure may result in long-term loss or restricted access to parts of the existing fishing grounds within the Morgan Array Scoping Boundary.	Datasets are listed in section 5.1.3 and include VMS data (indicating hours fished and value of catch by area) and landing statistics by ICES rectangle. Additional datasets including maps of key fishing grounds may also be collated where available. These datasets will be requested from the relevant fishing industry representatives and stakeholders in order to inform the commercial fisheries EIA. This information will also be supplemented by results of site-specific marine vessel traffic survey data.	Detailed analysis of existing datasets will be carried out to characterise the status of historic commercial fisheries patterns within the Morgan commercial fisheries study area for the generation assets and predict the potential impacts upon future commercial fishing activities (for UK and non-UK vessels). Datasets will be analysed over 5 to 10 year time periods to account for fluctuations in the commercial fisheries activities. Qualitative assessment informed by data analysis and consultation.
Displacement of fishing activity into other areas.	✓	✓	✓	Fishing activity may be temporarily displaced to other areas due to loss or restricted access to fishing grounds.	As above.	As above.
Interference with fishing activity.	✓	✓	✓	Increased vessel traffic within fishing grounds as a result of changes to shipping routes and project vessel traffic in the vicinity of the Morgan Array Scoping Boundary may result in increased interaction with fishing vessels.	As above.	Detailed analysis of existing datasets will be carried out to characterise the status of historic commercial fisheries patterns within the Morgan commercial fisheries study area for the generation assets and predict the potential impacts upon future commercial fishing activities (for UK and non-UK vessels). Datasets will be analysed over 5 to 10 year time periods to account for fluctuations in the commercial fisheries activities. Qualitative assessment informed by data analysis and consultation.
Temporary increase in steaming distances.	✓	×	✓	The implementation of safety zones around construction, maintenance and decommissioning works may result in temporary increases in steaming distances to and from fishing grounds.	As above.	As above.
Loss or damage to fishing gear due to snagging.	×	✓	×	Potential for snagging fishing gear on inter-array and interconnector cables. Safety risks for fishing vessels associated with potential gear snagging will be assessed in	As above.	As above.

Impact	Project phase			Justification	Data collection and analysis required to characterise the baseline environment	Summary of proposed approach to assessment
	C	O	D			
				the Shipping and navigation chapter of the EIA (see part 2, section 5.2: Shipping and navigation, of the EIA Scoping Report).		
Potential impacts on commercially important fish and shellfish resources.	✓	✓	✓	As described in part 2, section 4.2: Fish and shellfish ecology, of the EIA Scoping Report.	As above.	Qualitative assessment informed by data analysis in addition to consideration of results of the fish and shellfish ecology assessment of the EIA.
Supply chain opportunities for local fishing vessels	✓	✓	✓	Requirement for vessels (such as guard vessels) during all phases of the Morgan Offshore Wind Project generation assets may provide supply chain opportunities for local fishing vessels leading to a beneficial impact.	Engagement with local fisheries stakeholders.	Qualitative assessment informed by consultation.

Table 5.3: Impacts proposed to be scoped out of the project assessment for commercial fisheries.

Impact	Justification
Increased steaming distances during the operation and maintenance phase.	Once the Morgan Offshore Wind Project generation assets have been constructed, fishing vessels will be able to transit through the Morgan Array Scoping Boundary to/from adjacent fishing grounds, ensuring that the presence of wind farm infrastructure does not affect steaming distances. Consequently, any potential impacts are considered to be not significant in EIA terms. Therefore, subject to consultation with commercial fisheries stakeholders and feedback received on this EIA Scoping Report, the Applicant intends to scope this impact out of further consideration within the EIA.

5.1.6 Measures adopted as part of the project

5.1.6.1 The following measures adopted as part of the project are relevant to commercial fisheries. These measures may evolve as the engineering design and the EIA progresses.

- Ongoing liaison with the fishing industry via the Morgan Offshore Wind Project generation assets Fisheries Liaison Officer (FLO) and Fishing Industry Representative (FIR).
- Development of a Fisheries Liaison and Coexistence Plan.
- Adherence to good practice guidance with regards to fisheries liaison (e.g. Fishing Liaison with Offshore Wind and Wet Renewables Group (FLOWW), 2014; 2015).
- Advance warning to fishing fleets of construction, maintenance and decommissioning activities.
- Timely and efficient distribution of Notices to Mariners (NTM) of the location and nature of construction, maintenance and decommissioning works.
- Notification to the United Kingdom Hydrographic Office (UKHO) of the works to facilitate the promulgation of maritime safety information and updating of nautical charts and publications.
- Use of advisory clearance distances and safety zones during construction and periods of major maintenance.
- Use of guard vessels where required by risk assessment.
- Marking and lighting of the Morgan Offshore Wind Project generation assets in accordance with International Association of Marine Aids to Navigation and Lighthouse Authorities (IALA) guidance and in consultation with the Maritime and Coastguard Agency (MCA) and Trinity House.
- Cables to be buried to a suitable depth, where possible, to avoid interaction with fishing gear.
- Undertaking of post-lay and cable burial inspection surveys and monitoring.
- Cables will be buried where possible to a target depth of 1m, and in areas where this is not achievable the cable will be protected (e.g. with rock or mattressing). Any external cable protection will be designed, where possible, to enable trawling to occur over it (ESCA, 2016).

5.1.6.2 The requirement for and feasibility of any further mitigation will be dependent on the significance of effects and will be consulted upon with statutory consultees throughout the EIA process.

5.1.7 Proposed assessment methodology

5.1.7.1 The commercial fisheries EIA will follow the methodology set out in part 1, section 4: EIA methodology, of the EIA Scoping Report. Specific to the commercial fisheries EIA, the following guidance documents will also be considered:

- FLOWW Best Practice Guidance for Offshore Renewables Developments: Recommendations for Fisheries Liaison: FLOWW (Fishing Liaison with Offshore Wind and Wet Renewables Group) (FLOWW, 2014)
- FLOWW Best Practice Guidance for Offshore Renewables Developments: Recommendations for Fisheries Disruption Settlements and Community Funds. FLOWW (Fishing Liaison with Offshore Wind and Wet Renewables Group) (FLOWW, 2015)
- Best practice guidance for fishing industry financial and economic impact assessments (United Kingdom Fisheries Economics Network (UKFEN), 2012)
- Options and opportunities for marine fisheries mitigation associated with wind farms (Blyth-Skyrme, 2010)
- Fishing and Submarine Cables – Working Together (International Cable Protection Committee (ICPC), 2009).

5.1.7.2 In order to characterize the importance of fisheries in this region, consideration will be given to the value of fisheries within the Morgan commercial fisheries study area for the generation assets. Any valuation will not be used as the basis of the impact assessment process.

5.1.8 Potential cumulative effects

5.1.8.1 There is potential for cumulative effects to arise from other projects or activities within the east Irish Sea where projects or activities could act collectively with the Morgan Offshore Wind Project generation assets to affect commercial fisheries receptors.

5.1.8.2 The cumulative effect assessment will consider the maximum design scenarios for each of the identified projects or activities. The following projects or activities will be considered within the Morgan commercial fisheries study area for the generation assets:

- other offshore wind farms, including the Mona Offshore Wind Project and other existing and proposed projects
- other energy infrastructure projects, including oil and gas activities (including decommissioning) and carbon capture and storage (CCS) projects
- other infrastructure projects (e.g. cables and pipelines), including the Morgan Offshore Wind Project transmission assets.

5.1.8.3 The cumulative effects assessment will follow the approach outlined in part 1, section 4: EIA methodology, of the EIA Scoping Report.

5.1.9 Potential inter-related effects

5.1.9.1 The assessment of potential inter-related effects will be considered within the commercial fisheries Environmental Statement (ES) chapter. It will include consideration of project lifetime effects and receptor-led effects, in line with the approach outlined in part 1, section 4: EIA methodology, of the EIA Scoping Report.

5.1.10 Potential transboundary impacts

5.1.10.1 A screening of transboundary impacts has been carried out and is presented in part 3, Annex A: Transboundary Impacts Screening, of the EIA Scoping Report. This screening exercise identified that there is potential for transboundary impacts upon commercial fisheries due to construction, operation and maintenance, and decommissioning impacts of the project. These include:

- loss or restricted access to fishing grounds affecting fleets from the Republic of Ireland and Belgium
- displacement of fishing activity into other areas affecting fleets from the Republic of Ireland and Belgium.

5.1.10.2 The potential for transboundary impacts will be considered within the ES.

5.2 Shipping and navigation

5.2.1 Introduction

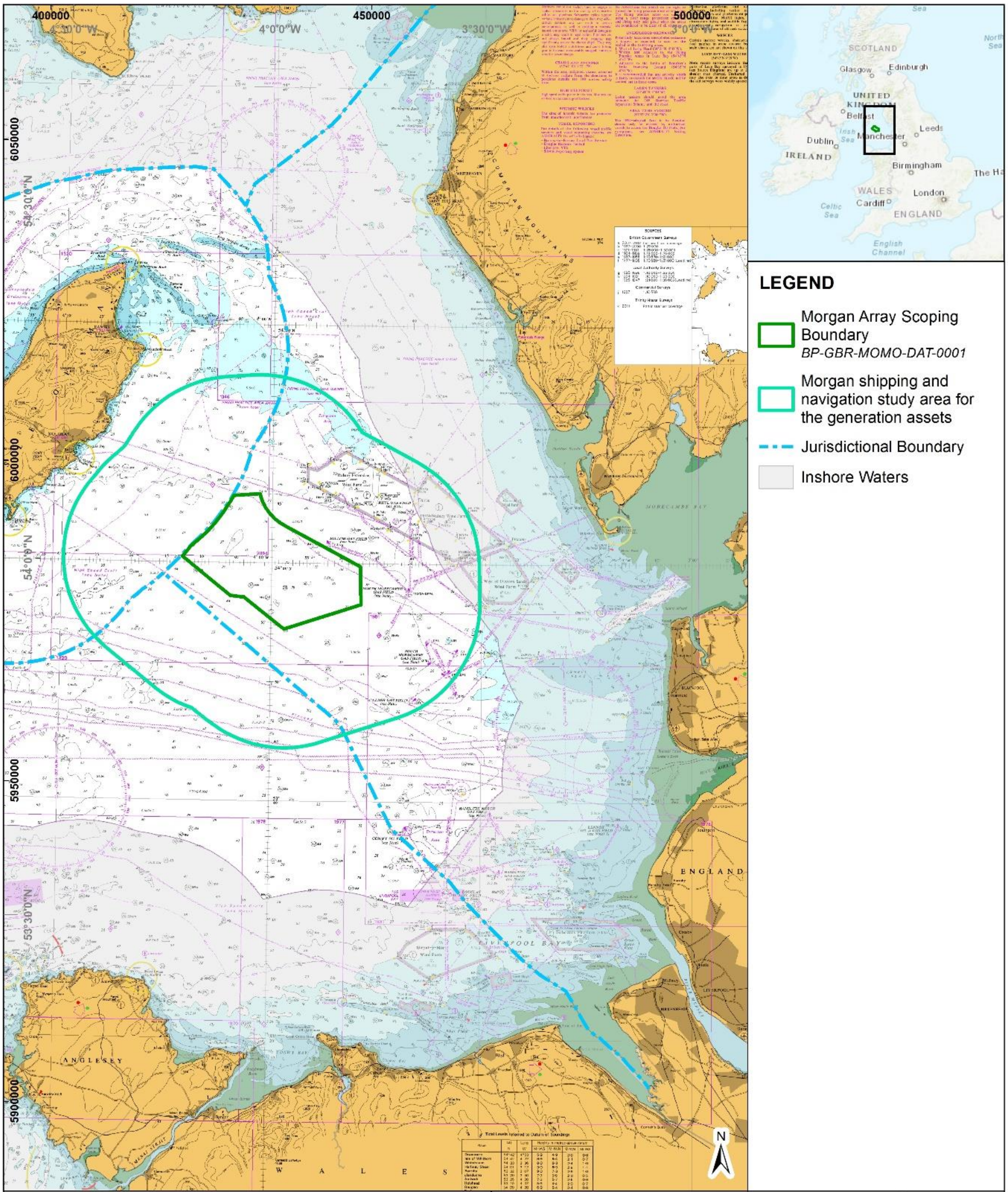
5.2.1.1 This section of the Environmental Impact Assessment (EIA) Scoping Report identifies the shipping and navigation receptors of relevance to the Morgan Offshore Wind Project generation assets and considers the potential impacts arising from the construction, operation and maintenance, and decommissioning of the generation assets on shipping and navigation receptors.

5.2.2 Study area

5.2.2.1 For the purpose of identifying shipping and navigation receptors for the Morgan Offshore Wind Project generation assets, a broad study area has been defined. The Morgan shipping and navigation study area for the generation assets is presented in Figure 5.8 and described below.

5.2.2.2 The Morgan shipping and navigation study area for the generation assets has been defined as an area extending 10 nautical miles (nm) around the Morgan Array Scoping Boundary. This is in line with industry standard and will provide a local context of activity within and in proximity to the Morgan Array Scoping Boundary.

5.2.2.3 Additionally, the waters of the east Irish Sea to the south and east of the Isle of Man (south of 54.5 degrees North and east of 5.0 degrees West) have been considered in terms of shipping routes in these waters and their interaction with the Morgan Offshore Wind Project generation assets and existing and planned offshore wind projects within this area.



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EnBW bp rps
Partners in UK offshore wind

Project Name:
MORGAN OFFSHORE WIND PROJECT

0 2.5 5 10 nm
0 5 10 20 km

Drawing Number:
RPSE-MG-SCO-015-01

Drawing Title:
MORGAN SHIPPING AND NAVIGATION STUDY AREA FOR THE GENERATION ASSETS

Geodetic Information:
Datum: ETRS 1989
Projection: ETRS 1989 UTM Zone 30N

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00	14/01/22	First Issue	JA	ST
01	11/03/22	Revision	NA	TGB

Figure 5.8: The Morgan shipping and navigation study area for the generation assets.

5.2.3 Data sources

Desktop data

5.2.3.1 An initial desk-based review of literature and data sources to support this EIA Scoping Report has identified a number of data sources to inform the identification of shipping and navigation receptors within the Morgan shipping and navigation study area for the generation assets. These are summarised in Table 5.4.

Table 5.4: Summary of key desktop datasets and reports.

Title	Source	Year	Author
Admiralty charts	British Crown and OceanWise, License No. EK001-FN1001-004664	2021	British Crown
Automatic Identification System (AIS) vessel traffic data	NASH Maritime Ltd.	2019	MarineTraffic
Vessel Monitoring Systems (VMS) data	MMO	2019	MMO
International Maritime Organization (IMO) Traffic Separation Schemes (TSS)	Oceanwise	2021	Oceanwise
UK Coastal Atlas of Recreational Boating	Royal Yachting Association (RYA)	2018	RYA
Marine Incident Data	Marine Accident Investigation Branch (MAIB)	2000-2019	MAIB
Royal National Lifeboat Institution (RNLI) incident data	RNLI	2010-2019	RNLI
Helicopter Search and Rescue (SAR) locations	The Bristow Group	2021	The Bristow Group
Offshore wind farms	The Crown Estate	2021	The Crown Estate
Oil and gas platforms	Oil and Gas Authority	2021	Oil and Gas Authority
Maritime statistics	Department for Transport (DfT)	2021	DfT
Practice and exercise (PEXA) charts	Admiralty	2013	Admiralty
Cables and pipelines	Kis-Orca via Client onemap site	2021	Kis-Orca
Marine aggregate sites and disposal sites	The Crown Estate	2021	The Crown Estate

Site-specific survey data

5.2.3.2 In addition to existing data, site-specific marine vessel traffic surveys will be carried out to inform the EIA. Surveys will comprise two seasonal 14-day surveys collecting Automatic Identification Systems (AIS), radar and visual vessel traffic survey data within the Morgan Array Scoping Boundary, in line with MCA Marine Guidance Note (MGN) 654. The winter vessel traffic survey was carried out during November and December 2021 with the second survey planned for summer 2022. AIS data from 2019 will be used to benchmark the outputs of these vessel traffic surveys and account for temporary changes in shipping/ferry activity. Consultation with operators (including fishing/recreational users) and analysis of shipping statistics from the DfT will support this comparison.

5.2.3.3 The data from these surveys will be used to inform the Navigation Risk Assessment (NRA) and EIA for the Morgan Offshore Wind Project generation assets. The scope of the vessel traffic surveys was reviewed and agreed with the MCA in October 2021.

Consultation

5.2.3.4 Supporting information and data will also be obtained from stakeholder consultation. The Applicant has established a Maritime Navigation Engagement Forum (MNEF) to provide a platform for the exchange of information, knowledge and experience that will enable marine developers and relevant shipping and navigation stakeholders to coexist in the marine environment. Specifically, the MNEF will focus on matters relating to:

- risk to safety of marine operations and navigation
- impact on marine operations and navigation.

5.2.3.5 Members of the MNEF include the MCA and Trinity House as statutory bodies, in addition to key user groups and organisations identified as having a potential shipping and navigation interface with the Morgan Offshore Wind Project generation assets including: the UK and Irish Chamber of Shipping, ferry operators, port operators, representatives from other industries (oil and gas, aggregates, other offshore wind developers), with fishing interests represented by the Morgan Offshore Wind Project generation assets Fisheries Liaison Officer (FLO). Other invited members include the RYA and Ministry of Defence (MOD). The MNEF is scheduled to meet quarterly during the pre-application phase and the first meeting of the MNEF took place in November 2021.

5.2.3.6 A marine hazard workshop will also be held as part of the NRA. The MCA, Trinity House and a number of local stakeholders representing all maritime interests (including ports, fishing, commercial shipping, oil and gas, recreation) will be invited to the hazard workshop**.**

5.2.4 Baseline environment

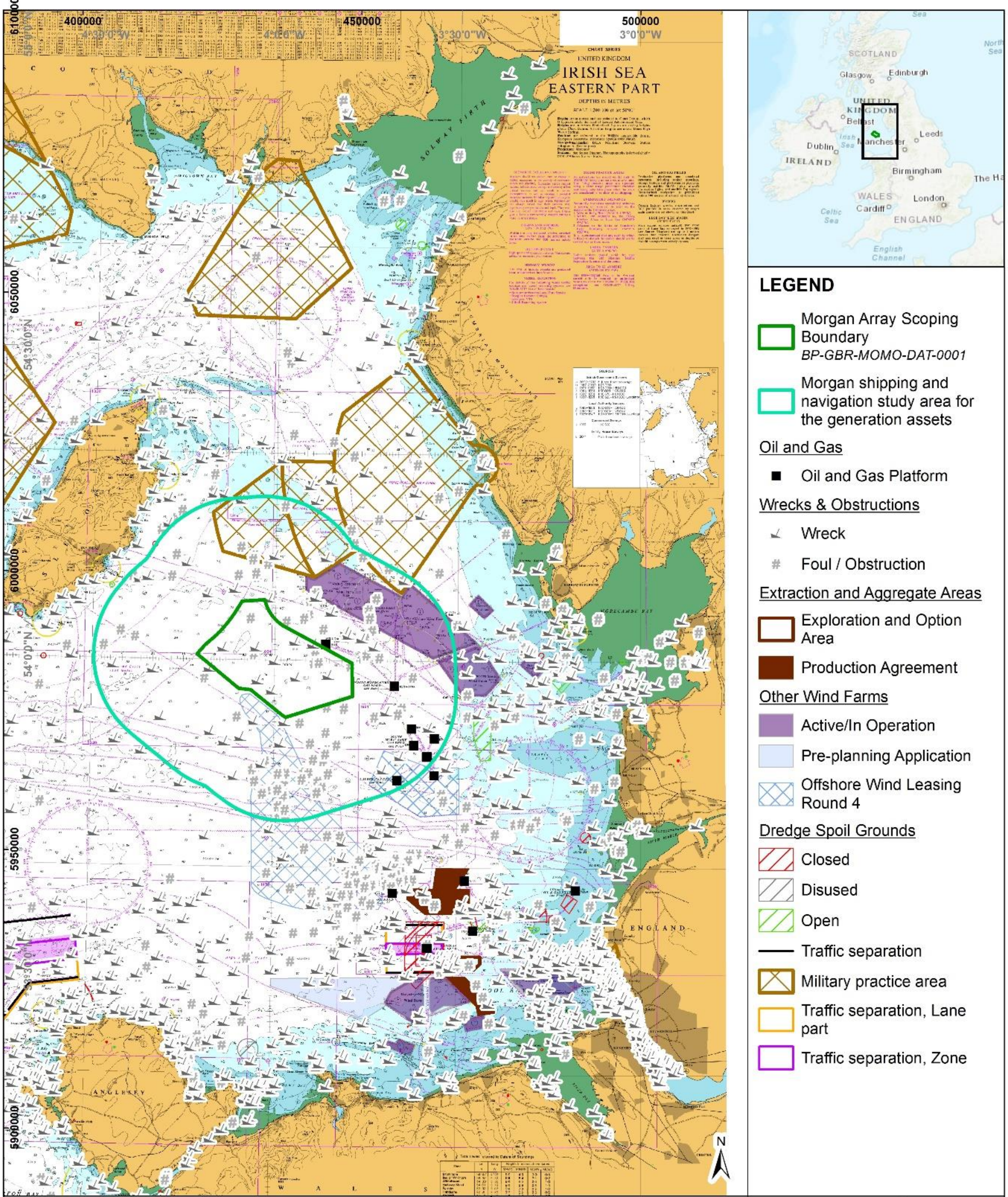
Navigational features

5.2.4.1 The Morgan Array Scoping Boundary is located in the east Irish Sea, where several ferry and shipping routes presently operate and safely co-exist alongside a number of notable marine assets and activities. Key marine navigation features within the east Irish Sea include:

- IMO TSS
- oil and gas activities (see Table 5.5)
- commercial fishing activities
- recreational cruising routes
- commercial ship anchorages
- pilot boarding stations

- ports and marine terminals
- offshore wind farms (see Table 5.6).

5.2.4.2 The key marine navigation features and activities within the east Irish Sea are presented in Figure 5.9.



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Project Name: MORGAN OFFSHORE WIND PROJECT	0 2.5 5 10 15 nm; 0 5 10 20 30 km	**Drawing Number:** RPSE-MG-SCO-023-01
Drawing Title: KEY MARINE NAVIGATION FEATURES AND ACTIVITIES IN THE VICINITY OF THE MORGAN SHIPPING AND NAVIGATION STUDY AREA FOR THE GENERATION ASSETS	**Geodetic Information:** Datum: ETRS 1989 Projection: ETRS 1989 UTM Zone 30N	

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00	14/01/22	First Issue	JA	ST
01	11/03/22	Revision	NA	TGB

Figure 5.9: Key marine navigation features and activities in the vicinity of the Morgan shipping and navigation study area for the generation assets.

Table 5.5: Oil and gas platforms in proximity to the Morgan Array Scoping Boundary.[18]

Platform	Owner/operator	Distance to Morgan Array Scoping Boundary	
		Kilometres (km)	Nautical miles (nm)
Millom West (N)	Harbour Energy own, Spirit Energy operate	0.7	0.4
Millom West (S)	Harbour Energy own, Spirit Energy operate	0.7	0.4
North Morecambe	Spirit Energy	7.6	4.1
North Morcambe DPPA	Spirit Energy	7.6	4.1
South Morecambe DP8 (E)	Spirit Energy	12.2	6.6
South Morecambe DP8 (W)	Spirit Energy	12.2	6.6
South Morecambe DP6 (E)	Spirit Energy	14.1	7.6
South Morecambe DP6 (W)	Spirit Energy	14.1	7.6
South Morecambe DP4 (E)	Spirit Energy	16.6	9
South Morecambe DP4 (W)	Spirit Energy	16.6	9
Calder	Harbour Energy own, Spirit Energy operate	17.1	9.2
South Morecambe DP1 (N)	Spirit Energy	17.2	9.3
South Morecambe DP1 (S)	Spirit Energy	17.2	9.3
South Morecambe AP1 (N)	Spirit Energy	17.2	9.3
South Morecambe AP1 (S)	Spirit Energy	17.2	9.3
South Morecambe CPP1 (N)	Spirit Energy	17.2	9.3
South Morecambe CPP1 (S)	Spirit Energy	17.2	9.3
South Morecambe FL1 (N)	Spirit Energy	17.2	9.3
South Morecambe FL1 (S)	Spirit Energy	17.2	9.3

18 Initial consultation has been carried out by the Applicant with oil and gas operators in the area and some operators have confirmed plans for decommissioning platforms such as Millom West, South Morecambe DP4 and Calder.

Table 5.6: Offshore wind farms in proximity to the Morgan Array Scoping Boundary.

Offshore wind Farm	Distance to Morgan Array Scoping Boundary	
	Kilometres (km)	Nautical miles (nm)
Mona Offshore Wind Project	5.5	2.9
Walney Extension	7.6	4.1
Round 4 Morecambe	11.2	6
Walney 2	11.9	6.4
West of Duddon Sands	15.2	8.2
Walney 1	15.5	8.4

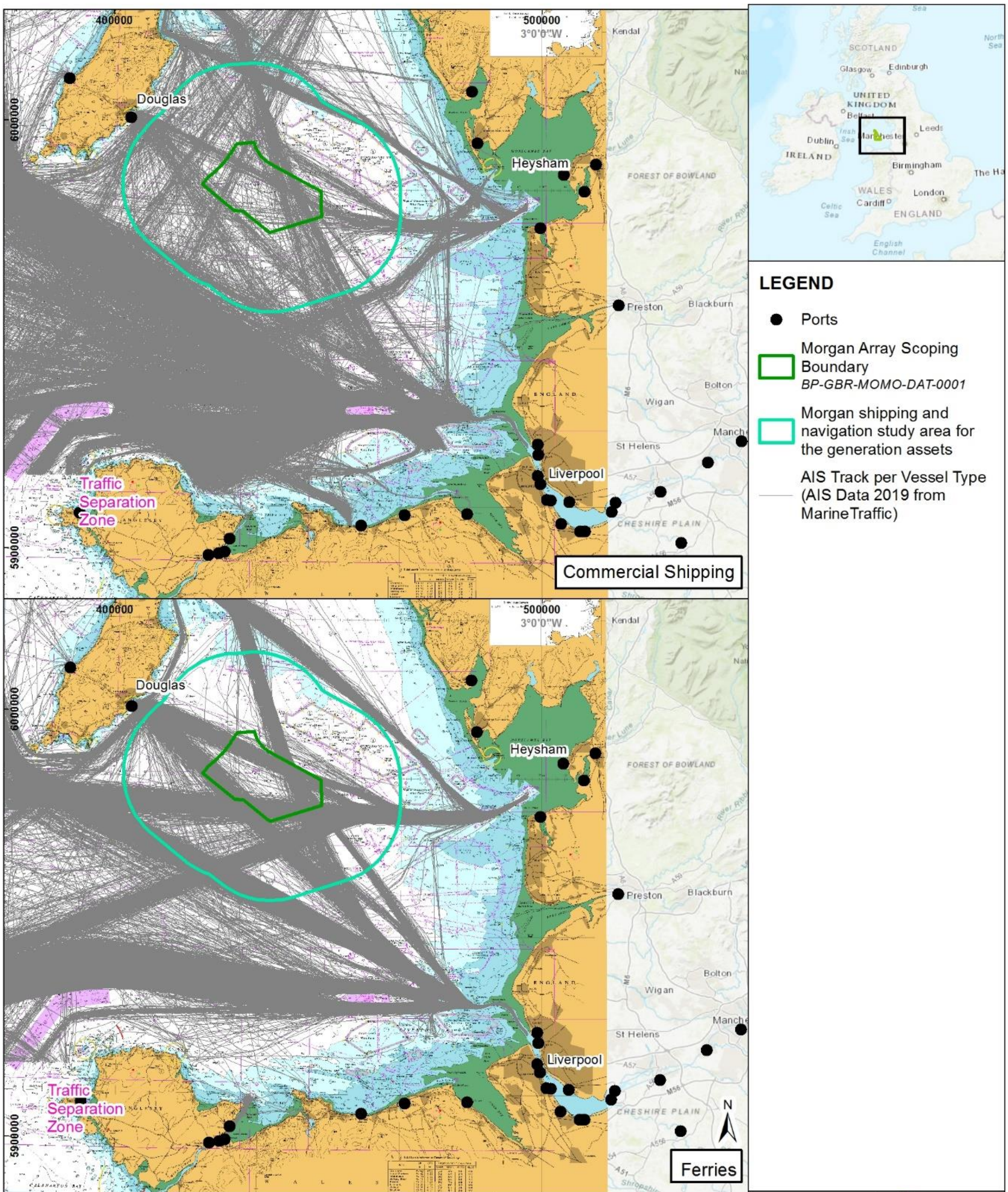
Commercial vessel and commercial passenger vessel analysis

5.2.4.3 The main commercial vessel routes identified in the Morgan shipping and navigation study area for the generation assets are shown in Figure 5.10. It should be noted that this data is preliminary and will be further informed by site-specific data collected during the marine traffic surveys.

5.2.4.4 Large commercial vessels are concentrated in routes to the Port of Liverpool, including a route passing Anglesey and to the south of the Morgan Array Scoping Boundary, and a route from Liverpool to the northern Irish Sea, passing to the west of the Isle of Man and intersecting with the Morgan Array Scoping Boundary. Usage of the IMO TSS ensures the separation of opposing streams of traffic to aid navigational safety.

5.2.4.5 As shown in Figure 5.10, a number of commercial ferry routes are known to pass through the Morgan shipping and navigation study area for the generation assets. Commercial ferry routes intersect the Morgan Array Scoping Boundary (namely Liverpool to Douglas, Liverpool to Belfast, Heysham to Douglas and Heysham to Warrenpoint) whilst another route is immediately adjacent (namely Heysham to Dublin). Other passenger vessels, including cruise ship activity, is recorded within the data passing within the Morgan shipping and navigation study area for the generation assets.

5.2.4.6 Key commercial ferry operators identified to date include Isle of Man Steam Packet Company, Seatruck Ferries, P&O ferries, and Stena Line. Each of these operators are members of the MNEF and consultation is underway to further understand their activities and operational procedures.



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EnBW bp rps
Partners in UK offshore wind

Project Name:
MORGAN OFFSHORE WIND PROJECT

0 2.5 5 10 15 20 nm
0 5 10 20 30 40 km

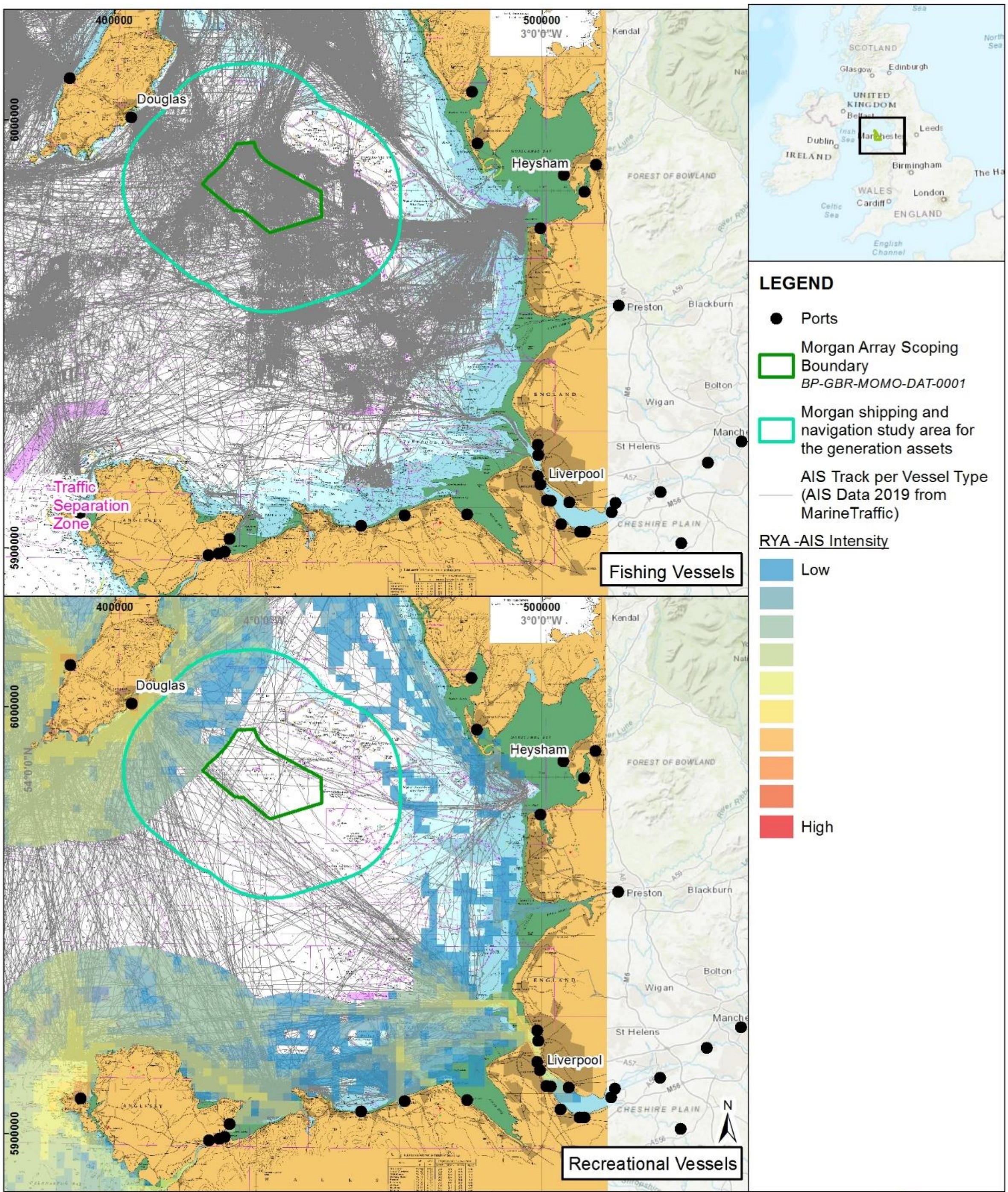
Drawing Number:
RPSE-MG-SCO-024-02

Drawing Title:
MARINE TRAFFIC IN THE VICINITY OF THE MORGAN SHIPPING AND NAVIGATION STUDY AREA FOR THE GENERATION ASSETS

Geodetic Information:
Datum: ETRS 1989
Projection: ETRS 1989 UTM Zone 30N

VER	DATE	DETAILS	BY	CHECK
00	17/01/22	First Issue	JA/LM	TGB
02	01/04/22	Revision	NA	TGB

Figure 5.10: Marine traffic (commercial shipping and ferries) in the vicinity of the Morgan shipping and navigation study area for the generation assets (all AIS vessel tracks from 2019).



Service Layer Credits: Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community

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Project Name: MORGAN OFFSHORE WIND PROJECT

0 2.5 5 10 15 20 nm
0 5 10 20 30 40 km

Drawing Number: RPSE-MG-SCO-045-01

Drawing Title: MARINE TRAFFIC IN THE VICINITY OF THE MORGAN SHIPPING AND NAVIGATION STUDY AREA FOR THE GENERATION ASSETS

Geodetic Information:
Datum: ETRS 1989
Projection: ETRS 1989 UTM Zone 30N

VER	DATE	DETAILS	BY	CHECK
00	11/03/22	First Issue	NA	TGB
01	01/04/22	Revision	NA	TGB

Figure 5.11: Marine traffic (fishing vessels and recreational vessels) in the vicinity of the Morgan shipping and navigation study area for the generation assets (all AIS vessel tracks from 2019).

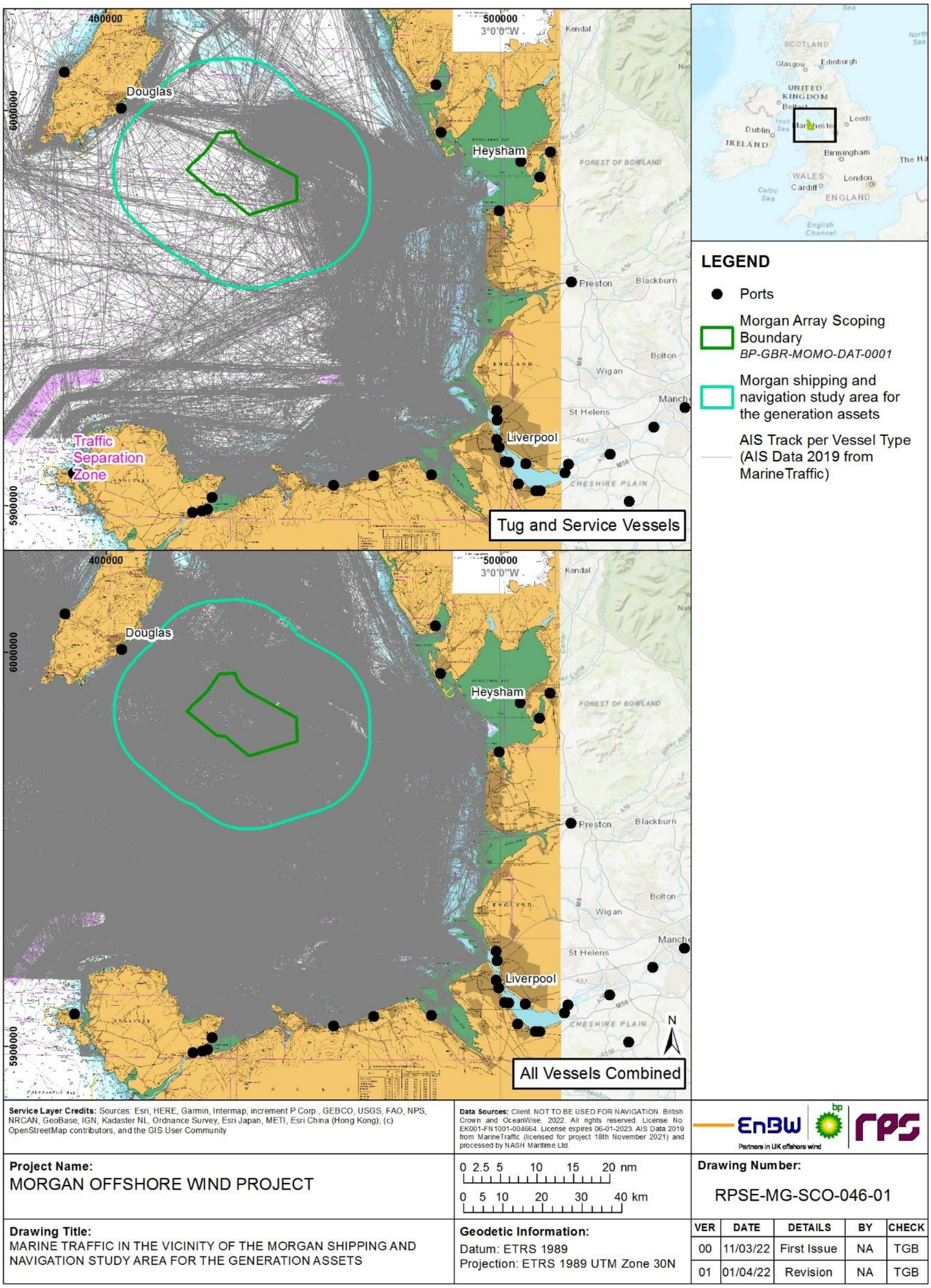


Figure 5.12: Marine traffic (tug and service vessels and all vessels combined) in the vicinity of the Morgan shipping and navigation study area for the generation assets (all AIS vessel tracks from 2019).

Fishing vessel density

5.2.4.7 Commercial fishing occurs within the Morgan shipping and navigation study area for the generation assets (Figure 5.11). Not all fishing vessels carry AIS and therefore additional data will be collected as part of the vessel traffic surveys and through consultation with commercial fisheries stakeholders through the Morgan Offshore Wind Project generation assets FLO.

5.2.4.8 Further detail on commercial fishing activity is provided in part 2, section 5.1: Commercial fisheries, of the EIA Scoping Report.

Recreational vessel activity

5.2.4.9 Recreational activity is defined for the purpose of the shipping and navigation assessment as sailing and motor craft (including those undertaking dive/fish excursions).

5.2.4.10 There is low recreational vessel activity within the Morgan shipping and navigation study area for the generation assets based on AIS data, as shown in Figure 5.11. Much of the recreational activity is concentrated inshore with only sporadic use of offshore cruising routes between the UK mainland and the Isle of Man. Not all recreational vessels carry AIS and therefore additional data will be collected as part of the vessel traffic surveys and through the MNEF engagement activities and hazard workshop.

Service vessels

5.2.4.11 Tugs and service vessels support ongoing operations associated with other infrastructure projects within the east Irish Sea (Figure 5.9). The activity of these vessels is shown in Figure 5.12 and are concentrated in harbours and within and between other offshore wind farms and oil and gas platforms, generally beyond the Morgan Array Scoping Boundary.

Search and rescue

5.2.4.12 SAR within the UK is coordinated by the MCA, with other organisations providing declared assets to undertake SAR operations. These different organisations are outlined below.

5.2.4.13 The MCA provides a coordination service for SAR, counter pollution and salvage. SAR is coordinated through a network of Maritime Rescue Coordination Centres (MRCC) situated throughout the UK, a Maritime Rescue Sub Centre (MRSC) based in London, and the Joint Rescue Coordination Centre (JRCC) in Fareham. The Morgan Array Scoping Boundary falls within the area of responsibility of the Holyhead MRCC.

5.2.4.14 SAR helicopters, available to the MCA for use during a SAR incident, are provided by the Bristow Group. The Caernarfon SAR helicopter base is the closest to the Morgan Offshore Wind Project generation assets, located 92km from the Morgan Array Scoping Boundary.

5.2.4.15 The RNLI provides a 24-hour SAR service maintaining a fleet of lifeboats from stations positioned around the coast of the UK and Ireland. There are a number of lifeboat stations positioned along the coast of north Wales and northwest coast of England that operate a variety of both smaller (open-deck) inshore lifeboats and larger all-weather lifeboats that are capable of high speed and able to safely undertake operations in all weather. Due to the distance offshore it is most likely that only all-weather lifeboats would respond to an incident in the vicinity of the Morgan Array Scoping Boundary. The closest all-weather lifeboat stations to the Morgan Array Scoping Boundary are the Douglas (Isle of Man) and Barrow Lifeboat Stations, however, given the significant number of stations surrounding the Irish Sea, other assets may respond to an incident.

5.2.4.16 Other offshore operators (e.g. oil and gas and other renewable energy developments) also have resources which could be used to assist with an incident in the vicinity of the Morgan Array Scoping Boundary. As part of the EIA process, the Applicant will undertake further consultation with the MCA in order to inform the assessment of SAR capability in the region.

Maritime accidents and incidents

5.2.4.17 Maritime incidents in the east Irish Sea from 2010 to 2019 have been recorded by MAIB are shown in Figure 5.13 according to vessel type. The majority of records occur in inshore waters, with two records of incidents involving fishing vessels within the Morgan Array Scoping Boundary. Data on maritime accidents and incidents will be analysed as part of the NRA for the Morgan Offshore Wind Project generation assets.

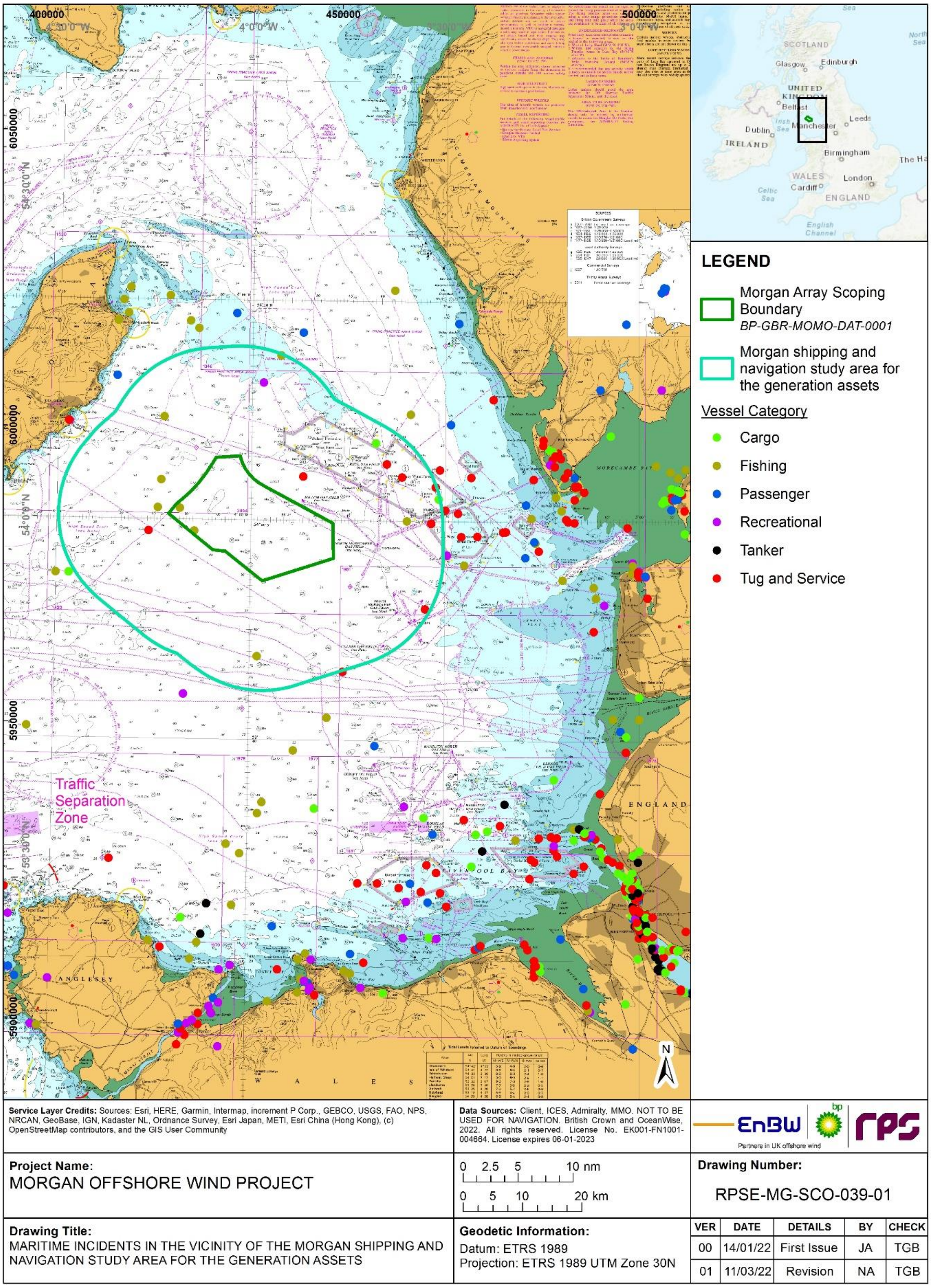


Figure 5.13: Maritime incidents in the vicinity of the Morgan shipping and navigation study area for the generation assets (MAIB data from 2010-2019).

5.2.5 Potential project impacts

5.2.5.1 A range of potential impacts on shipping and navigation receptors have been identified which may occur during the construction, operation and maintenance, and decommissioning phases of the Morgan Offshore Wind Project generation assets. The impacts that have been scoped into the assessment are outlined in Table 5.7 together with a description of any additional data collection (e.g. site-specific surveys) and supporting analyses (e.g. modelling) that will be required to enable a full assessment of the impacts.

5.2.5.2 On the basis of the baseline information currently available and the project description outlined in part 1, section 3: Project description, of the EIA Scoping Report, no impacts are proposed to be scoped out of the assessment for shipping and navigation.

Table 5.7: Impacts proposed to be scoped into the project assessment for shipping and navigation (project phase refers to construction (C), operation and maintenance (O) and decommissioning (D)).

Impact	Project phase			Justification	Data collection and analysis required to characterise the baseline environment	Summary of proposed approach to assessment
	C	O	D			
Deviations to commercial routes.	✓	✓	✓	The presence of wind farm infrastructure within the Morgan Array Scoping Boundary may require deviations to shipping routes and result in increased transit times.	AIS and radar marine traffic surveys will be undertaken to inform the NRA. The NRA will be used to inform the assessment. Consultation with commercial operators through the MNEF.	Modelling of deviations for commercial vessel routes will be undertaken in the NRA with input from regular operators and consideration of the baseline environment, including adverse weather routeing.
Increased vessel to vessel collision risk.	✓	✓	✓	Activities within the Morgan Array Scoping Boundary will increase the number of vessels operating and may increase the risk of collision between project vessels and other vessels. The deviation of existing commercial and ferry routes around the Morgan Array Scoping Boundary may increase the number of vessel interactions which may increase collision risk. Displacement of existing activities (such as fishing and recreational users) into adjacent shipping routes may increase the risk of collision.	AIS and radar marine traffic surveys will be undertaken to inform the NRA. The NRA will be used to inform the assessment. Consultation with commercial operators and other user groups through the MNEF.	Collision modelling to assess change in risk due to the Morgan Offshore Wind Project generation assets.
Increased allision (contact) risk to vessels.	✓	✓	✓	The presence of wind farm infrastructure in previously open sea areas within the Morgan Array Scoping Boundary may increase the risk of allision (contact) from passing vessels following engine failure or human error.	AIS and radar marine traffic surveys will be undertaken to inform the NRA. The NRA will be used to inform the assessment. Consultation with commercial operators and other user groups through the MNEF.	Allision risk will be calculated to assess change in risk due to the Morgan Offshore Wind Project generation assets.
Increased risk of anchor and gear snagging for commercial vessels and commercial fishing vessels (in transit).	✓	✓	✓	The presence of cables associated with the Morgan Offshore Wind Project generation assets may increase the likelihood of anchor and gear interaction for third party vessels including a snagging risk.	An assessment of the vessel traffic in proximity to the Morgan Offshore Wind Project generation assets will be carried out including identification of areas where anchoring activity occurs frequently.	Qualitative assessment to assess potential impact, informed by the NRA.
Reduction of under keel clearance	×	✓	×	The presence of cable protection associated with the Morgan Offshore Wind Project generation assets may reduce water depths and therefore reduce under keel clearance for third party vessel traffic.	An assessment of the vessel traffic in proximity to the Morgan Offshore Wind Project generation assets will be carried out and assessed against water depths to identify any areas where under keel clearance may be of concern.	Qualitative assessment to assess potential impact, informed by the NRA.

Impact	Project phase			Justification	Data collection and analysis required to characterise the baseline environment	Summary of proposed approach to assessment
	C	O	D			
Reduction of emergency response capability due to increased incident rates and reduced access for SAR responders.	✓	✓	✓	The Morgan Offshore Wind Project generation assets will increase the number of vessels in the area which may result in an increased number of incidents requiring emergency response and may reduce access for SAR responders.	MAIB and RNLI incident data and DfT SAR helicopter taskings data will be assessed to characterise baseline incident rates.	Qualitative assessment to assess potential impact, informed by the NRA. The NRA will include a section that considers the impacts of the Morgan Offshore Wind Project generation assets on SAR response in line with MGN 654 and its annexes based on desk-based research.
Interference with marine navigation, communications and position fixing equipment.	×	✓	×	Communication and position fixing equipment may be affected by the presence of infrastructure within the Morgan Array Scoping Boundary.	AIS and radar marine traffic surveys will be undertaken to characterise vessel movements in the area and inform the NRA. The NRA will be used to inform the assessment.	Qualitative assessment to assess potential impact, informed by the NRA.

5.2.6 Measures adopted as part of the project

5.2.6.1 The following measures adopted as part of the project are relevant to shipping and navigation. These measures may evolve as the engineering design and the EIA progresses.

- The use of advisory clearance distances and safety zones during construction and periods of major maintenance.
- Compliance with MGN 654 Safety of Navigation Offshore Renewable Energy Installations (OREIs) – UK Navigational Practice, Safety and Emergency Response (MGN 654) (MCA, 2021a), including:
  - at least one line of orientation, providing a helicopter corridor through the Morgan Array Scoping Boundary (see also part 2, section 6.3: Aviation and radar, of the EIA Scoping Report)
  - lowest blade tip height (air draught clearance) of at least 22m above Mean High Water Springs (MHWS). A commitment has been made by the Applicant to a minimum height that exceeds this (see part 1, section 3: Project description, of the EIA Scoping Report).
- The use of guard vessels where required by risk assessment.
- Notifying the United Kingdom Hydrographic Office (UKHO) of wind turbine locations, for marking on Admiralty Charts.
- Marking and lighting of the Morgan Offshore Wind Project generation assets in accordance with International Association of Marine Aids to Navigation and Lighthouse Authorities (IALA) guidance and in consultation with the MCA and Trinity House.
- Marine coordination and promulgation of information using Notices to Mariners and fishermen's awareness charts.
- Development of, and adherence to, an Emergency Response and Cooperation Plan (ERCoP) and provision of self-help capabilities.

5.2.6.2 The requirement for and feasibility of any further mitigation will be dependent of the significance of effects and will be consulted upon with statutory consultees throughout the EIA process.

5.2.6.3 The Applicant is also committed to implementing construction vessel traffic monitoring.

5.2.7 Proposed assessment methodology

Approach

5.2.7.1 Shipping and navigation is assessed primarily in accordance with guidance provided by the statutory consultees. The MCA require that their methodology is used as a template for undertaking the EIA (see MCA, 2021b). This template is centred on risk management and requires a submission that shows that sufficient controls are, or will be, in place in order for the assessed risk (base case and future case) to be judged as broadly acceptable or tolerable.

5.2.7.2 The following paragraphs provide an overview of the proposed approach to assessing risk to navigational receptors and how the outputs of the NRA will be carried through into the EIA in order to assess the significance of effect.

Navigational Risk Assessment and Formal Safety Assessment

5.2.7.3 The shipping and navigation EIA will be informed by a NRA undertaken in accordance with MGN 654. The NRA will be supported by stakeholder consultation and a hazard workshop in accordance with MGN 654.

5.2.7.4 The NRA will use a structured and systematic methodology to score the likelihood and consequence of different hazards occurring and is based on the IMO Formal Safety Assessment (FSA) approach (IMO, 2018).

5.2.7.5 The IMO FSA process is a structured and systematic methodology based on risk. As part of the FSA, the impact of the Morgan Offshore Wind Project generation assets is considered against the baseline datasets identified.

5.2.7.6 There are five basic steps within this process:

- Step 1 – Identification of hazards (a list of all relevant accident scenarios with potential causes and outcomes).
- Step 2 – Risk analysis (evaluation of risk factors).
- Step 3 – Risk control options (devising measures to control and reduce the identified risks).
- Step 4 – Cost benefit analysis (determining cost effectiveness of risk control measures).
- Step 5 – Recommendations for decision-making (information about the hazards, their associated risks and the cost effectiveness of alternative risk control measures).

5.2.7.7 The FSA would combine both quantitative and qualitative inputs in order to determine the level of risk. Quantitative inputs include vessel traffic analysis, historical incident analysis and risk modelling of shipping accidents. Qualitative inputs include the expertise and judgements of master mariners, regulators and wider stakeholders, elicited through extensive consultation and hazard workshops. By combining these inputs together, a holistic, collaborative approach to maritime risk assessment will be achieved.

Hazard workshop

5.2.7.8 In order to gather expert opinion and local knowledge, a hazard workshop will be undertaken, during which a project and site-specific hazard log will be prepared. The hazard log will be used to identify direct or indirect hazards relating to the development of the Morgan Offshore Wind Project generation assets, the level of risk associated with the hazards, the controls to be put in place and the tolerability of the residual risks.

5.2.7.9 The hazard log will also be used to identify standard and additional mitigation measures required to demonstrate that the hazards associated with the Morgan Offshore Wind Project generation assets are broadly acceptable or tolerable on the basis of As Low As Reasonably Practicable (ALARP) declarations, in line with regulatory requirements. This information is then fed into the FSA process to identify impacts associated with the Morgan Offshore Wind Project generation assets.

EIA methodology

5.2.7.10 The shipping and navigation EIA will broadly follow the methodology set out in part 1, section 4: EIA methodology, of the EIA Scoping Report, but with the assessment criteria tailored to align with MCA requirements described above. Specifically, the assessment criteria will include a combination of consequence and frequency, rather than magnitude and sensitivity, to establish significance. Significance will be determined as either broadly acceptable, tolerable, or unacceptable. This will be further described in the Preliminary Environmental Information Report (PEIR) and Environmental Statement (ES) after discussion with stakeholders.

5.2.7.11 Specific to the shipping and navigation EIA, the following guidance documents will be considered:

- MGN 654 (M+F) Safety of Navigation: OREIs – Guidance on UK Navigational Practice, Safety and Emergency Response (MCA, 2021a).
- Methodology for Assessing the Marine Navigational Safety and Emergency Response Risks of Offshore Renewable Energy Installations (OREI) (MCA, 2021b).

5.2.7.12 Other guidance that will be referred to during the completion of the shipping and navigation EIA include:

- Marine Guidance Notice 372, OREIs: Guidance to Mariners Operating in the Vicinity of UK OREIs (MCA, 2008)
- G1162 ED1.0 The Marking of Offshore Man-Made Structures (IALA, 2021)
- Guidelines for FSA for use in the IMO rule-making process (IMO, 2018)
- The RYA’s Position on Offshore Energy Developments: Paper 1 – Wind Energy (RYA, 2019).

5.2.8 Potential cumulative effects

5.2.8.1 There is potential for cumulative effects to arise from other projects or activities within the east Irish Sea area where projects or activities could act collectively with the Morgan Offshore Wind Project generation assets to affect shipping and navigation receptors.

5.2.8.2 The cumulative assessment will consider the maximum design scenarios for each of the identified projects or activities. The following projects or activities will be considered within the Morgan shipping and navigation study area for the generation assets:

- other offshore wind farms, including the Mona Offshore Wind Project and other existing and proposed projects
- other energy infrastructure projects, including oil and gas activities (including decommissioning) and carbon capture and storage (CCS) projects

- other infrastructure projects (e.g. cables and pipelines), including the Morgan Offshore Wind Project transmission assets.

5.2.8.3 The cumulative effect assessment will follow the approach outlined in part 1, section 4: EIA methodology, of the EIA Scoping Report.

5.2.9 Potential inter-related effects

5.2.9.1 The assessment of potential inter-related effects will be considered within the Shipping and navigation ES chapter. It will include consideration of project lifetime effects and receptor-led effects, in line with the approach outlined in part 1, section 4: EIA methodology, of the EIA Scoping Report.

5.2.10 Potential transboundary impacts

5.2.10.1 A screening of transboundary impacts has been carried out and is presented in part 3, Annex A: Transboundary Impacts Screening, of the EIA Scoping Report. This screening exercise identified that there is potential for transboundary impacts upon shipping and navigation due to construction, operational and maintenance, and decommissioning impacts of the Morgan Offshore Wind Project generation assets. These include:

- Deviations to commercial routes: there is potential for transboundary impacts on ferry and commercial routes operating to/from the Republic of Ireland.

5.2.10.2 The potential for transboundary impacts will be considered within the ES.

5.3 Marine archaeology

5.3.1 Introduction

5.3.1.1 This section of the Environmental Impact Assessment (EIA) Scoping Report identifies the marine archaeology receptors of relevance to the Morgan Offshore Wind Project generation assets and considers the potential impacts arising from the construction, operation and maintenance, and decommissioning of the generation assets on marine archaeology receptors.

5.3.2 Study area

5.3.2.1 The Morgan marine archaeology study area for the generation assets is shown in Figure 5.14. The Morgan marine archaeology study area for the generation assets is defined as the Morgan Array Scoping Boundary (green) with an additional 2km buffer (purple). This encompasses the generation assets of the Morgan Offshore Wind Project and allows the site-specific data to be put into a wider context.

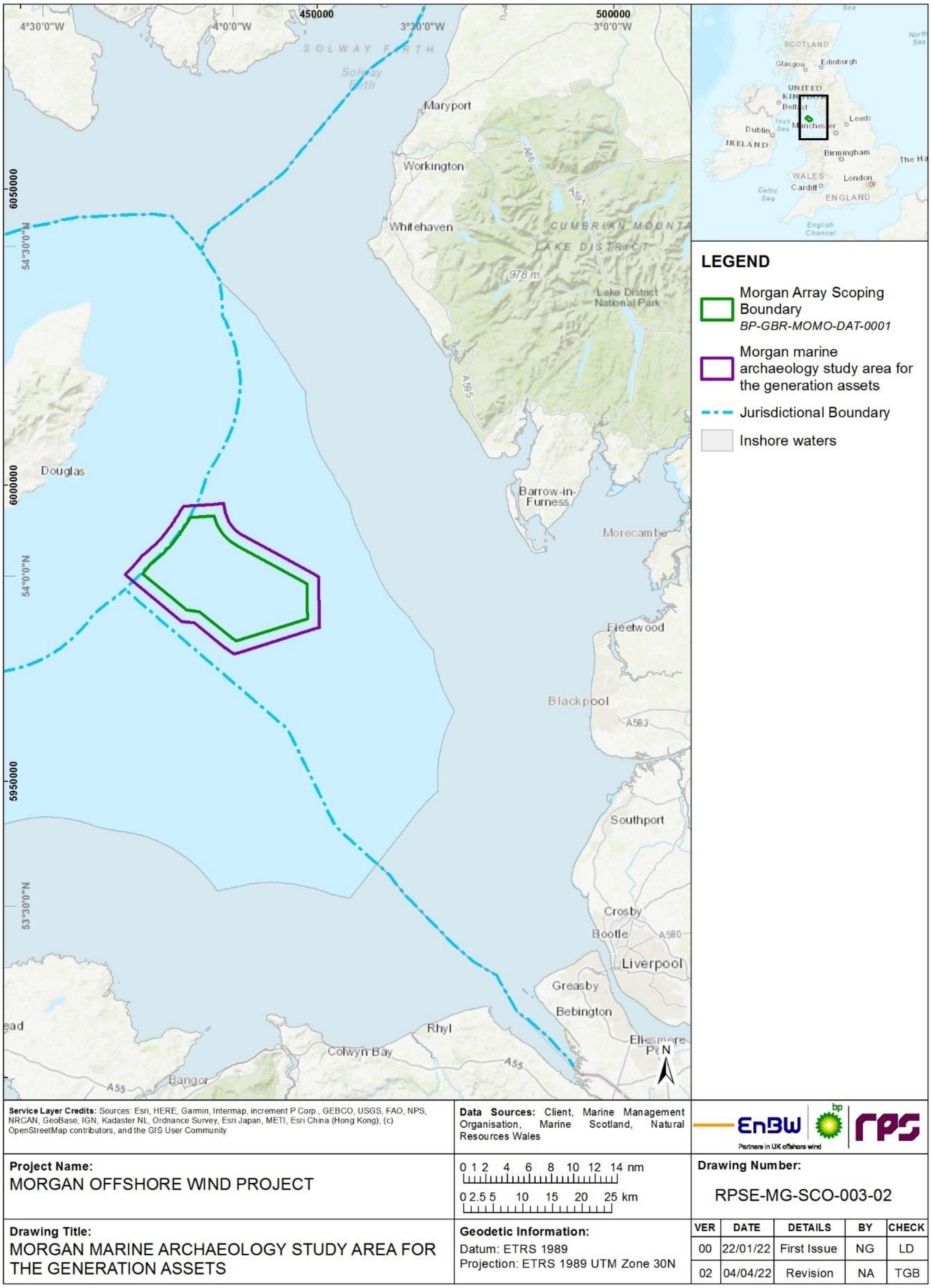


Figure 5.14: The Morgan marine archaeology study area for the generation assets.

5.3.3 Data sources

Desktop data

5.3.3.1 A number of sources were consulted in order to inform the Marine archaeology section of the EIA Scoping Report and will be used to inform the EIA. These comprise:

- The United Kingdom Hydrographic Office (UKHO) wrecks database, containing recorded wreck and obstruction data
- Records held by the National Record of the Historic Environment (NRHE), which include:
  - monuments records
  - archaeological event records
  - maritime records
  - aircraft crash sites
  - find locations.
- National Monuments Records Wales (NMRW) held by the Royal Commission on the Ancient and Historical Monuments of Wales (RCAHMW)
- Relevant mapping including Admiralty Charts, British Geological Survey (BGS), Ordnance Survey and historic maps
- Relevant primary and secondary sources and grey literature, available through the Archaeological Data Service (ADS) and other websites, including published and unpublished archaeological reports relevant to the vicinity of the Morgan marine archaeology study area for the generation assets.

5.3.3.2 In order to compile a marine archaeological baseline for the purposes of this EIA Scoping Report, these sources were compiled into gazetteers (see appendix 5.3.11).

5.3.3.3 The historic environment records have been classified between records where material is known to be on the seabed and ‘recorded losses’. Recorded losses are events of vessels that are known to have been lost in the area, but with which no accurately located remains are associated.

5.3.3.4 Where multiple entries across the datasets occur that relate to the same archaeological receptor, the coordinates from the UKHO dataset have been used, as they are most frequently updated with the latest survey positions.

Site-specific surveys

5.3.3.5 A geophysical survey took place in summer 2021 within the Morgan Array Scoping Boundary. This included a Multibeam Echo Sounder (MBES), Side Scan Sonar (SSS), Sub-bottom Profiler (SBP), multichannel 2D Ultra-high Resolution Seismic (UHRS), and magnetometer survey. Data from this survey will be reviewed by a marine archaeologist specialising in geophysical data interpretation and will be used to inform the marine archaeology baseline for the EIA.

5.3.4 Baseline environment

5.3.4.1 This section provides a high-level overview of the marine archaeological baseline environment within the Morgan marine archaeology study area for the generation assets. The baseline environment is structured into the following categories:

- Submerged prehistoric archaeology: This includes palaeochannels and other inundated terrestrial landforms that may preserve sequences of sediment of palaeoenvironmental interest, Palaeolithic and Mesolithic sites and artefacts.
- Maritime archaeology: relates generally to craft or vessels and any of their associated structures and cargo.
- Aviation archaeology: this comprises all military and civilian aircraft crash sites and related wreckage.

5.3.4.2 There are no designated archaeological sites within the Morgan marine archaeology study area for the generation assets.

5.3.4.3 A gazetteer of the known marine archaeology within the Morgan marine archaeology study area for the generation assets can be found in appendix 5.3.11.

Submerged prehistoric archaeology

5.3.4.4 There are no entries within the datasets relating to palaeolandscapes within the Morgan marine archaeology study area for the generation assets. However, this could be due to a lack of archaeological survey in the area and may not be representative of the submerged prehistoric environment.

<u>Submerged prehistoric archaeological potential</u>

5.3.4.5 The potential for submerged prehistoric archaeology within the Morgan marine archaeology study area for the generation assets is moderate with any surviving evidence likely to be found in association with the palaeolandscape features. Archaeological assessment of the geophysical survey data (see section 5.3.3) will provide further information on the potential for submerged prehistoric archaeology within the Morgan marine archaeology study area for the generation assets and will be presented in the PEIR and ES chapter.

5.3.4.6 Prior to 5,500BC fluctuations in sea level presented opportunities for early hominids to occupy and traverse the now submerged Liverpool Bay area (Fitch *et al*., 2011). When sea levels were low, the Liverpool Bay area was a landscape that connected the Isle of Man to mainland Britain (Coles, 1988). These falls in sea level were associated with the last three glacial maximums and the retreat of the ice sheets.

5.3.4.7 The earliest known occupation of the area near the Morgan marine archaeology study area for the generation assets is located on the north coast of Wales, at the Pontnewydd Cave site, Llandudno. This site dates to circa 225,000BP (Before Present) and confirms that this area was being exploited during the low to mid Palaeolithic period.

5.3.4.8 The Last Glacial Maximum (LGM) began circa 18,000BP and ice sheets began to retreat around 13,000BP. It is thought that human and animal reoccupation of mainland Britain was swift, and that this reoccupation came from crossing the now submerged palaeolandscape of Doggerland from mainland Europe (Fitch *et al*., 2011). There is therefore potential that this exploitation of the landscape continued across mainland Britain and over to the Isle of Man possibly via a now submerged palaeolandscape.

Maritime archaeology

5.3.4.9 The known maritime archaeology within the Morgan marine archaeology study area for the generation assets is shown in Figure 5.15 and described below.

Non-designated maritime archaeology

5.3.4.10 Within the datasets listed in section 5.3.3 there are a total of 11 entries that may indicate the presence of material of anthropogenic origin within the Morgan marine archaeology study area for the generation assets. These are described below.

5.3.4.11 There are five known maritime wreck sites within the Morgan marine archaeology study area for the generation assets. Three of these date to the post-medieval period, the *Flying Meteor*, *Hibernian* and *Peveril*. There are also two modern wrecks, which are therefore considered less significant in archaeology terms. There are two findspots within the data that relate to an anchor of unknown origin and a ship's whistle, suspected to be from the *Peveril*.

5.3.4.12 Within the UKHO data there are also six wreck sites which are listed as 'dead', indicating that no remains have been located and therefore the wreck is considered not to exist at the location given. However, it is worth noting that 'dead' wrecks may still be present at the locations indicated but are buried or flattened and therefore no longer represent a navigational hazard. Archaeological interpretation of the geophysical survey data will clarify whether archaeological material survives at these locations.

5.3.4.13 There is one unknown wreck site recorded in the UKHO data about which no further information is known. This entry within the dataset is attributed an unverifiable position and therefore may not exist within the Morgan marine archaeology study area for the generation assets. Archaeological interpretation of the geophysical survey data will determine whether it relates to the presence of archaeological material.

5.3.4.14 There are two seabed anomalies recorded as being of man-made origin that may also relate to the presence of archaeological material on the seabed within the Morgan marine archaeology study area for the generation assets.

Maritime archaeological potential

5.3.4.15 Maritime archaeological sites and materials can be defined as the physical remains of boats and ships that have been wrecked, sunk or have foundered, and artefacts which rest upon the seabed as the result of being jettisoned or lost overboard (for example, anchors, cannon or fishing gear).

5.3.4.16 There are two recorded losses attributed to coordinates within the Morgan marine archaeology study area for the generation assets. Recorded losses represent maritime and aviation losses that are known to have occurred in the vicinity but to which no specific location can be attributed. Recorded losses are often grouped with reference to a geographic, hydrographic or other point of reference, making the positional data of these records unreliable. However, they do provide information on the historical marine traffic of the general region.

5.3.4.17 Records of known wreck sites and losses in UK waters are biased towards the recent, predominantly post-medieval and modern periods. Although the existence and survival of Palaeolithic watercraft are highly speculative in the UK, Bronze and Iron Age sea-going vessels are likely to have been lost in the east Irish Sea.

5.3.4.18 The potential for the survival of medieval maritime archaeology is higher than from prehistoric periods but still rare, as ship construction during the medieval period relied heavily on organic building materials that are less likely to survive on and in the seabed.

5.3.4.19 The post-medieval and modern periods present the greatest potential for unrecorded archaeology to be discovered. The increasing incorporation of metal structural elements into vessel designs during this period means that wrecks for the 19th and early 20th centuries are also often more visible on the seabed than their wooden predecessors. They are visible to bathymetric and geophysical survey, and also generate strong magnetic anomalies, and this greater visibility is reflected in the increased number of known wrecks (i.e. those that have been located on the seabed) in contrast to earlier periods.

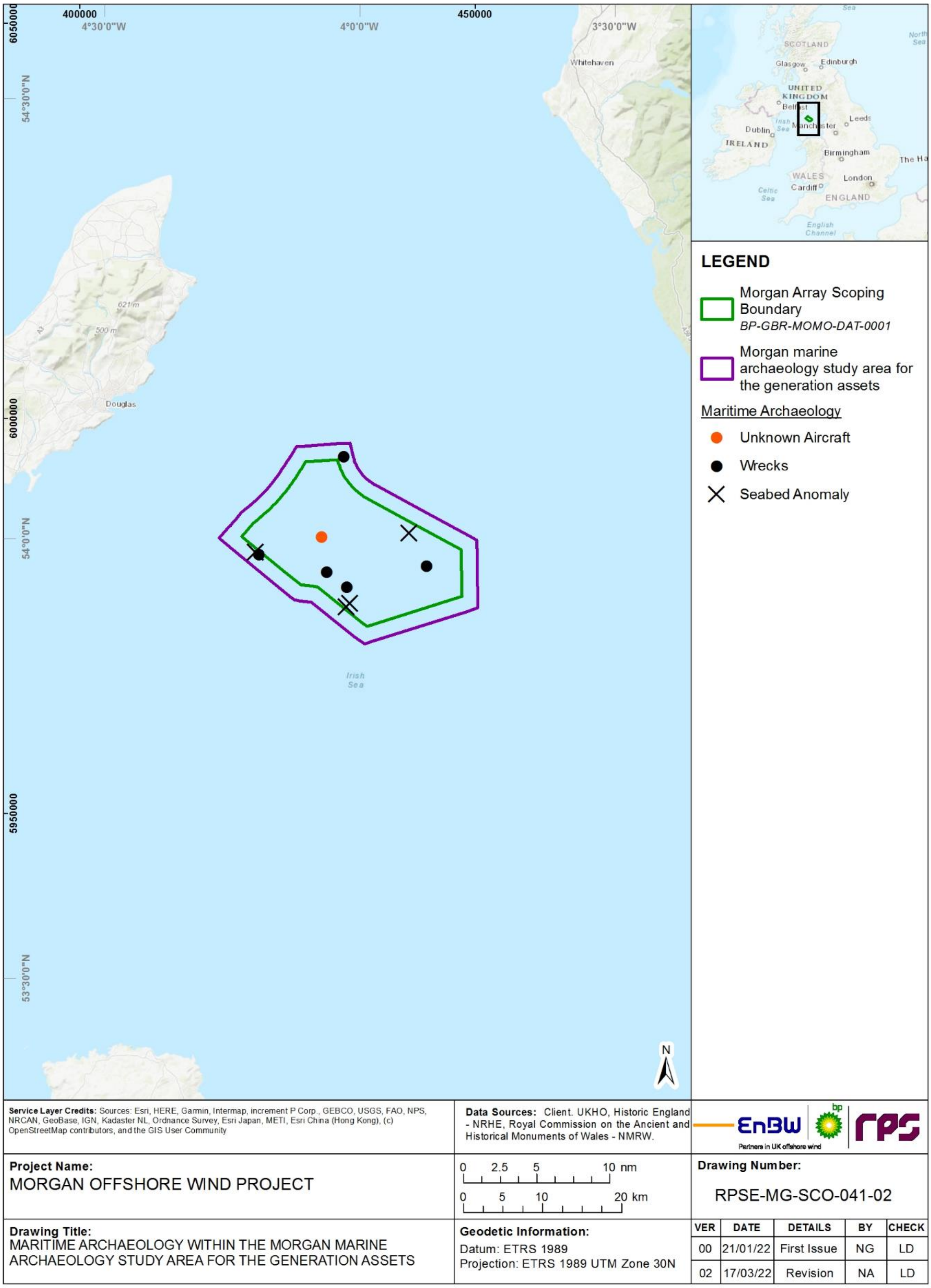


Figure 5.15: Maritime and aviation archaeology within the Morgan marine archaeology study area for the generation assets.

Aviation archaeology

5.3.4.20 The possible remains of one unknown aircraft are located within the Morgan marine archaeology study area for the generation assets, as shown in Figure 5.15.

Aviation archaeological potential

5.3.4.21 Thousands of military and civilian aircraft casualties have occurred in UK waters since the advent of powered flight in the early 20th century. The bulk of these casualties date to World War II and most are concentrated off the south and southeast coasts of England. However, there is evidence for substantial numbers of aircraft casualties in the east Irish Sea (Wessex Archaeology, 2008).

5.3.4.22 Whilst this aviation archaeology record is potentially very large, the ephemeral nature of aircraft wrecks ensures that many sites remain unknown and unrecorded. In addition, although records of aircraft losses at sea are extensive, they are seldom tied to an accurate position, which further complicates any assessment of the likely presence of aircraft wreckage on any area of the seabed.

5.3.4.23 Since World War II, despite the volume of both military and civilian air traffic, there have been few aviation losses off the west coast of England and north Wales, in the vicinity of the Morgan Offshore Wind Project generation assets. The potential for post-war aircraft remains to be discovered within the Morgan marine archaeology study area for the generation assets is therefore considered to be low. Civilian aircraft wrecks are not subject to protection under the terms of the Protection of Military Remains Act 1986.

5.3.5 Potential project impacts

5.3.5.1 A range of potential impacts on marine archaeology receptors have been identified which may occur during the construction, operation and maintenance, and decommissioning phases of the Morgan Offshore Wind Project generation assets. The impacts that have been scoped into the assessment are outlined in Table 5.8 together with a description of any additional data collection and supporting analyses that will be required to enable a full assessment of the impacts.

5.3.5.2 On the basis of the baseline information currently available and the project description outlined in part 1, section 3: Project description, of the EIA Scoping Report, no impacts are proposed to be scoped out of the assessment for marine archaeology.

Table 5.8: Impacts proposed to be scoped into the project assessment for marine archaeology (project phase refers to construction (C), operation and maintenance (O) and decommissioning (D)).

Impact	Project phase			Justification	Data collection and analysis required to characterise the baseline environment	Summary of proposed approach to assessment
	C	O	D			
Sediment disturbance and deposition leading to indirect impacts on archaeological receptors.	✓	✓	✓	Construction works, including seabed preparation, installation of foundations, and cable installation, may cause seabed sediment disturbance and associated deposition, which could lead to indirect impacts on archaeological receptors. Effects from decommissioning are likely to be similar to effects from construction. Maintenance operations, including cable repair activities, may cause seabed sediment disturbance and associated deposition, which could lead to indirect impacts on archaeological receptors.	Review of desktop data and archaeological assessment of geophysical survey data with reference to the results of the Physical processes chapter of the ES which will consider the extent of sediment disturbance and associated deposition. The geophysical survey data will be scanned to provide an understanding of the geological nature of the area and interpreted for any objects of possible anthropogenic origin. This involves creating a database of anomalies by tagging individual features of possible archaeological potential, recording their positions and dimensions, and acquiring an image of each anomaly for future reference.	Qualitative assessment informed by review of desktop data and archaeological assessment of geophysical survey data. Preparation of a technical report and draft Written Scheme of Investigation (WSI).
Direct damage to archaeological receptors.	✓	✓	✓	Construction works could directly affect any archaeological receptors present within the Morgan Array Scoping Boundary. These effects will likely be localised, but should they occur, they could lead to adverse and irreversible damage to archaeological receptors. Where receptor locations are already known, measures for their avoidance and protection include implementing Archaeological Exclusion Zones (AEZs). Effects from decommissioning are likely to be similar to effects from construction.	As above.	Qualitative assessment informed by review of desktop data and archaeological assessment of geophysical survey data. Preparation of a technical report and draft WSI.
Alteration of sediment transport regimes.	×	✓	×	The presence of wind turbine and offshore substation platform foundations and associated scour protection, and cable protection, may interrupt sediment transport pathways, which could be directed towards or away from archaeological receptors causing damage.	As above, with reference to the Physical processes chapter of the ES which will consider the extent of potential impact on sediment transport pathways.	Qualitative assessment informed by review of desktop data and archaeological assessment of geophysical survey data. Preparation of a technical report and draft WSI.

5.3.6 Measures adopted as part of the project

5.3.6.1 The following measures adopted as part of the project are relevant to marine archaeology. These measures may evolve as the engineering design and the EIA progresses.

- The identification and implementation of AEZs around receptors identified as having a known archaeological potential. The size of the AEZ will be evidence based and established using the precautionary principle to ensure that it is of sufficient size to protect the site from the nature of the impact (Wessex Archaeology, 2007; Wessex Archaeology for The Crown Estate, 2020).
- The development of, and adherence to, a WSI for the construction phase.
- Provision of a Protocol for Archaeological Discoveries (PAD) similar to that set out by The Crown Estate (TCE, 2014) for unexpected archaeological discoveries made during the course of the Morgan Offshore Wind Project generation assets.
- Archaeological input into specifications for and analysis of pre-construction geophysical surveys.
- Suitably qualified marine archaeologists to be consulted in the preparation of any pre-construction Remotely Operated Vehicle (ROV) or diver surveys and, if appropriate, in the monitoring and checking of data.
- Geoarchaeological input into specifications for and analysis of pre-construction geotechnical surveys. This may include the presence of a geoarchaeologist on board the survey vessel and provision for sampling, analysis and reporting of recovered cores. The results of all geoarchaeological investigations will be complied in a final report which will include a sediment deposit model.

5.3.6.2 The requirement for and feasibility of any further mitigation will be dependent on the significance of effects and will be consulted upon with statutory consultees throughout the EIA process.

5.3.7 Proposed assessment methodology

5.3.7.1 The marine archaeology EIA will follow the methodology set out in part 1, section 4: EIA methodology, of the EIA Scoping Report. Specific to the marine archaeology EIA, the following guidance will also be considered:

- Standard and Guidance for Historic Environment Desk-Based Assessment, Chartered Institute for Archaeologists (CIfA) (2014).
- Historic Environment Guidance for Offshore Renewable Energy Sector, Collaborative Offshore Wind Research into the Environment (COWRIE) (2007).
- Guidance for Assessment of Cumulative Impacts on the Historic Environment from Offshore Renewable Energy, COWRIE (2008).
- Joint Nautical Archaeology Policy Committee (JNAPC) Code of Practice for Seabed Development, JNAPC (2006).

- Model Clauses for Archaeological Written Schemes of Investigation, Offshore Renewables Projects, The Crown Estate (2010).
- Protocol for Archaeological Discoveries: Offshore Renewables Projects, The Crown Estate (2014).

5.3.8 Potential cumulative effects

5.3.8.1 The majority of the potential effects on marine archaeological receptors arising from the construction, operation and maintenance, and decommissioning of the Morgan Offshore Wind Project generation assets are considered to be localised to within the footprint of the Morgan Array Scoping Boundary. However, there is potential for cumulative effects to arise from other projects or activities within the east Irish Sea where projects or activities could act collectively on sediment transport regimes with the Morgan Offshore Wind Project generation assets to affect marine archaeological receptors. The cumulative assessment will consider the maximum design scenario for each of the projects or activities.

5.3.8.2 The cumulative effect assessment will follow the approach outlined in part 1, section 4: EIA methodology, of the EIA Scoping Report.

5.3.9 Potential inter-related effects

5.3.9.1 The assessment of potential inter-related effects will be considered within the marine archaeology Environmental Statement (ES) chapter. It will include consideration of project lifetime effects and receptor-led effects, in line with the approach outlined in part 1, section 4: EIA methodology, of the EIA Scoping Report.

5.3.10 Potential transboundary impacts

5.3.10.1 A screening of transboundary impacts has been carried out and is presented in part 3, Annex A: Transboundary Impacts Screening, of the EIA Scoping Report. This screening exercise identified that there is no potential for transboundary impacts upon marine archaeology due to construction, operation and maintenance, and decommissioning of the Morgan Offshore Wind Project generation assets.

5.3.11 Appendix 5.3.11

Gazetteer of known marine archaeology within the Morgan marine archaeology study area for the generation assets (data has been compiled from the NMRW, NRHE and UKHO datasets as listed in section 5.3.3).

Some of the data cannot be attributed an ID number at this stage. If these become confirmed locations of archaeological material, they will be assigned ID numbers during the geophysical data analysis.

ID	Easting	Northing	Name	Description	Period
6019	441703.8	5985507	Anchor	Find	Unknown
5991	443924.9	5981301	Flying Meteor	British paddle-steam tug built in 1864 that was wrecked in March 1874 due to an explosion.	Post Medieval
6098	433820.7	5978667	Hibernian	Steam ship. Post Medieval	Post Medieval
6021	431229.3	5980520	Lucy	The *Lucy* was a small steamship built by Scot & Sons at Bowling in 1899. On 21 July 1910, the vessel was on passage from Weston Point to Douglas with a cargo of moulding. It developed a leak and foundered.	Modern
6100	433437.4	5995145	Malaguena	A small motorised fishing vessel lost in 2000.	Modern
6235	422681.3	5982769	Peveril	The *Peveril* was a steamship owned by the Isle of Man Steam Packet Company. On 16 September 1899, it was returning to Douglas from Liverpool when it was in collision with the British steamship *Monarch* and sank.	Post Medieval
-	433731.5	5976141	Seabed Anomaly (man-made origin)	Findspot	Post Medieval
-	434152.8	5976616	Seabed Anomaly (man-made origin)	Findspot	Post Medieval
-	422235.5	5983095	Ship's whistle (from Peveril?)	Find	Post Medieval
6086 / 909495	430634.9	5985017	Unknown aircraft	Possible remains of an aircraft	Unknown
909493	443842.7	5981316	Unknown	Broken remains of a vessel, probably a trawler	Unknown

5.4 Other sea users

5.4.1 Introduction

5.4.1.1 This section of the Environmental Impact Assessment (EIA) Scoping Report identifies the other sea users receptors of relevance to the Morgan Offshore Wind Project generation assets and considers the potential impacts arising from the construction, operation and maintenance, and decommissioning of the generation assets on other sea users receptors.

5.4.1.2 Potential impacts upon other sea users related to navigational safety are addressed in part 2, section 5.2: Shipping and navigation, of the EIA Scoping Report. Potential impacts on helicopter access to oil and gas platforms are addressed in part 2, section 6.3: Aviation and radar, of the EIA Scoping Report. The other sea users Environmental Statement (ES) chapter will only consider impacts that have likely significant effects on the undertaking of a certain marine activity or the operational effectiveness of marine infrastructure.

5.4.2 Study area

5.4.2.1 The other sea users study area varies in scale depending on the receptor. Two study areas have been defined for the assessment of different groupings of other sea users receptors. These are the Morgan regional other sea users study area for the generation assets, and Morgan local other sea users study area for the generation assets, as shown in Figure 5.16.

5.4.2.2 The Morgan regional other sea users study area for the generation assets is based on one tidal excursion of the Morgan Array Scoping Boundary and represents the area with potential increases in suspended sediments arising from Morgan Offshore Wind Project generation assets activities. This study area is relevant to those receptors which are susceptible to increases in suspended sediment concentrations:

- aggregate extraction and disposal sites
- recreational receptors (dive sites).

5.4.2.3 The Morgan local other sea users study area for the generation assets is defined as the Morgan Array Scoping Boundary with an additional 1km buffer. The 1km buffer has been included as oil and gas infrastructure, cables and pipelines and offshore wind farm structures undergoing maintenance will require a 500m safety zone or advisory clearance distance. This area includes the extent of potential direct physical overlap between the Morgan Offshore Wind Project generation assets activities and the following receptors:

- recreational receptors (including sailing and motor cruising and recreational fishing)
- offshore energy projects (including offshore wind farms, oil and gas activities, carbon capture and storage)
- cable and pipeline operators
- offshore microwave fixed communication links.

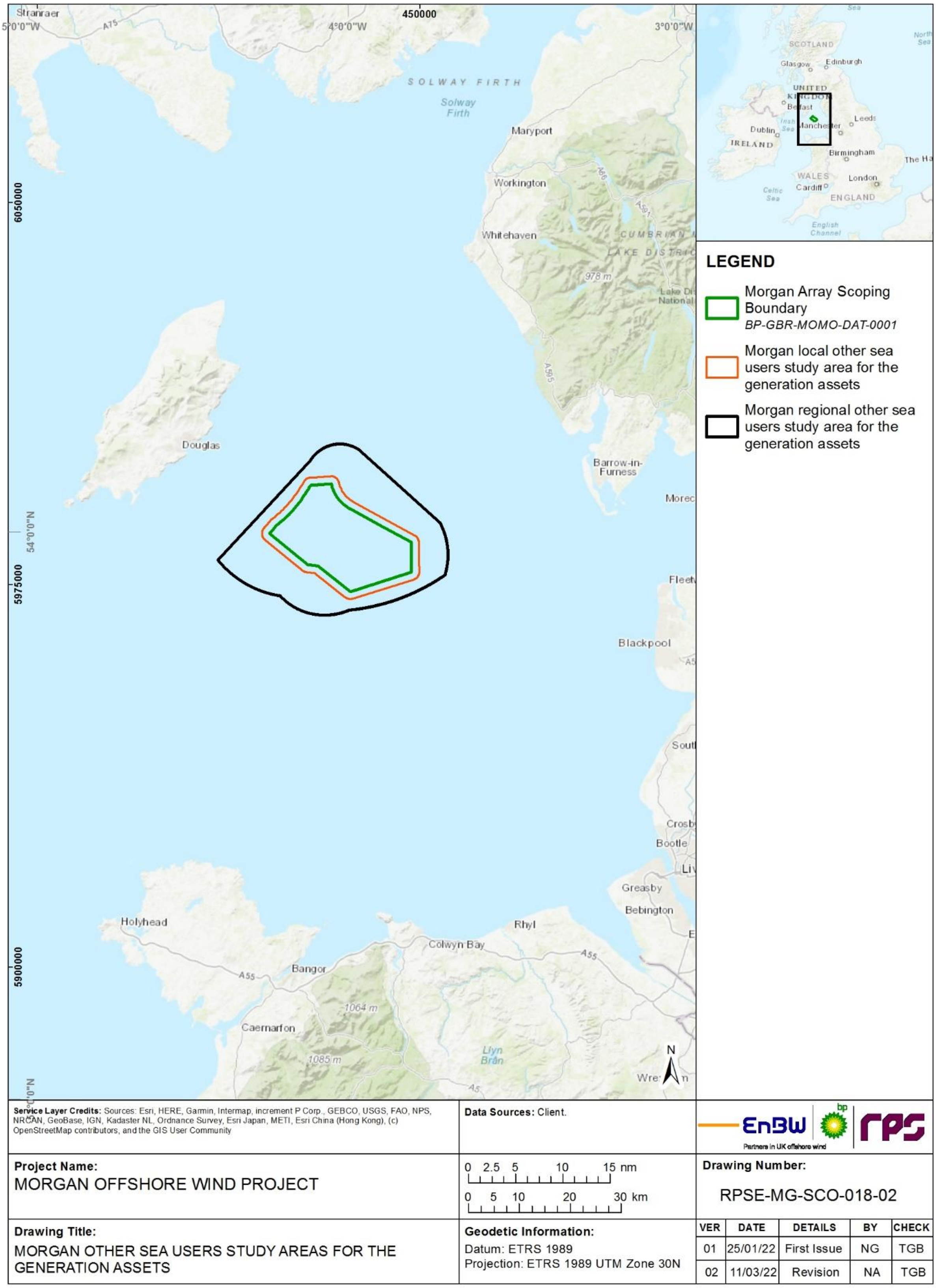


Figure 5.16: Morgan regional other sea users study area for the generation assets and Morgan local other sea users study areas for the generation assets.

5.4.4 Data sources

Desktop data

5.4.4.1 A number of sources were consulted in order to inform the Other sea users section of the EIA Scoping Report and will be used to inform the EIA. These are shown in Table 5.9.

Table 5.9: Data sources for other sea users.

Title	Source	Year	Author
Cable routes	Kis-Orca	2021	Kis-Orca
Disposal sites	EMODnet	2015	EMODnet
Offshore wind farms	The Crown Estate (TCE)	2021	TCE
Aggregate extraction areas	TCE	2021	TCE
Pipelines	Oil and Gas Authority (OGA)	2021	OGA
Wells	OGA	2021	OGA
Oil and gas platforms	OGA	2021	OGA
Subsurface structures	OGA	2021	OGA
Hydrocarbon fields	OGA	2021	OGA
Oil and gas licence block	OGA	2021	OGA
United Kingdom Continental Shelf (UKCS) block	OGA	2021	OGA
Marinas	UK Coastal Atlas of Recreational Boating	2018	Royal Yachting Association (RYA)
Recreational activities	UK Coastal Atlas of Recreational Boating	2018	RYA
RYA clubs	UK Coastal Atlas of Recreational Boating	2018	RYA
RYA training centres	UK Coastal Atlas of Recreational Boating	2018	RYA
General boating areas	UK Coastal Atlas of Recreational Boating	2018	RYA
Data from site-specific 2 x 14-day Marine Vessel Traffic Surveys (see part 2, section 5.2: Shipping and navigation, of the EIA Scoping Report)	NASH Maritime (commissioned by the Applicant)	2021/ 2022	NASH
Wrecks (diving sites)	UKDiving.co.uk	2010	UK Diving
Communication links	Ofcom, communication	2019	Ofcom
Recreational fishing	Cefas British sea fishing	2021 2020	Cefas British sea fishing

Consultation

5.4.4.2 Supporting data and information will also be obtained through consultation with relevant other sea users receptors with activities and interests in proximity to the Morgan Array Scoping Boundary.

5.4.5 Baseline environment

5.4.5.1 This section provides a high level overview of the other sea users baseline environment within the Morgan regional other sea users study area for the generation assets and the Morgan local other sea users study area for the generation assets.

Morgan regional other sea users study area for the generation assets

5.4.5.2 Other sea users receptors within the Morgan regional other sea users study area for the generation assets include aggregate extraction and disposal sites and recreational receptors (dive sites). The baseline environment for these receptors is described below.

Marine aggregate extraction

5.4.5.3 There are no marine aggregate areas within the Morgan regional other sea users study area for the generation assets (Figure 5.17).

Disposal sites

5.4.5.4 There are a number of dredge disposal sites located within the east Irish Sea, however there are no disposal sites located within the Morgan regional other sea users study area for the generation assets. The nearest disposal site is located 18.2km to the northwest of the Morgan Array Scoping Boundary, with another 22km southeast of the Morgan Array Scoping Boundary.

5.4.5.5 There are no disposal sites for explosive material, chemical munitions disposal sites (post 1945) or radioactive waste sites (1946 to 1993) located within the Morgan regional other sea users study area for the generation assets, according to DECC, 2011 (see Figure A3h.21 in DECC, 2011).

Scuba diving

5.4.5.6 There are no known recreational dive sites within the Morgan regional other sea users study area for the generation assets (www.ukdiving.co.uk). As such, recreational diving is not expected to occur within the Morgan regional other sea users study area for the generation assets.

Morgan local other sea users study area for the generation assets

5.4.5.7 Other sea users receptors within the Morgan local other sea users study area for the generation assets include recreational receptors (sailing and motor cruising and recreational fishing), offshore energy projects (offshore wind farms, oil and gas activities, carbon capture and storage), cable and pipeline operators and communication links. The baseline environment for these receptors is described below.

Recreational sailing and motor cruising

5.4.5.8 Recreational sailing is generally divided into two categories: offshore and inshore. Offshore sailing is usually undertaken by yachts in the form of either cruising or organised offshore racing. Inshore sailing is typically undertaken by smaller vessels including dinghies and recreational vessels that are used for either cruising at leisure or racing. Cruising may include day trips between local ports and often includes a return journey to the home port on the same day. Inshore racing takes place around racing marks and navigational buoyage.

5.4.5.9 As noted in paragraph 5.4.1.2, navigational safety and risk to recreational vessels is considered in part 2, section 5.2: Shipping and navigation, of the EIA Scoping Report. The Other sea users ES chapter will only consider receptors undertaking recreational sailing and motor cruising as an activity.

5.4.5.10 Figure 5.18 illustrates that recreational sailing and motor cruising in inshore and coastal areas is of a low to medium intensity, including along the north western edge of the Morgan local other sea users study area for the generation assets. The RYA data is limited to inshore waters, but Automatic Identification System (AIS) data tracks show that recreational vessels also transit through the Morgan local other sea users study area for the generation assets, mainly between Douglas and Liverpool. Due to the distance of the Morgan Array Scoping Boundary from the coast (22.3km/12nm from the Isle of Man at the closest point), any sailing would likely consist of offshore cruising and racing.

5.4.5.11 Data from the marine vessel traffic surveys and consultation activities carried out to inform the Navigation Risk Assessment (NRA) (see part 2, section 5.2: Shipping and navigation, of the EIA Scoping Report) will be used as an additional data source to inform the assessment on recreational sailing and motor cruising receptors.

Recreational fishing

5.4.5.12 Sea fishing trips run from Conwy, North Wales and specialise in wreck fishing, deep sea fishing and reef fishing from Anglesey to Liverpool Bay (www.sea-fishing-trips.co.uk). Sea fishing trips also operate from the Isle of Man (https://www.manxseafishing.com/) and Fleetwood, Lancashire (http://www.blueminkboatcharters.co.uk/) amongst other ports along the coasts of the east Irish Sea. Consultation will take place with local operators to further understand activities and operational range.

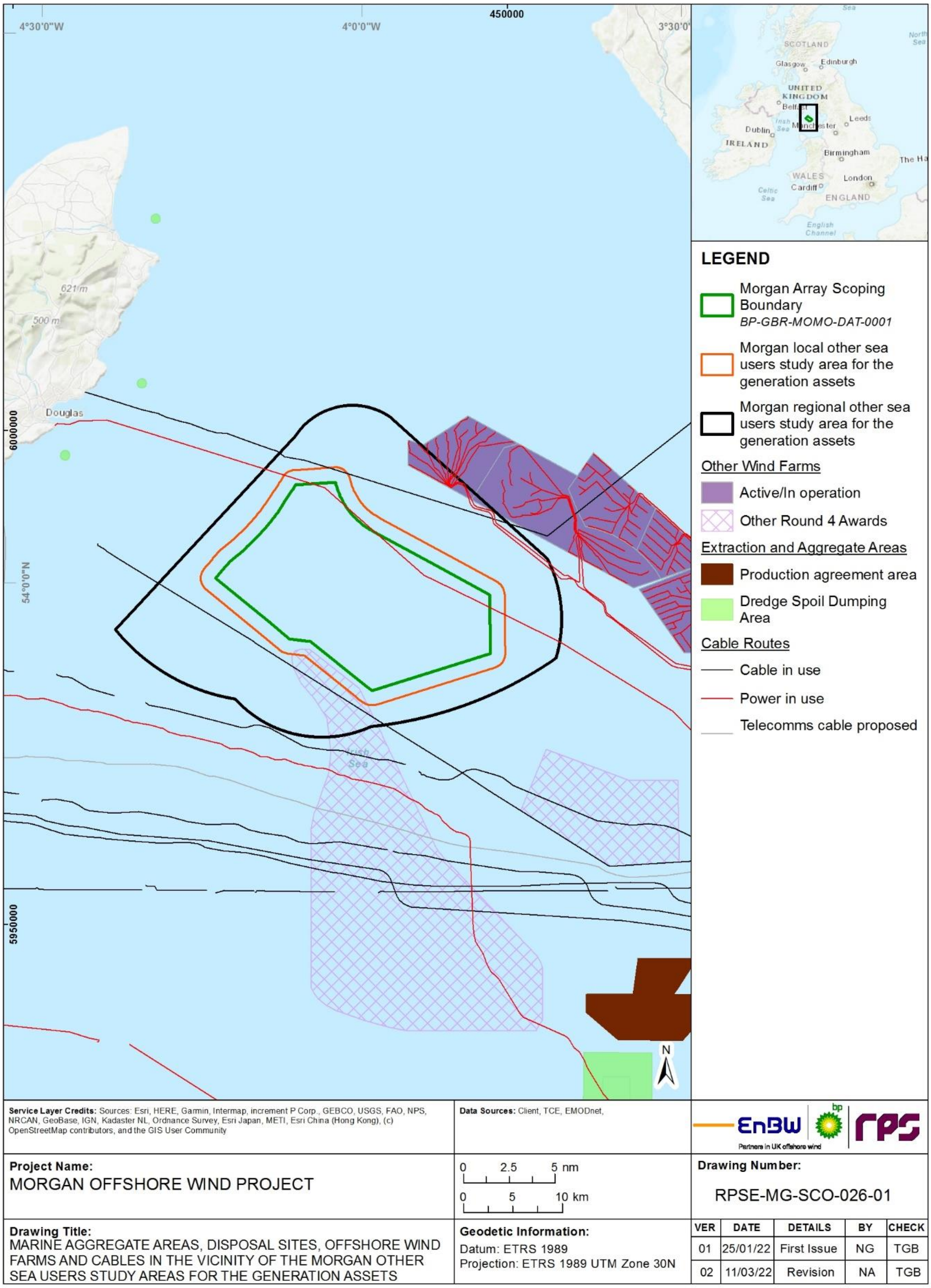


Figure 5.17: Marine aggregate areas, disposal sites, offshore wind farms and cables within the Morgan regional other sea users study areas for the generation assets and the Morgan local other sea users study areas for the generation assets.

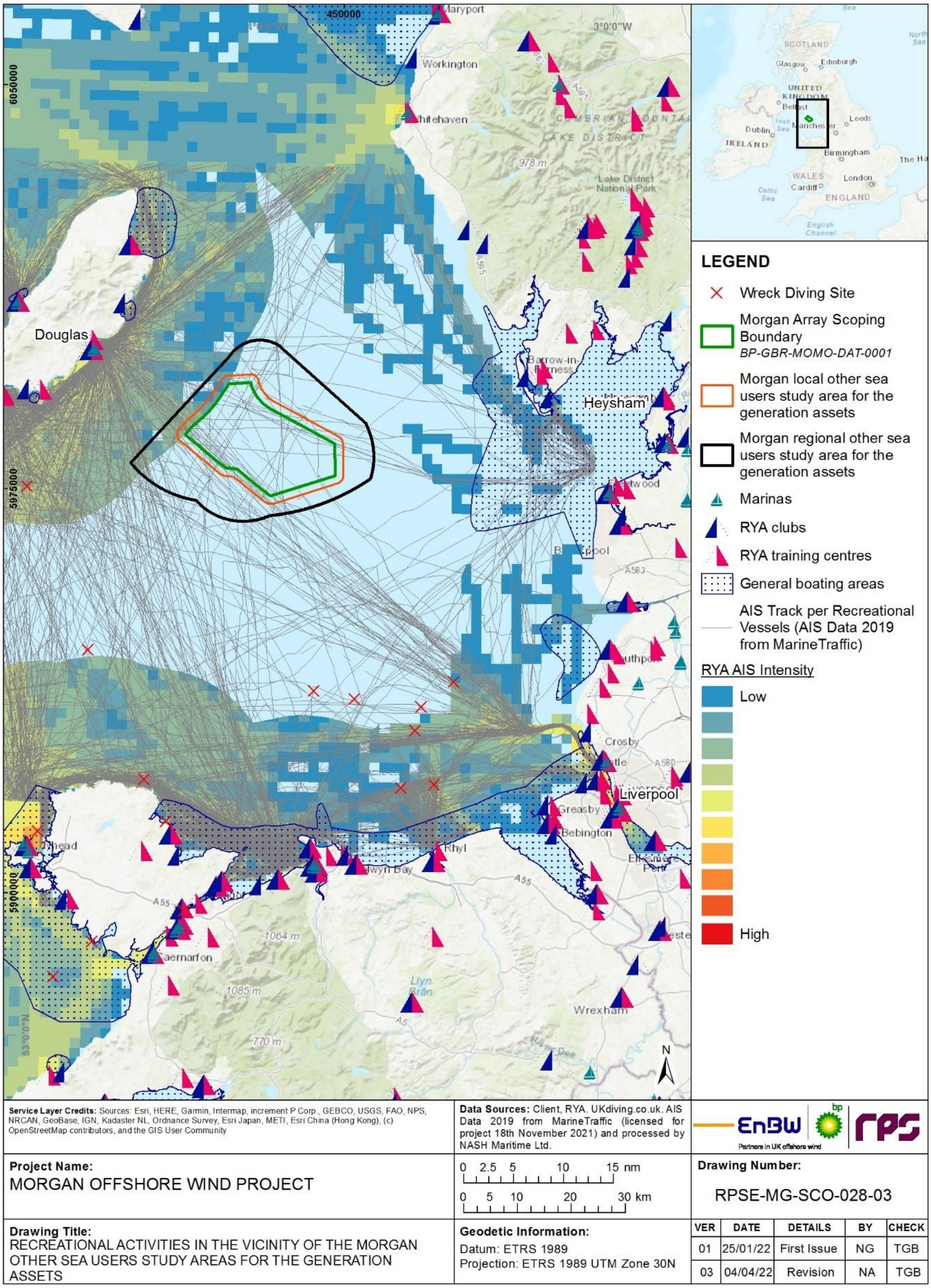


Figure 5.18: Recreational activities in the Morgan regional other sea users study area for the generation assets and the Morgan local other sea users study area for the generation assets.

Offshore wind farms

5.4.5.13 Offshore wind farms in the east Irish Sea are shown in Figure 5.17. There are no offshore wind farms within the Morgan local other sea users study area for the generation assets. The nearest operational offshore wind farms are Walney Extension and Walney, located 7.6km to the northeast of the Morgan Array Scoping Boundary and West of Duddon Sands, located 15.2km east of the Morgan Array Scoping Boundary. Further to the east are the operational wind farms of Ormonde and Barrow.

5.4.5.14 The nearest offshore wind farms in planning are the Mona and Morecambe offshore wind projects, located 5.5km to the south and 11.2km to the southeast respectively.

Oil and gas operations

5.4.5.15 The Morgan local other sea users study area for the generation assets overlaps with six licence blocks (109/5, 110/1, 112/30 licenced by Chrysaor North Sea Ltd. and 110/2c, 113/26a and 113/27a licenced by Chrysaor Resources (Irish Sea) Ltd.) currently licenced for the exploration and extraction of oil and gas (Figure 5.19). There is one hydrocarbon platform (Millom West) located within the northeast of the Morgan local other sea users study area for generation assets, operated by Spirit Energy and owned by Harbour Energy (Figure 5.19). Initial consultation with Harbour Energy and Spirit Energy has confirmed that the Millom West platform is planned to be decommissioned. Radar Early Warning Systems (REWS) may be used on oil and gas platforms to detect approaching vessels and prevent vessel collision with a platform.

5.4.5.16 Subsea structures (including protective structures, pipe junctions, manifolds, wellheads, trees and valves) are usually protected by a 500m safety zone. There are no subsurface structures located within the Morgan local other sea users study area for the generation assets, with the closest located 9km to the northeast of the Morgan Array Scoping Boundary.

5.4.5.17 Wells are classified into the following four categories: completed wells (ready for production), drilling wells (wells in the process of being drilled), plugged and abandoned wells (where work has ceased because it has become non-productive or non-viable) and suspended wells (a well may be temporarily suspended if an operator intends to carry out further operations at a later date). Completed and drilling wells typically have a 500m safety zone. Plugged and abandoned and suspended wells do not have safety zones attached to their location. There is one plugged and abandoned well within the Morgan local other sea users study area for the generation assets (Figure 5.19).

5.4.5.18 Consultation will take place with Spirit Energy/Harbour Energy and Chrysaor Resources (Irish Sea) Limited to further understand the nature of their operations.

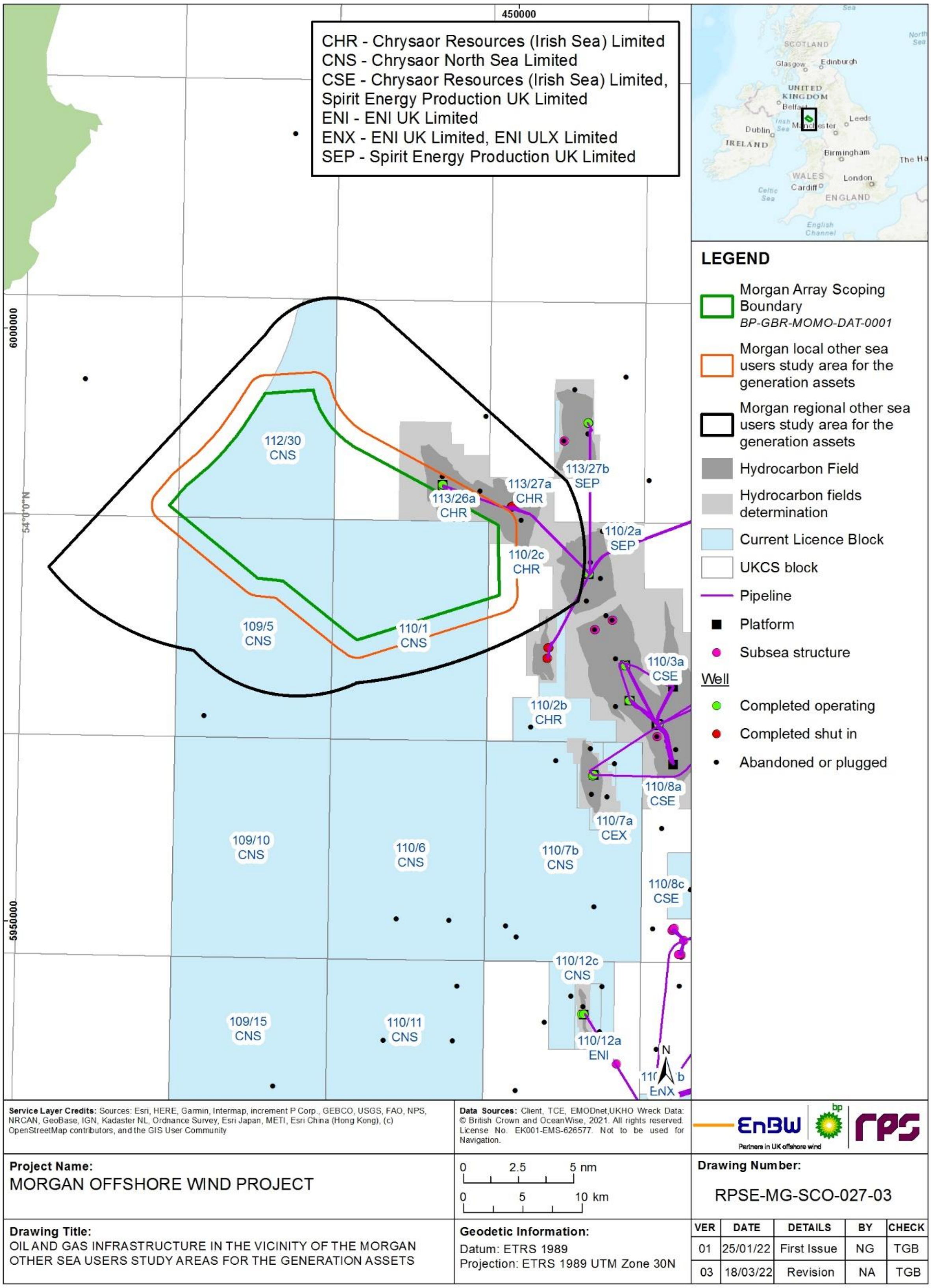


Figure 5.19: Oil and gas infrastructure within the Morgan local other sea users study area for the generation assets.

Cables

5.4.5.19 There is one operational power cable, the Isle of Man/United Kingdom Interconnector owned by Manx Electricity Authority, that runs just within and broadly parallel to the northern boundary of the Morgan local other sea users study area for the generation assets. There are also two cables in proximity to the northern and southern boundaries of the Morgan local other sea users study area for the generation assets, respectively. The northern cable (BT-MT1, owned by BT) intersects the northern tip of the Morgan local other sea users study area for the generation assets, while the southern cable (Lanis 1, owned by Vodafone) is just outside the Morgan local other sea users study area for the generation assets and runs parallel to its southern edge.

5.4.5.20 Where the Morgan Offshore Wind Project generation assets cables will be required to cross an active cable, it is intended that a commercial 'crossing agreement' will be entered into with the cable operator. This is a formal arrangement that establishes the responsibilities and obligations of both parties and allows operations to be managed safely. A crossing agreement based upon the International Cable Protection Committee (ICPC) Recommendation 3-10C 'Telecommunications Cable and Oil Pipeline/Power Cables Crossing Criteria' will be used for any cable crossings. Where a cable is inactive, the Applicant will consult with the cable operator to ascertain if such a crossing agreement is required.

Pipelines

5.4.5.21 There are no pipelines that intersect with the Morgan local other sea users study area for the generation assets, however the nearest pipeline is located 0.5km from the Morgan Array Scoping Boundary (Figure 5.19).

Carbon capture and storage

5.4.5.22 In October 2020, the OGA awarded Eni a six-year appraisal licence which targets Eni's offshore fields in Liverpool Bay to be utilised as a permanent store for CO_2 (www.eni.com). The development is part of 'HyNet North West', a low carbon cluster project to help UK decarbonisation which also operates a carbon capture and storage (CCS) facility off the north coast of Wales (www.hynet.co.uk).

5.4.5.23 Consultation will take place with Eni to further understand the location and nature of their plans.

Offshore microwave fixed communication links

5.4.5.24 Communication systems considered within this section include offshore microwave fixed links, which may be used to facilitate communications between offshore oil and gas platforms. Marine navigation, communications and position fixing equipment is addressed in part 2, section 5.2: Shipping and navigation, of the EIA Scoping Report.

5.4.5.25 It is considered unlikely that wireless fixed telecommunication links cross the Morgan Array Scoping Boundary, due to the location of the offshore assets as presented in Figure 5.19. This will be further explored through desk study and consultation for the EIA.

5.4.6 Potential project impacts

5.4.6.1 A range of potential impacts on other sea users receptors have been identified which may occur during the construction, operation and maintenance, and decommissioning phases of the Morgan Offshore Wind Project. The impacts that have been scoped into the assessment are outlined in Table 5.10, together with a description of any additional data collection and supporting analyses that will be required to enable a full assessment of the impacts.

5.4.6.2 On the basis of the baseline information currently available and the project description outlined in part 1, section 3: Project description, of the EIA Scoping Report, potential impacts scoped out of the assessment are presented in Table 5.11, with justification.

Table 5.10: Impacts proposed to be scoped into the project assessment for other sea users (project phase refers to construction (C), operation and maintenance (O) and decommissioning (D)).

Impact	Project phase			Justification	Data collection and analysis required to characterise the baseline environment	Summary of proposed approach to assessment
	C	O	D			
Displacement of recreational activities.	✓	✓	✓	Safety zones and advisory clearance distances established during construction, maintenance and decommissioning activities may displace recreational activities.	Review of desktop data, including results of the marine vessel traffic surveys, supported by the outcome of consultation.	Qualitative assessment informed from the results of baseline data review and consultation.
Impacts to existing cables or pipelines or restrictions on access to cables or pipelines.	✓	✓	✓	There is one active cable within the Morgan Array Scoping Boundary and therefore there is potential for impact to existing cables or restrictions on access to cables from installation, maintenance and decommissioning activities.	Review of desktop data supported by the outcome of consultation.	Qualitative assessment informed from the results of baseline data review and consultation.
Reduction or restriction of oil and gas exploration activities (including surveys, drilling and the placement of infrastructure) within the Morgan Array Scoping Boundary.	✓	✓	✓	The installation, presence and decommissioning of infrastructure associated with the Morgan Offshore Wind Project generation assets may reduce or restrict oil and gas exploration activities within the Morgan Array Scoping Boundary.	Review of desktop data. Consultation with each potentially affected licence block operator will be undertaken to inform the assessment.	Qualitative assessment informed from the results of baseline data review and consultation.
Interference with the performance of REWS located on oil and gas platforms.	×	✓	×	The presence of wind turbines in previously open sea areas may cause interference with the performance of the REWS located on oil and gas platforms.	Consultation will be carried out with oil and gas operators to identify any platforms with REWS and to understand the range and capabilities of the REWS.	Approach to assessment depends on the outcome of consultation. Should a potential impact be established, a REWS modelling study will be commissioned to support the assessment.
Interference with offshore microwave fixed communication links.	×	✓	×	Presence of wind turbines within the Morgan Array Scoping Boundary may affect offshore microwave fixed links between offshore oil and gas platforms.	Review of desktop data. Consultation with Ofcom and oil and gas operators to inform the assessment.	Qualitative assessment informed from the results of baseline data review and consultation.

Table 5.11: Impacts proposed to be scoped out of the project assessment for other sea users.

Impact	Justification
Increased suspended sediment concentrations and associated deposition affecting recreational diving sites.	There are no recreational diving sites within the Morgan regional other users study area for the generation assets, as described in section 5.4.5. As such, there is no potential impact pathway, and therefore it is proposed that this impact is scoped out of the EIA.

Impact	Justification
Increased suspended sediment concentrations and associated deposition affecting aggregate extraction areas.	There are no aggregate extraction areas within the Morgan regional other users study area for the generation assets, as described in section 5.4.5. As such, there is no potential impact pathway, and therefore it is proposed that this impact is scoped out of the EIA.
Alterations to sediment transport pathways affecting aggregate extraction areas.	There are no aggregate extraction areas within the Morgan regional other users study area for the generation assets, as described in section 5.4.5. As such, there is no potential impact pathway, and therefore it is proposed that this impact is scoped out of the EIA.

5.4.7 Measures adopted as part of the project

5.4.7.1 The following measures adopted as part of the project are relevant to other sea users. These measures may evolve as the engineering design and the EIA progresses.

- Promulgation of information advising on the nature, timing and location of activities, including through Notices to Mariners.
- Navigational aids and marine charting.
- Consultation with oil and gas operators and other energy infrastructure operators to promote and maximise cooperation between parties and minimise both spatial and temporal interactions between conflicting activities.
- Installation of infrastructure over or adjacent to existing or future cables or pipelines will be subject to crossing or proximity agreements between the two parties, prior to the start of the construction phase.

5.4.7.2 The requirement for and feasibility of any further mitigation will be dependent on the significance of effects and will be consulted upon with statutory consultees throughout the EIA process.

5.4.8 Proposed assessment methodology

5.4.8.1 The other sea users EIA will follow the methodology set out in part 1, section 4: EIA methodology, of the EIA Scoping Report. Specific to the other sea users EIA, the following guidance documents will also be considered:

- The RYA's position on offshore renewable energy developments: Paper 1 (of 4) – Wind Energy, June 2019 (RYA, 2019)
- European Subsea Cables UK Association (ESCA) guideline no 6, the proximity of offshore renewable energy installations and submarine cable infrastructure in UK waters (ESCA, 2016)
- ICPC recommendations:
  - recommendation No.2-11B: Cable routing and reporting criteria (ICPC, 2015)
  - recommendation No.3-10C: Telecommunications cable and oil pipeline/power cables crossing criteria (ICPC, 2014)
  - recommendation No.13-2C: The proximity of offshore renewable wind energy installations and submarine cable infrastructure in national waters (ICPC, 2013)
- Pipeline crossing agreement and proximity agreement pack (Oil and Gas UK, 2021)
- Submarine cables and offshore renewable energy installations proximity study (TCE, 2012).

5.4.9 Potential cumulative effects

5.4.9.1 There is potential for cumulative effects to arise from other projects or activities within the east Irish Sea area where projects or activities could act collectively with the Morgan Offshore Wind Project generation assets to affect other sea users receptors. The cumulative assessment will consider the maximum design scenarios for each of the projects or activities.

5.4.9.2 The cumulative effect assessment will follow the approach outlined in part 1, section 4: EIA methodology, of the EIA Scoping Report.

5.4.10 Potential inter-related effects

5.4.10.1 The assessment of potential inter-related effects will be considered within the Other sea users ES chapter. It will include consideration of project lifetime effects and receptor-led effects, in line with the approach outlined in part 1, section 4: EIA methodology, of the EIA Scoping Report.

5.4.11 Potential transboundary impacts

5.4.11.1 A screening of transboundary impacts has been carried out and is presented in part 3, Annex A: Transboundary Impacts Screening, of the EIA Scoping Report. This screening exercise identified that there is no potential for transboundary impacts upon other sea users due to construction, operation and maintenance, and decommissioning of the Morgan Offshore Wind Project generation assets.

6 Offshore and onshore combined topics

6.1 Seascape, landscape and visual resources

6.1.1 Introduction

6.1.1.1 This section of the Environmental Impact Assessment (EIA) Scoping Report identifies the seascape, landscape and visual resources and receptors of relevance to the Morgan Offshore Wind Project generation assets and considers the potential impacts arising from the construction, operation and maintenance, and decommissioning of the generation assets.

6.1.1.2 This section of the EIA Scoping Report also sets out the proposed scope of the Seascape Landscape and Visual Impact Assessment (SLVIA) and the methodology to be used in the assessment of seascape, landscape and visual effects of the generation assets.

6.1.2 Study area

6.1.2.1 The Morgan seascape, landscape and visual study area for the generation assets will be based on the findings of an analysis of the Zone of Theoretical Visibility (ZTV) for the generation assets, which will also inform the identification of representative viewpoints.

6.1.2.2 Once the ZTV has been determined, representative viewpoints will be agreed with the relevant stakeholders, including local authorities, Natural England, National Park authorities and Areas of Outstanding Natural Beauty (AONB) partnerships.

6.1.2.3 Taking into account the known parameters of the generation assets, the following is likely to form the basis of the Morgan seascape, landscape and visual study area for the generation assets when considered in combination with the relevant ZTVs:

Offshore generation assets

- Area of the sea to be temporarily and permanently occupied during construction, operation and maintenance, and decommissioning of the generation assets, with an additional 50km buffer from the outer edge of the Morgan Array Scoping Boundary.

6.1.2.4 The Morgan seascape, landscape and visual study area for the generation assets will be reviewed and modified, if necessary, in response to refinements made to the location of generation assets infrastructure, any additional environmental and/or design constraints identified in the EIA process, and once the ZTV has been determined.

6.1.3 Data sources

6.1.3.1 The data sources used to inform the baseline assessment will comprise a combination of published material publicly available online and site visits undertaken by competent experts.

6.1.3.2 An initial desk-based review has identified several data sources which provide baseline data coverage of the Morgan Array Scoping Boundary. These data sources are summarised in Table 6.1 below.

Table 6.1: Baseline data sources.

Source	Summary
Published national and local seascape and landscape character assessments and studies.	Provides information regarding the character of the landscape at the national and local scale.
MAGIC (interactive mapping website), Natural England and Historic England websites. AONB Management Boards/National Park Authority management plans. United Nations Educational, Scientific and Cultural Organisation (UNESCO) world heritage list. Local Plan designations, including heritage coast.	Descriptions of internationally and nationally designated landscapes, including publicly accessible Registered Parks and Gardens (RPaGs). Provides information regarding the nature of the internationally and nationally designated landscapes, including publicly accessible RPaGs.
Ordnance survey 1:25,000 maps and Definitive Public Rights of Way (PRoW) maps produced by the relevant local authorities.	Provides information regarding the location of visual receptors, including PRoW.
Arial photography.	Provides information regarding the location of visual receptors, including PRoW.

6.1.3.3 In addition, site visits will be undertaken to verify the documented seascape, landscape and visual baseline, particularly the local landscape and seascape character. Site visits would be used to select and take photographs from the agreed representative viewpoints.

6.1.3.4 The baseline data sources identified in this EIA Scoping Report will remain under review and may be updated in response to feedback from relevant statutory and non-statutory consultees during the EIA process, or in response to new sources of information becoming available.

6.1.4 Baseline environment

6.1.4.1 This section provides a high-level overview of the internationally and nationally designated landscapes within the Morgan seascape, landscape and visual study area for the generation assets.

6.1.4.2 Not all the landscapes detailed below will be impacted by the generation assets. Those with theoretical visibility of any part of the Morgan Offshore Wind Project generation assets will be identified following an analysis of the ZTV.

Offshore generation assets

6.1.4.3 The following internationally and nationally designated landscapes are located within 50km of the Morgan Array Scoping Boundary:

- The English Lake District World Heritage Site (WHS)
- Frontiers of the Roman Empire WHS, including Muncaster Castle
- Barrow Park RPAG
- Muncaster Castle RPaG.

6.1.4.4 In addition to the designated landscapes identified above, large areas of the Isle of Man, which is a Crown Dependency, have been designated as having high landscape or coastal value and scenic significance and are located within 50km of the Morgan Array Scoping Boundary.

6.1.4.5 The Preliminary Environmental Information Report (PEIR) and Environmental Statement (ES) will provide details of the baseline conditions within the Morgan seascape, landscape and visual study area for the generation assets, including the following seascape, landscape and visual receptors:

- National and local seascape and landscape character areas, including designated sites.
- Users of rights of way and areas of Access Land (as defined under the Countryside and Rights of Way Act (CRoW) Act 2000).
- Other recreational users of land, such as those people involved in outdoor sports.
- Dynamic users of transport routes, including both those people within motor vehicles as well as walkers, horse riders and cyclists.
- Residents, where there is the potential for such receptors to experience significant adverse effects. It is noted that, in addition, many views important to the community will also be captured by the above and below representative viewpoints.
- Tourists visiting specific destinations, including publicly accessible RPaGs and other historic assets.
- People on marine vessels or installations at sea, such as those people at work, passengers on ferries and recreational yachtsmen and other recreational users/those involved in watersports.

6.1.5 Potential project impacts

6.1.5.1 A range of potential impacts on seascape, landscape and visual resources have been identified which may occur during the construction, operation and maintenance, and decommissioning phases of the Morgan Offshore Wind Project generation assets.

6.1.5.2 The seascape, landscape and visual assessment will consider two key areas:

Seascape and landscape character

- A review of the seascape and landscape character (features, elements and characteristics) of the Morgan seascape, landscape and visual study area for the generation assets will be undertaken with reference to published landscape assessment documents and field survey, as well as individual landscape features and elements.

Visual receptors

- Considering the findings of the site visits and field appraisal, a range of viewpoint locations will be identified and agreed with the relevant statutory consultees. Photographs from viewpoint locations will be representative of views towards the generation assets from areas identified by the ZTV. Photographs from representative viewpoint locations will typically be undertaken in both the summer and winter months. However, this may be dependent on the programme of submission and prevailing weather conditions at the time photographs are due to be undertaken.

- Night-time photography, from selected representative viewpoints, may also be undertaken if deemed necessary by the relevant statutory consultees.

6.1.5.3 The impacts that have been scoped into the assessment are outlined in Table 6.2 together with a description of any additional data collection (e.g. site-specific surveys) and supporting analyses that will be required to enable a full assessment of the impacts.

6.1.5.4 Potential impacts scoped out of the assessment are presented in Table 6.3, with justification.

Table 6.2: Impacts proposed to be scoped into the project assessment of effects on seascape, landscape and visual resources (project phase refers to construction (C), operation and maintenance (O) and decommissioning (D)).

Impact	Project phase			Justification	Data collection and analysis required to characterise the baseline environment	Summary of proposed approach to assessment
	C	O	D			
The impact of the generation assets on seascape and landscape character.	✓	✓	✓	Activities required to facilitate the construction, operation and maintenance and decommissioning of the generation assets, including temporary and permanent lighting, may result in direct impacts upon seascape and landscape character (designations, types, areas).	The seascape and landscape character within the Morgan seascape, landscape and visual study area for the generation assets will be determined using desk-based analysis, supported by contextual photography. The desk-based analysis will be undertaken in accordance with Guidelines for Landscape and Visual Impact Assessment: Third Edition (GLVIA3) (Landscape Institute and Institute of Environmental Management and Assessment (IEMA, 2013). In addition, the seascape and landscape character within the Morgan seascape, landscape and visual study area for the generation assets will be confirmed and refined during site visits undertaken by competent experts.	The impact of the generation assets on seascape and landscape character will be assessed in accordance with GLVIA3 (Landscape Institute and IEMA, 2013). The assessment will be informed by the ZTV, which will identify the seascape and landscape character areas that may be impacted during construction, operation and maintenance and decommissioning of the generation assets.
The impact of the generation assets on publicly accessible views.	✓	✓	✓	Activities required to facilitate the construction, operation and maintenance and decommissioning of the generation assets, including temporary and permanent lighting, may impact publicly accessible views from visual receptors, including users of PRoW, Access Land, transport routes and other land and marine recreational resources.	Visual receptors located within the Morgan seascape, landscape and visual study area for the generation assets will be identified using desk-based analysis, supported by photography taken from representative viewpoints. The desk-based analysis will be undertaken in accordance with GLVIA3 (Landscape Institute and IEMA, 2013). In addition, the visual receptors within the Morgan seascape, landscape and visual study area for the generation assets will be confirmed and refined during site visits undertaken by competent experts.	The impact of the generation assets on publicly accessible views will be assessed in accordance with GLVIA3 (Landscape Institute and IEMA, 2013). The assessment will be informed by the ZTV, which will identify the visual receptors that may be impacted during construction, operation and maintenance and decommissioning of the generation assets. Representative viewpoints from publicly accessible locations would be agreed with the relevant statutory consultees and the impact to these views would be assessed. Potential impacts on more general views available by receptor groups would also be assessed. The assessment of operational effects will be further informed using wirelines and photomontages (where appropriate) to illustrate views of the generation assets from the perspective of representative viewpoints.

Table 6.3: Impacts proposed to be scoped out of the project assessment for seascape, landscape and visual resources.

Impact	Justification
The impact of construction, operation and maintenance and decommissioning of the generation assets on seascape and landscape character and visual resources located beyond the Morgan seascape, landscape and visual study area for the generation assets.	The potential impact of the generation assets on seascape and landscape character and visual resources located beyond the Morgan seascape, landscape and visual study area for the generation assets during the construction, operation and maintenance and decommissioning phase is unlikely to be significant and is proposed to be scoped out of the assessment for seascape, landscape and visual resources.
The impact of operation and maintenance of the inter-array and interconnector cables on seascape and landscape character and visual resources.	Inter-array and interconnector cables would be fully submerged. Therefore, the potential impact of the inter-array and interconnector cables on seascape and landscape character and visual resources during the operation and maintenance phase is unlikely to be significant and is proposed to be scoped out of the assessment for seascape, landscape and visual resources.
The impact of decommissioning of the inter-array and interconnector cables on seascape and landscape character and visual resources.	Activities required to facilitate decommissioning of the inter-array and interconnector cables are unlikely to result in significant impacts on seascape and landscape character and visual resources. It is anticipated that only structures above the seabed will be decommissioned. Therefore, the potential impact of the inter-array and interconnector cables on seascape and landscape character and visual resources during the decommissioning phase is unlikely to be significant and is proposed to be scoped out of the assessment for seascape, landscape and visual resources.

6.1.6 Measures adopted as part of the project

6.1.6.1 The following measures adopted as part of the project are relevant to seascape, landscape and visual resources. These measures may evolve as the engineering design and the EIA progresses.

- Site selection and micro-siting of the generation assets (where practicable), as to avoid or reduce potential impacts on seascape and landscape character and visual resources.
- Where possible, the alignment and layout of the wind turbine array will be designed to minimise the potential impact of 'stacking' on the most sensitive receptors. This may be supported by further analysis to identify receptors susceptible to stacking during operation of the wind turbine array.

6.1.6.2 The requirement for and feasibility of any mitigation measures will be dependent on the significance of effects and will be consulted upon with statutory consultees throughout the EIA process.

6.1.7 Proposed assessment methodology

6.1.7.1 The principal objectives of the assessment of seascape, landscape and visual resources in the ES will be:

- To identify the existing seascape, landscape and visual resources that may be impacted during the construction, operation and maintenance and decommissioning of the generation assets.
- To assess the significance of the effects on seascape, landscape and visual resources, taking into account the measures proposed to mitigate any of the potential impacts identified.

6.1.7.2 The assessment will be undertaken in accordance with established guidelines, principally the GLVIA3 (Landscape Institute and IEMA, 2013), and will consider the likely significant effects of the generation assets on the following sensitive receptors:

- individual seascape, landscape and townscape features, elements and characteristics
- seascape, landscape and townscape character
- visual receptors (people) for whom the generation assets might be visible during the construction, operation and maintenance and decommissioning phase.

6.1.7.3 As set out in GLVIA3, the seascape/landscape and visual effects will be assessed separately. However, the procedure for assessing each of these areas is closely linked. A clear distinction will be drawn between seascape/landscape and visual effects as described below:

- Seascape/landscape effects relate to the effects of the generation assets on the physical and other characteristics of the landscape and its resulting character and quality.
- Visual effects relate to the impacts on publicly accessible views experienced by visual receptors (e.g. users of PRoW, open space or

roads) and private views (e.g. occupiers of residential or commercial properties).

6.1.7.4 The short-term effects of the construction and decommissioning phases and the long-term effects relating to the operation and maintenance phase will be assessed. ZTVs will be generated to show the theoretical extent of visibility of the generation assets within the seascape, landscape and visual study area for the generation assets.

6.1.7.5 Consideration will be given to the likely seasonal variations in the visibility of the generation assets, including variations in weather conditions and deciduous vegetation.

6.1.7.6 The assessment process will take into account the overall assessment methodology set out in part 1, section 4: EIA methodology, of the EIA Scoping Report, in addition to established guidance, such as GLVIA3.

6.1.7.7 The assessment process will follow the approach set out in GLVIA3, regarding the identification of resource and receptor sensitivity (susceptibility and value), impact magnitude and evaluation of significance of effects.

6.1.7.8 The sensitivity of seascape, landscape and visual resources and receptors will be identified, together with the predicted magnitude of impact on that resource or receptor. Taking this into account, the significance of effect will be described for each resource (or receptor) during the construction, operation and maintenance and decommissioning of the generation assets.

6.1.7.9 The evaluation of significance will be underpinned by a narrative approach, based on professional judgement.

6.1.8 Potential cumulative effects

6.1.8.1 There is potential for cumulative effects to occur on sensitive receptors arising from the Morgan Offshore Wind Project generation assets alongside other developments. Potential cumulative effects with respect to seascape, landscape and visual resources will be considered within the PEIR and the ES.

6.1.8.2 This will include other onshore and offshore developments, including the cumulative effect with other proposed offshore wind farms. The scope of the cumulative assessment (in terms of proposed developments to be included) will be identified in consultation with stakeholders, including Natural England and relevant planning authorities.

6.1.8.3 The cumulative effects assessment will be undertaken in accordance with the methodology set out in part 1, section 4: EIA methodology, of the EIA Scoping Report and GLVIA3.

6.1.8.4 In accordance with GLVIA3, the types of cumulative effects that would be considered in the assessment of seascape, landscape and visual resources would include:

- effects of extension to an existing development
- filling an area with the same development or different types of development over time

- interactions between different types of development
- incremental change as a result of successive individual development
- temporal cumulative effects
- indirect effects of development such as enabling other further development
- future actions that remove elements which may have consequences for other existing or proposed development.

6.1.8.5 The cumulative effects assessment would consider potential effects arising from the generation assets, where these may interact with the construction, operation and maintenance and decommissioning phases of other proposed developments located within the Morgan seascape, landscape and visual study area for the generation assets, including other wind farms.

6.1.8.6 It is considered that the operation and maintenance and decommissioning of the inter-array and interconnector cables would not result in significant effects on seascape, landscape and visual resources either alone or cumulatively with other developments. Therefore, it is proposed that the potential cumulative effects arising from operation and maintenance and decommissioning of the inter-array and interconnector cables are scoped out of the cumulative effects assessment for seascape, landscape and visual resources.

6.1.9 Potential inter-related effects

6.1.9.1 The potential inter-related effects arising from the generation assets with respect to seascape, landscape and visual resources will be considered in relevant topic chapters of the ES. For example:

- Historic environment:
  - Seascape, landscape and visual impacts associated with the construction, operation and maintenance and decommissioning of the generation assets may impact the setting of above ground heritage assets and historic landscape patterns.
- Land use and recreation:
  - Seascape, landscape and visual impacts associated with the construction, operation and maintenance and decommissioning of the generation assets may impact the visual amenity of users of PRoW and other recreational resources.

6.1.10 Potential transboundary impacts

6.1.10.1 A screening of transboundary impacts has been carried out and is presented in part 3, Annex A: Transboundary Impacts Screening, of the EIA Scoping Report. This screening exercise identified that there is no potential for transboundary impacts upon seascape, landscape and visual resources due to construction, operation and maintenance, and decommissioning impacts of the Morgan Offshore Wind Project generation assets.

6.2 Socio-economics and community

6.2.1 Introduction

6.2.1.1 This section of the Environmental Impact Assessment (EIA) Scoping Report identifies the socio-economic and community receptors of relevance to the Morgan Offshore Wind Project generation assets and considers the potential impacts arising from the construction, operation and maintenance, and decommissioning of the generation assets.

6.2.1.2 This section of the EIA Scoping Report also sets out the proposed scope of the EIA and the methodology to be used in the assessment of socio-economic and community impacts for the generation assets.

6.2.2 Study area

6.2.2.1 The Morgan socio-economic and community study area for the generation assets will be based on the multiple spatial scales at which impacts to receptors (landward of Mean High Water Springs (MHWS)) are likely to occur.

6.2.2.2 The spatial scales to be used in the socio-economic and community assessment will be defined according to the receptor type. These receptors comprise tourism and recreation receptors, employment and economy receptors, including Gross Value Added (GVA) and community receptors.

6.2.2.3 The approach to defining Local Impact Areas (LIAs) is focused on the likely centres of impact. This will ensure the assessment of impacts relative to the baseline is meaningful and is not masked as a result of large and high-level LIAs which are unrelated to the location of the potential impact.

Tourism and recreation receptors

6.2.2.4 It is considered that the potential impacts on tourism and recreation receptors will be assessed on the basis of LIAs informed by the location of hub ports which will support the construction, operation and maintenance and decommissioning of the generation assets, the ZTV and evidence on the impacts on offshore recreational users.

6.2.2.5 The LIA will be informed by findings of other relevant topic chapters of the Environmental Statement (ES), such as seascape, landscape and visual resources and noise and vibration.

6.2.2.6 The LIA will include offshore recreational users as determined by the other sea users assessment (see part 2, section 5.4: Other sea users, of the EIA Scoping Report) and tourism and recreation receptors located within the ZTV of the generation assets, as determined in the seascape, landscape and visual impact assessment (see part 2, section 6.1: Seascape, landscape and visual resources, of the EIA Scoping Report).

6.2.2.7 Table 6.4 sets out potential centres around which the LIAs will be drawn. To ensure consistency with LIAs for other socio-economic and community receptors, LIAs will be based on Local Authority areas falling predominantly within a 60 minute drive time of the impact centres.

6.2.2.8 The selection of port locations to support construction, operation and maintenance and decommissioning of the generation assets is unlikely to be confirmed prior to completion of the EIA. On this basis, LIAs relevant to the port locations under consideration that fall within England and Wales will be considered. An initial short list of ports under consideration has been provided by the Applicant and included in Table 6.4.

Table 6.4: LIA impact centres.

Basis	Locations
Construction and decommissioning ports	Holyhead
Operation and maintenance ports	Barrow-in-Furness Heysham Liverpool/Birkenhead Mostyn Holyhead

6.2.2.9 The list of port locations set out Table 6.4 is not definitive and other port locations are under consideration. The LIA impact centres and the short list of ports will be refined during the EIA process.

Employment and economy related receptors

6.2.2.10 It is considered that the potential impacts on employment and economy receptors, including GVA would occur both locally and over a much larger geographic area, because of the various stages in the supply chain during construction, operation and maintenance and decommissioning of the generation assets.

6.2.2.11 Given the national significance and scale of investment required to facilitate the construction, operation and maintenance, and decommissioning of the generation assets, it is considered appropriate to include a spatial scale that considers socio-economic impacts at the national level (National Impact Area or NIA). Employment and economy receptors, including GVA within the NIA will be considered in the assessment of socio-economics and community.

6.2.2.12 The LIAs will be centred on port locations that have the potential to support the construction, operation and maintenance and decommissioning of generation assets. LIAs will be based on Local Authority areas falling predominantly within a 60 minute drive time of the impact centres to capture effective travel to work areas for assessing employment and labour market impacts.

6.2.2.13 The LIA and NIA identified in this EIA Scoping Report will remain under review and may be updated in response to feedback from relevant statutory and non-statutory consultees during the EIA process, or in response to new sources of information becoming available.

Community receptors

6.2.2.14 It is considered that potential community level effects will primarily fall within LIAs centred on port locations that have the potential to support the construction, operation and maintenance and decommissioning of the generation assets. LIAs will be based on Local Authority areas falling predominantly within a 60 minute drive time of the impact centres to capture effective travel to work areas for assessing employment and labour market impacts.

6.2.3 Data sources

6.2.3.1 The data sources used to inform the baseline assessment will primarily comprise of published material which is publicly available online. An initial desk-based review has identified several data sources. These data sources are summarised in Table 6.5 below.

Table 6.5: Baseline data sources.

Source	Summary
Census data	Information regarding commuting patterns, housing tenure profiles
Gov.uk Compare School Performance Services	Data relating to primary and secondary school pupil populations
House price statistics for small areas in England and Wales	Data relating to median house prices and affordability ratios
Local Authority websites	Data on school capacities and other local surveys and monitoring
NHS Digital	Data relating to healthcare facility registered patients
Office for National Statistics (ONS) mid-year population estimates	Information regarding population structure, dependency ratios, changes over time and population projections.
ONS Annual Population Survey	Information regarding economic activity (e.g. full-time, part-time, unemployed) and occupational breakdown.
ONS Annual Survey of Hours and Earnings	Information regarding workplace and residence-based earnings.
ONS Business Register and Employment Survey (BRES)	Sectoral and size band structure of the employment base, including change over time and location quotients.
ONS Jobs Density	Jobs density is the number of jobs in an area divided by the resident population aged 16-64 in that area.
ONS regional and local GVA estimates	Information regarding trends in GVA for the main industrial sectors.
UK Marine Energy Council	Various documents on capacity of sector and supply chain
Visit Britain	Data relating to levels of tourism activity.

6.2.3.2 The baseline data sources identified in this EIA Scoping Report will remain under review and may be updated in response to feedback from relevant statutory and non-statutory consultees during the EIA process, or in response to new sources of information becoming available.

6.2.4 Baseline environment

Tourism and recreation receptors

<u>LIA</u>

6.2.4.1 The following baseline information will be identified and considered in the assessment of tourism and recreation receptors:

- tourism sector employment based on the Office for National Statistics Business Register and Employment Survey (ONS BRES)

- the number of businesses in the sector based on ONS Business Demography
- the number of visitors (day and overnight) and primary recreation activity – data availability dependent on local authority records and Visit Britain surveys
- the number of hotel/B&B beds and occupancy rates – the data availability will be dependent on local authority records and Visit Britain surveys
- the key attractions or assets.

Employment and economy receptors

<u>LIAs and NIA</u>

6.2.4.2 The following baseline information will be identified and considered in the assessment of employment and economy receptors for the LIAs and the NIA:

- total employment and recent employment change based on ONS BRES and Jobs Density measures
- employment and recent employment change within sectors of relevance to the offshore wind industry based on ONS BRES
- total GVA and recent change based on ONS
- GVA and recent change within sectors of relevance to the offshore wind industry based on ONS
- local labour market participation indicators including economic activity, inactivity and unemployment based on ONS APS
- local labour market profile indicators including occupations and qualifications based on ONS APS
- travel to work data based on ONS Census of Population
- other relevant data available at local level, particularly related to offshore wind industry and supply chain.

Community receptors

<u>LIA</u>

6.2.4.3 The following baseline information will be identified and considered in the assessment of socio-economics and community:

- total population and how it has changed in recent years based on ONS
- the education capacity, which will comprise a list of primary/secondary schools and colleges, with roll size and places available
- healthcare capacity, which will comprise a list of hospitals/health centres and GP surgeries and capacities. Individual healthcare facilities data can be extracted and analysed from NHS Digital data sources
- housing stock and tenure profile sourced from Census 2011 data, which will act as a guide

- house prices and affordability ratios, which can be sourced from ONS.

Designated sites

6.2.4.4 There are no statutory or non-statutory designations specifically related to matters of socio-economics and community, or how it should be controlled. However, some designated sites may attract visitors (e.g. National Parks, World Heritage Sites) which may be of relevance to the assessment of socio-economics and community.

6.2.4.5 These designated sites will be identified in the relevant topic chapters of the ES. The socio-economics and community assessment will consider the potential impacts of the generation assets on visitor numbers to designated sites located within the LIA.

6.2.5 Potential project impacts

6.2.5.1 A range of potential impacts on socio-economics and community have been identified which may occur during the construction, operation and maintenance, and decommissioning phases of the Morgan Offshore Wind Project generation assets.

6.2.5.2 The impacts that have been scoped into the assessment are outlined in Table 6.6 together with a description of any additional data collection (e.g. site-specific surveys) and supporting analyses (e.g. modelling) that will be required to enable a full assessment of the impacts.

6.2.5.3 Potential impacts scoped out of the assessment are presented in Table 6.7, with justification.

Table 6.6: Impacts proposed to be scoped into the project assessment for socio-economics and community (project phase refers to construction (C), operation and maintenance (O) and decommissioning (D)).

Impact	Project phase			Justification	Data collection and analysis required to characterise the baseline environment	Summary of proposed approach to assessment
	C	O	D			
The impact of disruption on tourism and recreation receptors.	✓	✓	✓	Construction, operation and maintenance, and decommissioning of the generation assets could lead to the disruption of tourism and recreation receptors.	Tourism and recreation receptors located within the LIA will be identified using desk-based analysis and informed by the relevant topic chapters of the ES. The desk-based analysis will be further informed through consultation with the relevant stakeholders.	A mixture of qualitative and quantitative approaches will be used to assess the impact of disruption on tourism and recreation receptors. The assessment will be further informed by the relevant topic chapters of the ES, other impacts to be considered in assessment of socio-economics and community (e.g. workforce accommodation needs) and consultation with the relevant stakeholders.
The impact on economic receptors including employment, GVA, and supply chain demand.	✓	✓	✓	Construction, operation and maintenance, and decommissioning of the generation assets could create additional economic activity which could impact economic receptors, including employment, GVA, and increase demand on supply chains.	Employment receptors, including GVA located within the LIA and NIA will be identified using desk-based analysis. The desk-based analysis will be further informed through consultation with the relevant stakeholders.	The impact on economic receptors including employment, GVA, and supply chain demand will be assessed using a bespoke economic impact model. This economic impact model will be used to estimate the direct, indirect, and induced employment impacts of expenditure during the construction, operation and maintenance, and decommissioning of the generation assets.
The impact of increased employment opportunities.	✓	✓	✓	Construction, operation and maintenance, and decommissioning of the generation assets could increase the range and supply of employment opportunities accessible to residents in the local area.	A desk-based analysis of the current labour market capacity and the existence of appropriately skilled residents in local impact areas. Desk-based analysis will be enhanced with stakeholder consultation.	The impact of increased local employment opportunities will be assessed using a bespoke economic impact model. This economic impact model will be used to estimate the direct, indirect, and induced employment impacts of expenditure during the construction, operation and maintenance, and decommissioning of the generation assets. The local employment (workplace based) will be assessed against local labour market capacity and informed by stakeholder consultation.
The impact on the demand for housing, accommodation and local services.	✓	✓	✓	Direct and indirect employment generated by the construction, operation and maintenance, and decommissioning of the generation assets could increase the demand for housing accommodation and	A desk-based analysis of current capacity of local services and housing market. Consultation with relevant local authority officers to ascertain current conditions and capacity in the supply of housing,	The assessment will draw on the modelling of economic impacts, local labour market impacts and planned construction, operation and maintenance and decommissioning activities in order to assess the likely extent of

Impact	Project phase			Justification	Data collection and analysis required to characterise the baseline environment	Summary of proposed approach to assessment
	C	O	D			
				local services and cause other community and social effects.	accommodation and local services as well as other community and social effects.	temporary or permanent relocation of workers and/or demand for local services.

Table 6.7: Impacts proposed to be scoped out of the project assessment for socio-economics and community.

Impact	Justification
Tourism and community effects within the NIA	Tourism and community effects will be concentrated within particular localities related to the physical location of the generation assets and centres of activity during the construction, operation and maintenance, and decommissioning phases. These are not anticipated to have any significant effects on tourism and community receptors outside the LIAs.

6.2.6 Measures adopted as part of the project

6.2.6.1 The following measures adopted as part of the project are relevant to socio-economics and community. These measures may evolve as the engineering design and the EIA progresses.

- Preparation and implementation of a Code of Construction Practice (CoCP)
- Preparation and implementation of a Construction Traffic Management Plan (CTMP)
- Preparation and implementation of a Local Procurement Plan
- Preparation and implementation of a Local Skills Development Plan
- Preparation and implementation of a Local Recruitment Plan.

6.2.6.2 The requirement and feasibility of any further mitigation will be dependent on the significance of effects and will be consulted upon with statutory consultees throughout the EIA process.

6.2.7 Proposed assessment methodology

6.2.7.1 There is no established or industry specific guidance which can be referred to when undertaking an assessment of socio-economics and community. Notwithstanding, the overarching NPS for energy (NPS EN-1) does provide guidance on how a socio-economic assessment should be undertaken, including the nature of impacts that may need to be considered. The approach to the assessment will also be informed by the following:

- Guidance on assessing the socio-economic impacts of offshore wind farms Glasson, J; Durning B; Olorundami, T; and Welch, K (2020)
- UK Offshore Wind Charting the Right Course: Building the Offshore Wind Supply Chain (BWEA, 2009)
- A Guide to an Offshore Wind Farm (The Crown Estate, TCE, 2012)
- Socio-economic indicators of marine-related activities in the UK economy (TCE, 2008)
- State of the Sector: Economics for Wales (Marine Energy Wales, 2019)
- Working for a Greener Britain: Vol 2 – Future Employment and Skills in the UK Wind and Marine Industries (RenewableUK, 2011)
- Offshore Wind. Forecasts of future costs and benefits (RenewableUK, 2011).

6.2.7.2 The socio-economics and community assessment will be undertaken in accordance with the methodology set out in part 1, section 4: EIA methodology, of the EIA Scoping Report.

6.2.8 Potential cumulative effects

6.2.8.1 There is potential for cumulative effects to occur on sensitive receptors arising from the Morgan Offshore Wind Project generation assets alongside other developments. Potential cumulative effects with respect to socio-economics and community will be considered within the ES.

6.2.8.2 The cumulative effects assessment would be undertaken in accordance with the methodology set out in part 1, section 4: EIA methodology, of the EIA Scoping Report.

6.2.9 Potential inter-related effects

6.2.9.1 The assessment of potential inter-related effects will be considered within the Socio-economics and community chapter of the ES. It will include consideration of project lifetime effects and receptor-led effects, in line with the approach outlined in part 1, section 4: EIA methodology, of the EIA Scoping Report. For example:

- Commercial fisheries:
  - Impacts on commercial fisheries associated with construction, operation and maintenance and decommissioning of the generation assets may impact socio-economic and community receptors located within the LIA.
- Seascape, landscape and visual resources:
  - The ZTV of the generation assets will be used to inform the LIA and the identification of tourism and recreation receptors to be considered in the socio-economics and community assessment.

6.2.10 Potential transboundary impacts

6.2.10.1 A screening of transboundary impacts has been carried out and is presented in part 3, Annex A: Transboundary Impacts Screening, of the EIA Scoping Report. This screening exercise identified that there is no potential for transboundary impacts upon socio-economics and community due to construction, operation and maintenance, and decommissioning impacts of the Morgan Offshore Wind Project generation assets.

6.3 Aviation and radar

6.3.1 Introduction

6.3.1.1 This section of the Environmental Impact Assessment (EIA) Scoping Report identifies the aviation and radar receptors of relevance to the Morgan Offshore Wind Project generation assets and considers the potential impacts arising from the construction, operation and maintenance, and decommissioning of the generation assets on aviation and radar receptors.

6.3.2 Study area

6.3.2.1 For the purposes of identifying aviation and radar receptors for the Morgan Offshore Wind Project generation assets, a broad study area has been defined. The Morgan aviation and radar study area for the generation assets is presented in Figure 6.1 and described below.

6.3.2.2 The Morgan aviation and radar study area for the generation assets has been defined as the airspace created when joining the following points:

- the National Air Traffic Services (NATS) Lowther Hill Primary Surveillance Radar (PSR) to the north northeast of the Morgan Array Scoping Boundary
- the NATS Great Dun Fell PSR to the northeast of the Morgan Array Scoping Boundary
- the Manchester Airport PSR to the southeast of the Morgan Array Scoping Boundary
- the NATS Clee Hill PSR to the south southeast of the Morgan Array Scoping Boundary
- the Ministry of Defence (MOD) Royal Air Force (RAF) Valley PSR to the southwest of the Morgan Array Scoping Boundary
- a point 30km west of the location of the Ronaldsway Airport PSR, Isle of Man
- the MOD (QinetiQ) West Freugh PSR to the north of the Morgan Array Scoping Boundary.

6.3.2.3 This area has been defined to include the aviation radar systems that could potentially detect the maximum wind turbine blade tip height (see part 1, section 3: Project description, of the EIA Scoping Report) within the Morgan Array Scoping Boundary and to encompass other relevant aviation receptors in proximity to the Morgan Array Scoping Boundary.

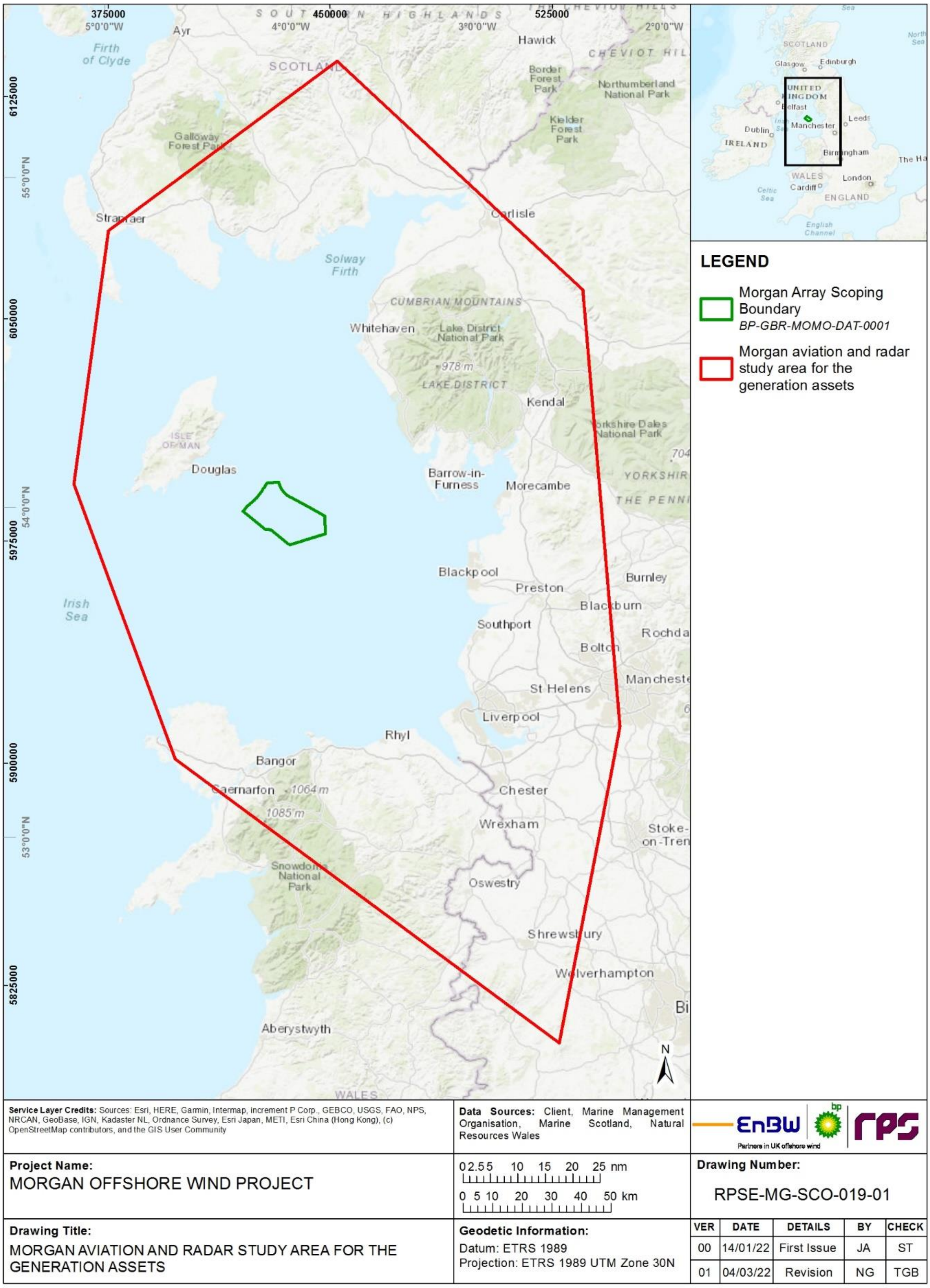


Figure 6.1: The Morgan aviation and radar study area for the generation assets.

6.3.3 Data sources

6.3.3.1 A number of sources were consulted in order to inform the aviation and radar section of the EIA Scoping Report and will be used to inform the EIA. These are summarised in Table 6.8.

6.3.3.2 In addition to existing data, the assessment will be informed through desk studies and computer modelling carried out by Osprey Consulting Services, including radar line of sight analysis. Other supporting data will be obtained from stakeholder consultation.

Table 6.8: Summary of key desktop datasets and reports.

Title	Source	Year	Author
Visual Flight Rules (VFR) Data	NATS VFR Chart	2020	NATS
Search and Rescue (SAR) Locations	The Bristow Group	2021	The Bristow Group
Meteorological radar sites	The Met Office	2020	The Met Office
Helicopter Main Routes (HMRs)	NATS En-Route charting	2019	NATS
Aerodromes and Ground Aids (AGA), Surveillance Radars, Navigational Aid areas	NATS Safeguarding	2012	NATS
Air navigation characterisations	UK Aeronautical Information Publication	2021	NATS
Airfields	UK General Aviation (UKGA) Environmental Systems Research Institute (ESRI) Ordnance Survey Open Data	2022 2015 2021	UKGA ESRI Ordnance Survey
Military Practice and Exercise areas (PEXAs)	Oceanwise	2021	Emapsite
Offshore platforms and consultation zones	Oil and Gas Authority	2021	Oil and Gas Authority

6.3.4 Baseline environment

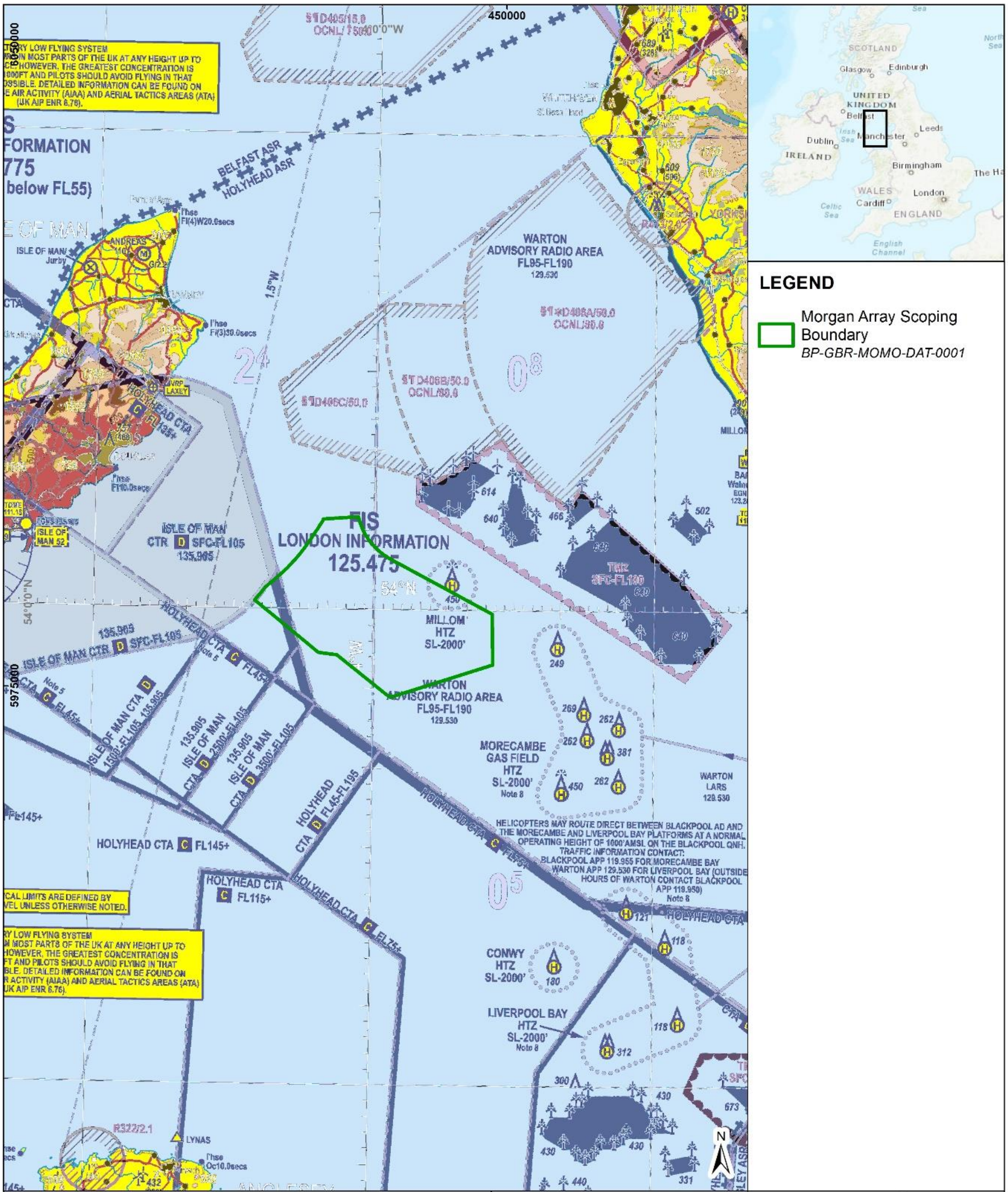
Airspace

6.3.4.1 The airspace within, above and surrounding the Morgan Array Scoping Boundary (Figure 6.2) is used by both military and civil registered aircraft which observe the airspace rules dependent on the classification of airspace they are operating in as follows:

- Class G uncontrolled airspace: any aircraft can operate in an area of uncontrolled airspace without any mandatory requirement to be in communication with Air Traffic Control (ATC). Pilots of aircraft operating under VFR in Class G airspace are ultimately responsible for seeing and avoiding other aircraft, terrain and obstructions
- Class C and D Controlled airspace: all aircraft operating in this airspace must be in receipt of an Air Traffic Service (ATS).

6.3.4.2 The Morgan Array Scoping Boundary predominantly lies within Class G uncontrolled airspace, established from the surface to Flight Level (FL) 195 (approximately 19,500 feet (ft)). Above FL 195 controlled airspace is established.

6.3.4.3 The northwestern corner of the Morgan Array Scoping Boundary also lies within Class G uncontrolled airspace. However, the level of the uncontrolled airspace lowers where the Morgan Array Scoping Boundary overlaps the Isle of Man Control Area (CTA), which is established from 2,500ft to FL 105 (approximately 10,500ft). This area lowers to the surface at the northwestern tip of the Morgan Array Scoping Boundary. Above FL 105 further controlled airspace is established, which forms the Holyhead CTA.



Service Layer Credits: Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community	**Data Sources:** Client. VFR Chart-Northern England and Northern Ireland Ed.44 (2021) copyright NATS (Services)Ltd/ALL RIGHTS RESERVED	EnBW bp rps Partners in UK offshore wind
Project Name: MORGAN AND MONA OFFSHORE WIND PROJECTS	0 2.5 5 10 nm; 0 5 10 20 km	**Drawing Number:** RPSE-MG-SCO-047-00
Drawing Title: AIRSPACE ABOVE THE MORGAN ARRAY SCOPING BOUNDARY	**Geodetic Information:** Datum: ETRS 1989 Projection: ETRS 1989 UTM Zone 30N	

VER	DATE	DETAILS	BY	CHECK
00	14/03/22	First Issue	NG	TGB

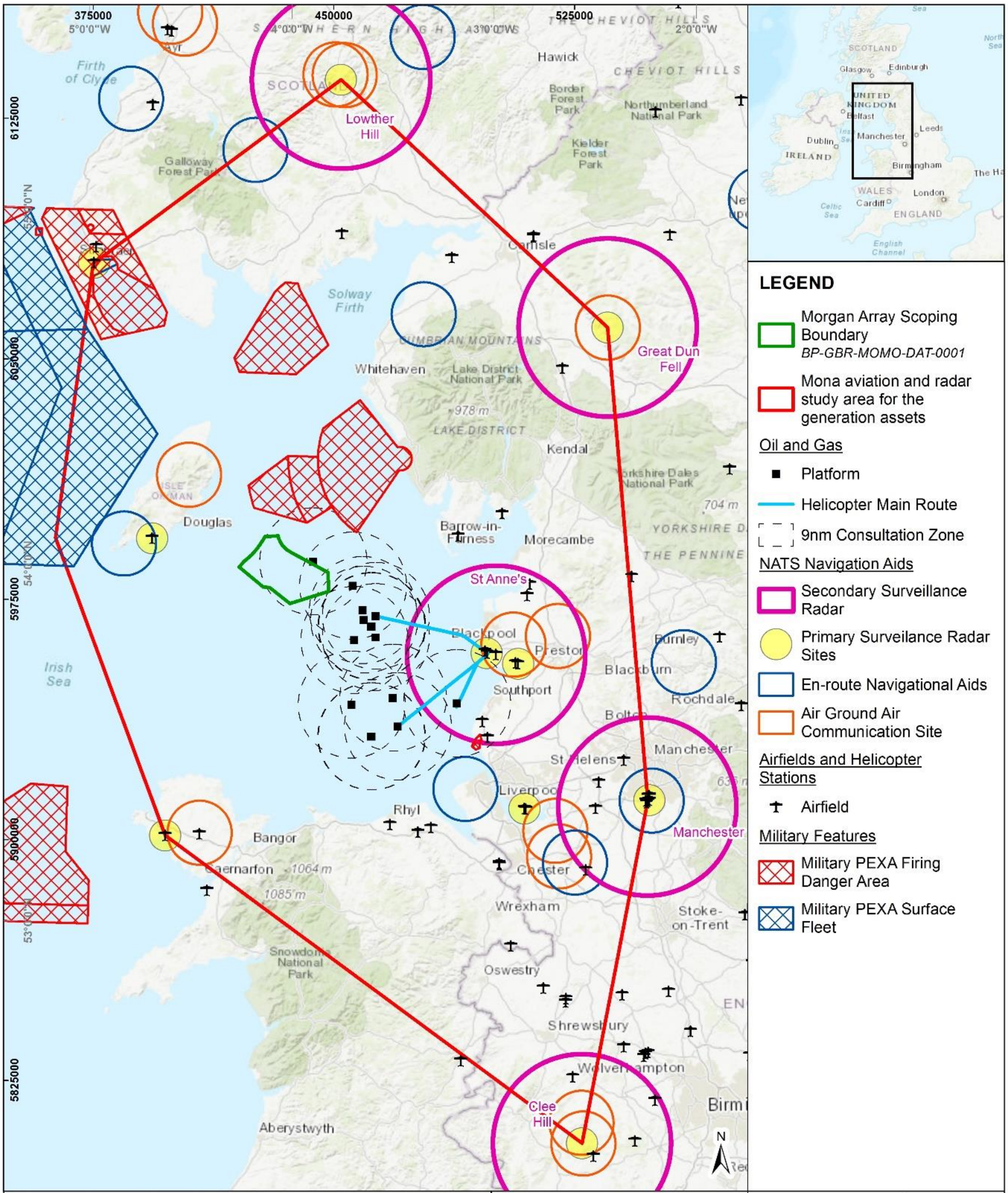
Figure 6.2: Airspace above the Morgan Array Scoping Boundary.

Civil aviation

6.3.4.4 HMRs support the transport of personnel and equipment to offshore oil and gas installations. HMRs are routes typically and routinely flown by helicopters operating to and from offshore destinations and are promulgated for the purpose of signposting concentrations of helicopter traffic to other airspace users. HMR promulgation does not predicate the flow of helicopter traffic. Whilst HMRs have no airspace status and assume the background airspace classification within which they lie (in the case of the Irish Sea, Class G), they are used by the Air Navigation Service Provider (ANSP) and helicopter operators for flight planning and management purposes. Civil Aviation Publication (CAP) 764 CAA Policy and Guidance on Wind Turbines (Civil Aviation Authority (CAA), 2016) states that HMRs have no defined lateral dimensions (only route centre-lines are charted on navigational charts) and that 2nm either side of the route centre-line should be kept obstacle free (CAA, 2016). No HMRs cross the Morgan Array Scoping Boundary. The HMR system in the east Irish Sea is shown in Figure 6.3.

6.3.4.5 In order to maintain a safe operating environment, the CAA recommend a consultation zone of 9nm radius around offshore installations serviced by helicopters (CAA, 2016). This consultation zone is not considered a prohibition on development, but a trigger for consultation between offshore helicopter operators, the operators of existing installations and developers of proposed offshore wind farms, in order to determine a solution that maintains safe offshore helicopter operations. The Morgan Array Scoping Boundary extends into the 9nm consultation zones established around 10 platforms. These platforms and their consultation zones are presented in Figure 6.3 and listed in Table 6.9, along with information on the platform operator and distance from the Morgan Array Scoping Boundary. A 9nm consultation zone should also be a trigger for consultation with the operators of any subsea infrastructure and wells where mobile drilling rigs or vessels may require helicopter access.

6.3.4.6 Initial consultation carried out by the Applicant with Spirit Energy has indicated that the Millom West, North Morecambe and South Morecambe DP4 platforms have plans for decommissioning.



Service Layer Credits: Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community	**Data Sources:** Client. , Oceanwise, ESRI, OGA, www.ukairfieldguide.net	EnBW bp Partners in UK offshore wind rps
Project Name: MORGAN AND MONA OFFSHORE WIND PROJECTS	0 2.5 5 10 15 20 25 nm 0 5 10 20 30 40 50 km	**Drawing Number:** RPSE-MG-SCO-025-02
Drawing Title: RADAR LOCATIONS AND AVIATION FEATURES IN THE VICINITY OF THE MORGAN AVIATION AND RADAR STUDY AREA FOR THE GENERATION ASSETS	**Geodetic Information:** Datum: ETRS 1989 Projection: ETRS 1989 UTM Zone 30N	

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00	11/03/22	First Issue	NG	TGB
02	14/03/22	Revision	NG	TGB

Figure 6.3: Radar locations and aviation features in the vicinity of the Morgan aviation and radar study area for the generation assets.

Table 6.9: Platforms with 9nm consultation zones which overlap with the Morgan Array Scoping Boundary.

Platform	Owner/operator	Distance to Morgan Array Scoping Boundary	
		Kilometres (km)	Nautical miles (nm)
Millom West (N)	Harbour Energy own, Spirit Energy operate	0.7	0.4
Millom West (S)	Harbour Energy own, Spirit Energy operate	0.7	0.4
North Morecambe	Spirit Energy	7.6	4.1
North Morcambe DPPA	Spirit Energy	7.6	4.1
South Morecambe DP8 (E)	Spirit Energy	12.2	6.6
South Morecambe DP8 (W)	Spirit Energy	12.2	6.6
South Morecambe DP6 (E)	Spirit Energy	14.1	7.6
South Morecambe DP6 (W)	Spirit Energy	14.1	7.6
South Morecambe DP4 (E)	Spirit Energy	16.6	9
South Morecambe DP4 (W)	Spirit Energy	16.6	9

Civil and military radar

6.3.4.7 UK airspace and air traffic surveillance and management infrastructure is comprised of the following systems which may be affected by the detection and proximity of wind turbines:

- PSR
- Secondary Surveillance Radar (SSR).

6.3.4.8 Radar detection of a rotating wind turbine by a PSR may create reflections from both stationary and moving elements: these provide different challenges for the radar. While the reflected radar signal from stationary elements, such as the tower, can be removed using stationary clutter filters in the radar processor, rotating wind turbine blades can impart a Doppler shift to any radar energy reflecting off the blades. Doppler shifts are used by a number of radars to differentiate between moving objects, namely aircraft, and stationary terrain with the latter being processed out and not displayed to the operator. The radar may therefore detect Doppler returns from moving wind turbine blades and display them as radar clutter on the radar screen.

6.3.4.9 Furthermore, at sites with more than one turbine, the radar may illuminate a blade or blades from one turbine on one antenna sweep, then illuminate the blades of a different turbine on the next sweep. This can create the appearance on the radar screen of returns moving about within the area of the wind farm, sometimes described as a ‘twinkling’ appearance or ‘blade flash effect’. These moving returns can appear very similar to those that would be produced by a light aircraft. The appearance of multiple false targets in close proximity can trick the radar processor into initiating false aircraft tracks. False PSR returns can also 'seduce' real aircraft tracks away from their true returns as the radar attempts to update an aircraft track using the false return. This can lead to degradation of radar tracking capability (CAA, 2016).

6.3.4.10 NATS operate PSRs located at Lowther Hill, Great Dun Fell, St Anne's and Clee Hill to support its provision of ATC services to aircraft operating in the east Irish Sea region. Additional PSRs are also located at the airfields at RAF Valley, British Aerospace (BAE) Warton, West Freugh, Ronaldsway, Manchester and Liverpool. These locations are shown in Figure 6.3. The Morgan Array Scoping Boundary is within the declared operational range of all of these sites; however, initial radar line of sight modelling results indicate that theoretically the Great Dun Fell, Clee Hill, RAF Valley, West Freugh, Manchester and Liverpool airport PSRs will not detect wind turbines with a tip height of up to 320m above mean sea level (ASML).

6.3.4.11 CAP 764 states that wind turbine effects on SSR are traditionally less than those on PSRs, but can be caused due to the physical blanking and diffracting effects of the turbine towers, depending on the size of the wind turbines and the wind farm. These effects are typically only a consideration when the wind turbines are located very close to the SSR (i.e. less than 10km). There are no SSR radar systems within 10km of the Morgan Array Scoping Boundary.

6.3.4.12 Military air traffic management is supported by military ATC radars with an instrumented range of 60nm. The RAF Valley PSR is located within 60nm of the Morgan Array Scoping Boundary. Initial radar line of sight modelling results indicate that theoretically the RAF Valley PSR will not detect wind turbines with a tip height of up to 320m ASML.

6.3.4.13 The Statement of the European Union Meteorological Network Operational Programme for the Exchange of weather Radar information (OPERA) Group, on the cohabitation between meteorological weather radars and wind turbines, states that the deployment of wind turbines within 5km of weather radar is prohibited (OPERA, 2009). The Meteorological (Met) Office radar infrastructure is safeguarded by the Met Office. The Met office works to wind turbine safeguarding guidelines that stipulate a 20km separation between any development and a weather radar system. The closest Met Office radar system is located at Hameldon Hill (Met Office, 2020), approximately 4.6km southwest of Burnley, Lancashire, 100.8km from the Morgan Array Scoping Boundary.

Airborne search and rescue operations

6.3.4.14 The SAR helicopter force provides constant SAR cover in the UK from ten bases located across the UK. The bases are positioned close to SAR hotspots so aircraft can provide support as quickly and efficiently as possible. Bristow Helicopters was awarded the contract to provide helicopter SAR services for the UK in 2013, with the closest SAR base to the Morgan Array Scoping Boundary being at Caernarfon Airport, Gwynedd, 92km away. The Morgan Offshore Wind Project generation assets has the potential to affect airborne SAR operations due to the creation of multiple obstructions.

6.3.5 Potential project impacts

6.3.5.1 A range of potential impacts on aviation and radar receptors have been identified which may occur during the construction, operation and maintenance, and decommissioning phases of the Morgan Offshore Wind Project generation assets. The impacts that have been scoped into the assessment are outlined in Table 6.10, together with a description of any additional data collection and supporting analyses (e.g. modelling) that will be required to enable a full assessment of the impacts.

6.3.5.2 On the basis of the baseline information currently available and the project description outlined in part 1, section 3, Project description, of the EIA Scoping Report, potential impacts to be scoped out of the assessment are presented in Table 6.11, with justification.

Table 6.10: Impacts proposed to be scoped into the project assessment for aviation and radar (project phase refers to construction (C), operation and maintenance (O) and decommissioning (D)).

Impact	Project phase			Justification	Data collection and analysis required to characterise the baseline environment	Summary of proposed approach to assessment
	C	O	D			
Potential interference to the NATS Lowther Hill, Great Dun Fell and St Anne's PSRs, and the BAE Warton PSR, Manchester Airport PSR, Liverpool Airport PSR and Ronaldsway Airport PSR.	×	✓	×	The Morgan Array Scoping Boundary is within the range of the NATS Lowther Hill, Great Dun Fell and St Anne's PSRs, BAE Warton PSR, Liverpool Airport PSR, Manchester Airport PSR and Ronaldsway Airport PSR and therefore the presence of operational wind turbines within the Morgan Array Scoping Boundary could affect the radar performance.	Review of the data sources as set out in 6.3.3 has been carried out to identify radar receptors. Consultation with each radar operator will be carried out to understand the potential impact of the Morgan Offshore Wind Project generation assets on radar systems and operations.	A radar line of sight analysis will be undertaken using the maximum wind turbine blade tip height to understand theoretical visibility. This will be supplemented with the outcomes of consultation with radar operators to understand the potential impact on radar systems and operations.
Potential impact on Ronaldsway Airport Minimum Safe Altitude (MSA) and Instrument Flight Procedures (IFP) through the creation of physical obstructions.	✓	✓	✓	Part of the Morgan Array Scoping Boundary overlaps with the Ronaldsway Airport CTA. In low visibility and when operating in IMC or when pilots are operating the aircraft with reference to cockpit instruments, aircraft will be flown above the relevant MSA and are likely to be under the control of ATC with an appropriate level of radar service. IFPs are published by airports and are standard procedures used by aircraft flying in accordance with Instrument Flight Rules (IFR) and regulations which are designed to achieve and maintain an acceptable level of safety in operations. Dependent on proximity, the tallest wind turbines placed within the Morgan Array Scoping Boundary may affect the Isle of Man MSA and IFP through the creation of multiple obstacles.	Consultation with Ronaldsway Airport to understand potential for impact.	The Ronaldsway Airport MSA and IFP in the vicinity of the Morgan Array Scoping Boundary will require an assessment of the potential obstruction created by the wind turbines, informed by the results of consultation.
Creation of physical obstacles to aircraft operations.	✓	✓	✓	Construction and decommissioning infrastructure and the presence of wind turbines within the Morgan Array Scoping Boundary may impinge on the routing of aircraft operating at low level in the vicinity of the Morgan Array Scoping Boundary.	Consultation with airspace users to understand current airspace usage and potential for impact.	Qualitative assessment informed by consideration of the outcomes of consultation and taking into account the extant rules of the air.
Physical obstruction and potential for disruption to helicopter access/egress to/from offshore oil and gas platforms.	✓	✓	✓	The Morgan Array Scoping Boundary overlaps with the 9nm consultation zones of the Millom West, North Morecambe, South Morecambe DP6 and South Morecambe DP8 platforms (Spirit Energy). The presence of physical obstructions in	Consultation with the operators of these platforms and their helicopter service providers to understand current and future helicopter access requirements (including any temporary access requirements to	A helicopter access report considering routine and emergency access procedures will be prepared for those platforms where ongoing helicopter operations will be required during all phases of the Morgan Offshore Wind Project generation assets.

Impact	Project phase			Justification	Data collection and analysis required to characterise the baseline environment	Summary of proposed approach to assessment
	C	O	D			
				proximity to the airspace utilised by helicopters operating to and from oil and gas platforms may disrupt helicopter operations to and from the potentially affected platforms.	drilling rigs and vessels), and to understand any plans for decommissioning of assets.	
Obstruction to SAR helicopter operations.	✓	✓	✓	The presence of infrastructure (and associated construction equipment) within a previously open sea area may cause an obstruction to SAR operations.	Consultation will be carried out with SAR operators and the Maritime and Coastguard Agency (MCA) to understand requirements and to inform the assessment.	Qualitative assessment based on industry guidance informed through review of the project description against the outcomes of consultation with SAR operators and the MCA.

Table 6.11: Impacts proposed to be scoped out of the project assessment for aviation and radar.

Impact	Justification
Potential disruption to HMRs due to presence of wind turbines.	The Morgan Array Scoping Boundary does not overlap with any HMRs and therefore it is proposed that this impact is scoped out of the EIA.
Increased helicopter traffic to and from the Morgan Offshore Wind Project generation assets may affect available airspace for other users.	The Morgan Offshore Wind Project generation assets may require helicopter operations during the construction, operation and maintenance and decommissioning phases, which may affect the available airspace for other users. The Morgan Offshore Wind Project generation assets will mainly be located within Class G (uncontrolled airspace) where pilots are responsible for the avoidance of terrain, obstacles and other aircraft. The present operation of low flying aircraft in the Irish Sea is safe. This, together with the availability of an air traffic service, will remove aviation traffic risk therefore it is proposed that this impact is scoped out of the EIA.
Disruption to meteorological radar.	The Met Office publish defined consultation zones for each meteorological radar system; the Morgan Offshore Wind Project generation assets is outside of these consultation zones and therefore it is proposed that this impact is scoped out of the EIA.
Impacts to SSR systems.	The CAA (2016) state that impact to SSR systems may be prevalent if wind turbines are located within 10km of the radar source; there are no SSR systems within 10km of the Morgan Array Scoping Boundary and therefore it is proposed that this impact is scoped out of the EIA.

6.3.6 Measures adopted as part of the project

6.3.6.1 The following measures adopted as part of the project are relevant to aviation and radar. These measures may evolve as the engineering design and the EIA progresses.

- Appropriate lighting and marking of wind turbines will be established in accordance with CAA regulations and guidance (CAA, 2016; 2021) and in consultation with the CAA and the Defence Infrastructure Organisation (DIO).
- Prior to the start of construction and decommissioning, the UK Hydrographic Office (UKHO) will be informed of the locations, heights and lighting status of the wind turbines, including estimated and actual dates of activities, and the maximum height of any equipment to be used, to allow inclusion on Aviation Charts.
- The DIO will be informed of the construction start and end dates; the maximum height of construction equipment; and the latitude and longitude of each wind turbine.
- A minimum spacing of 500 m shall be maintained between blade tip to blade tip of all surface infrastructure. This is to facilitate access by SAR helicopters operating under Instrument Meteorological Conditions (IMC) flight rules, in line with MCA guidance (MCA, 2021b).
- Development of, and adherence to, an Emergency Response and Cooperation Plan (ERCoP), including consideration of helicopters undertaking SAR operations.
- The operator of the Morgan Offshore Wind Project generation assets will issue, as necessary, requests to the UK Aeronautical Information Service to submit a Notice to Airmen (NOTAM) in the event of any failure of aviation lighting.

6.3.6.2 The requirement for and feasibility of any further mitigation will be dependent on the significance of effects and will be consulted upon with statutory consultees throughout the EIA process.

6.3.7 Proposed assessment methodology

6.3.7.1 The aviation and radar EIA will follow the methodology set out in part 1, section 4: EIA methodology, of the EIA Scoping Report. Specific to the aviation and radar EIA, the following guidance documents will also be considered:

- CAP 393: Regulations made under powers in the Civil Aviation Act 1982 and the Air Navigation Order 2016 (CAA, 2021)
- CAP 764: CAA Policy and Guidelines on Wind Turbines, Sixth Edition (CAA, 2016)
- CAP 670: Air Traffic Services Safety Requirements, Third Issue Amendment 1/2019 (CAA, 2019)
- OREIs – Guidance on UK Navigational Practice, Safety and Emergency Response, MGN 654 (M+F) (MCA, 2021a)

- Offshore Renewable Energy Installations: Requirements, guidance and operational considerations for SAR and Emergency Response (MCA, 2021b).

6.3.8 Potential cumulative effects

6.3.8.1 There is potential for cumulative effects to arise from other projects or activities within the east Irish Sea area where projects or activities could act collectively with the Morgan Offshore Wind Project generation assets to affect aviation and radar receptors.

6.3.8.2 The cumulative assessment will consider the maximum design scenarios for each of the identified projects or activities. The following projects or activities will be considered within the Morgan aviation and radar study area for the generation assets:

- other offshore wind farms, including the Mona Offshore Wind Project
- other infrastructure projects (e.g. cables and pipelines), including the Morgan Offshore Wind Project transmission assets.

6.3.8.3 The cumulative effects assessment will follow the approach outlined in part 1, section 4: EIA methodology, of the EIA Scoping Report.

6.3.9 Potential inter-related effects

6.3.9.1 The assessment of potential inter-related effects will be considered within the Aviation and radar ES chapter. It will include consideration of project lifetime effects and receptor-led effects, in line with the approach outlined in part 1, section 4: EIA methodology, of the EIA Scoping Report.

6.3.10 Potential transboundary impacts

6.3.10.1 A screening of transboundary impacts has been carried out and is presented in part 3, Annex A: Transboundary Impacts Screening, of the EIA Scoping Report. This screening exercise identified that there is no potential for transboundary impacts upon aviation and radar due to construction, operation and maintenance, and decommissioning of the Morgan Offshore Wind Project generation assets.

6.4 Climate change

6.4.1 Introduction

6.4.1.1 This section of the Environmental Impact Assessment (EIA) Scoping Report identifies the climate change receptors of relevance to the Morgan Offshore Wind Project generation assets and considers the potential impacts arising from the construction, operation and maintenance, and decommissioning of the generation assets.

6.4.1.2 This section of the EIA Scoping Report also sets out the proposed scope of the EIA and the methodology to be used in the assessment of climate change impacts for the generation assets.

6.4.1.3 In accordance with the EIA Regulations, the Environmental Impact Assessment Guide to Assessing Greenhouse Gas Emissions and Evaluating their Significance (IEMA, 2017) and the Environmental Impact Assessment Guide to Climate Change Resilience and Adaptation (IEMA, 2020), the following aspects of climate change are relevant to the assessment:

- The emission of greenhouse gases (GHGs) contributing to climate change, including cumulative impacts with other development.
- The potential risks to the generation assets arising from a changing climate and its vulnerability to climate change.
- The potential inter-related impact of climate change with other environmental topics to be considered in the Environmental Statement (ES).

6.4.1.4 As discussed below, it is proposed to scope out a climate change risk assessment, and inter-related effects will be assessed in the relevant topic chapters of the ES.

6.4.1.5 This section of the EIA Scoping Report focuses on the proposed approach to the assessment of GHG emissions arising from the construction, operation and maintenance and decommissioning of the Morgan Offshore Wind Project generation assets.

6.4.2 Study area

6.4.2.1 GHG emissions have a global effect rather than directly affecting any specific local receptor. The impact of GHG emissions occurring due to the Morgan Offshore Wind Project generation assets on the global atmospheric concentration of the relevant GHGs, expressed in CO_2-equivalents (CO_2e), will therefore be considered in the climate change assessment.

6.4.2.2 The GHG emissions will be assessed on a life-cycle basis for activities required for the construction, operation and maintenance and decommissioning of the generation assets. GHG emissions will be caused directly and indirectly from sources at a variety of locations, including onsite activities and the associated supply chain.

6.4.2.3 In addition, as the Morgan Offshore Wind Project generation assets is proposed to generate renewable electricity it will avoid the baseline GHG emissions from other grid-connected electricity generators; this will be considered in the assessment of net effects of the Morgan Offshore Wind Project generation assets.

6.4.2.4 The Morgan climate change study area for the generation assets is therefore defined in terms of an assessment boundary rather than geographical area. The assessment boundary and relevant sources of GHG emissions are set out in sections 6.4.5 and 6.4.7 of the EIA Scoping Report respectively.

6.4.3 Data sources

6.4.3.1 The data sources used to inform the baseline assessment will primarily comprise published material which is publicly available online. No baseline surveys would be required to support the climate change assessment for the generation assets. Where a date or edition has been specified, this is the current edition but the latest at the time of assessment would be used. These data sources are summarised in Table 6.12 below.

Table 6.12: Baseline data sources.

Source	Summary
Climate Change Committee (CCC) – Progress Report to Parliament (2021)	Provides information regarding state of renewable energy generation in the UK
Digest of UK Energy Statistics (DUKES)	Provide statistics on UK renewable energy and electricity generation
Published Environmental Product Declarations (EPDs, the outputs of lifecycle analysis studies – LCAs)	Use of published EPDs and LCA studies to establish the embodied carbon emissions for a typical wind turbine and associated switchgear, transformers and cabling.
Valuation of Energy Use and Greenhouse Gas: Supplementary guidance to the HM Treasury Green Book, and supporting data tables	Used to establish baseline grid scenarios from which to compare to the development
UK Government GHG Conversion Factors for Company Reporting	Current UK grid carbon intensity and other GHG emissions factors.
RICS, GBUK or OneClick Building Carbon Database for 'industrial/utilities' building	Benchmark values per m^2 of gross internal area (GIA) for an 'industrial building'
National Grid Future Energy Scenarios (2021)	Provides projected future energy scenarios to compare the development's renewable energy generation potential with

6.4.4 Baseline environment

6.4.4.1 The baseline environment for this climate change section is concerned with two areas:

- GHG emissions from the generation assets associated land use change
- GHG emissions savings that the operational use of the generation assets will provide to the National Grid.

6.4.4.2 The current baseline within the Morgan Array Scoping Boundary will be taken into account in the assessment and would be based on the information provided in the marine environment ES chapters.

6.4.4.3 The future baseline GHG emissions for existing land-use in the absence of the Morgan Offshore Wind Project generation assets are expected to remain similar, with a decrease in agriculture-related GHG emissions over time, in line with the UK's national climate change policies.

6.4.4.4 The current baseline with regard to the carbon intensity of grid-average electricity generation, without the Morgan Offshore Wind Project generation assets and accounting for generation, excluding transmission and distribution loses is 212.3 $kgCO_2e/MWh$.

6.4.4.5 The future baseline for electricity generation that would be displaced by the Morgan Offshore Wind Project generation assets depends broadly on future energy and climate policy in the UK, and more specifically (with regard to day-to-day emissions) on the demand for operation of the Morgan Offshore Wind Project generation assets compared to other generation sources available, influenced by commercial factors and National Grid's needs.

6.4.4.6 The carbon intensity of baseline electricity generation is projected to reduce over time and so too would the intensity of the marginal generation source displaced at a given time.

6.4.4.7 The Morgan Offshore Wind Project generation assets operational GHG emissions savings from renewable energy generation for the grid will be compared with appropriate sources such as the Department for Business, Energy and Industrial Strategy (BEIS) projected marginal and grid average baseline scenarios and the National Grid's Future Energy Scenario publication.

6.4.5 Potential project impacts

6.4.5.1 A range of potential impacts on climate change have been identified which may occur during the construction, operation and maintenance, and decommissioning phases of the generation assets.

6.4.5.2 The impacts that have been scoped into the assessment are outlined in Table 6.13 together with a description of any additional data collection (e.g. site-specific surveys) and supporting analyses (e.g. modelling) that will be required to enable a full assessment of the impacts.

6.4.5.3 Potential impacts scoped out of the assessment are presented in Table 6.14, with justification.

Table 6.13: Impacts proposed to be scoped into the project assessment for climate change (project phase refers to construction (C), operation and maintenance (O) and decommissioning (D)).

Impact	Project phase			Justification	Data collection and analysis required to characterise the baseline environment	Summary of proposed approach to assessment
	C	O	D			
The impact of GHG emissions arising from the consumption of materials and activities required to facilitate the operation and maintenance phase.	×	✓	×	GHG emissions arising from the consumption of materials and activities required to facilitate the operation and maintenance phase would contribute to the lifecycle total and net GHG balance of the Morgan Offshore Wind Project generation assets.	The data sources used to inform the baseline assessment will primarily comprise published material which is publicly available online. No baseline surveys would be required to support the climate change assessment for the generation assets.	No modelling is proposed to be undertaken as part of the climate change assessment. Use of published carbon intensity benchmark values for buildings and/or project specific materials estimates together with published EPD's concerning Life Cycle Assessment research into embodied carbon associated with construction of the offshore substation platforms and associated infrastructure including switchgear, transformers and cabling. Use of published EPD's concerning Life Cycle Assessment research into embodied carbon associated with construction of wind turbines and wind farm developments. Use of published EPD's concerning Life Cycle Assessment research into embodied carbon associated with operation and maintenance of wind turbines and wind farm developments. Use of published EPD's concerning Life Cycle Assessment research into embodied carbon associated with recycling and recovery activities at end of life for wind turbines and wind farm developments.
The impact of GHG emissions arising from land-use change.	✓	✓	✓	GHG emissions arising from land-use change during the construction, operation and maintenance and decommissioning phases will be assessed in the ES.		
The impact of GHG emissions arising from the manufacturing and installation of the generation assets.	✓	×	×	GHG emissions arising from the manufacturing and installation of the generation assets would contribute to the lifecycle total and net GHG balance of the Morgan Offshore Wind Project generation assets.		
The impact of GHG emissions arising from decommissioning works (e.g. plant, fuel and vessel use) and the recovery (or disposal) of materials.	×	×	✓	GHG emissions arising from decommissioning works (e.g. plant, fuel and vessel use) and the recovery (or disposal) of materials would contribute to the lifecycle total and net GHG balance of the Morgan Offshore Wind Project generation assets. Options for either recycling or re-powering wind turbines will be assessed at end of life.		
The impact of estimated abatement of UK Grid emissions during the operation and maintenance phase.	×	✓	×	Exporting renewable energy to the grid throughout the operational lifetime of the Morgan Offshore Wind Project generation assets is likely to have a significant net benefit compared to the future baseline for power generation.	Future baseline environment will be based on BEIS and/or National Grid projections for grid average marginal carbon intensity of electricity generation.	The reduction in GHG emissions as a result of operation of the Morgan Offshore Wind Project generation assets will be assessed based on the carbon intensity of the alternative grid average and marginal generation source that is displaced (i.e. the generator that would be supplying the grid in the absence of the Morgan Offshore Wind Project generation assets).

Table 6.14: Impacts proposed to be scoped out of the project assessment for climate change.

Impact	Justification
The vulnerability of the generation assets to climate change during the construction, operation and maintenance and decommissioning phases.	Offshore assets (wind turbines, subsea cables and offshore substation platforms) are designed to be resilient to storm events with an engineering safety headroom. There is no clear evidence that peak wind speeds or wave heights are likely to be increased by climate change during the development's lifetime (Met Office, 2018). The construction phase will not be lengthy enough for significant climate change risks compared to the present-day baseline to occur. The Applicant will employ good health and safety practices with respect to risks such as heatstroke or storm events offshore.
Inter-related effects of climate change during the construction, operation and maintenance and decommissioning of the generation assets.	Inter-related effects of climate change during the construction, operation and maintenance and decommissioning of the generation assets will be considered individually within the relevant topic chapters of the Environmental Statement. Each topic chapter will assess how climate change may affect the future baseline scenario, including the sensitivity and/or resilience of identified receptors. Therefore, the inter-related effects of climate change during the construction, operation and maintenance and decommissioning of the generation assets are proposed to be scoped out of the assessment of climate change.

6.4.6 Measures adopted as part of the project

6.4.6.1 The following measures adopted as part of the project are relevant to climate change. These measures may evolve as the engineering design and the EIA progresses.

- The Morgan Offshore Wind Project generation assets will incorporate circular economy considerations, with the intention for wind turbine generators to be recycled where possible at the end of the operational lifetime.

6.4.6.2 The requirement for and feasibility of any mitigation measures will be dependent on the significance of effects and will be consulted upon with relevant statutory consultees throughout the EIA process.

6.4.7 Proposed assessment methodology

6.4.7.1 The climate change assessment will take into account the IEMA Environmental Impact Assessment Guide 'Assessing Greenhouse Gas Emissions and Evaluating Their Significance' (IEMA, 2017) and any updates to this guidance that may be published by IEMA at the time of assessment. It will be undertaken on a lifecycle basis, calculating the GHG emissions associated with the construction, operation and maintenance and decommissioning of the Morgan Offshore Wind Project generation assets.

6.4.7.2 GHG emissions would contribute to the effect of global climate change. The guidance suggests that, in principle, any additional GHG emissions may be considered significant and recommends that GHG emissions should be reported using an appropriate and proportionate level of detail.

6.4.7.3 The reduction in GHG emissions as a result of the operation of the Morgan Offshore Wind Project generation assets will be assessed based on the carbon intensity of the alternative marginal generator that is displaced (i.e. the generator that would be supplying the grid in the absence of the Morgan Offshore Wind Project generation assets).

6.4.7.4 The magnitude of impact will be expressed as tonnes of carbon dioxide equivalent (tCO_2e), using 100-year global warming potential values for non-CO_2 GHGs from the Intergovernmental Panel on Climate Change's Sixth Assessment Working Group 1 Report (IPCC, 2021) or as otherwise defined in literature sources to be used.

6.4.7.5 The sensitive receptor will be defined as the global atmospheric concentration of GHGs, and it will be characterised as having a 'high' sensitivity, given the severe consequences of climate change.

6.4.7.6 There are no clear, generally agreed, thresholds or methods for evaluating the significance of GHG impacts in EIA. The IEMA guidance recommends contextualising a development's GHG impacts, for example on a sectoral basis or compared to the UK's national carbon budget.

6.4.7.7 It is considered that broadly speaking, the significance of the Morgan Offshore Wind Project generation assets GHG emissions can be contextualised in the following ways:

- With reference to the absolute magnitude of net GHG emissions as a percentage of the UK's national carbon budget.

- Through considering any increase/reduction in absolute GHG emissions and GHG intensity compared with baseline scenarios, including projections for future changes in those baselines.
- With reference to whether the Morgan Offshore Wind Project generation assets contributes to and is in line with the UK's national carbon budget sectoral goals for GHG emissions reduction, which are consistent with science-based commitments to limit global climate change to an internationally agreed level.

6.4.7.8 Taking these factors into account, where applicable, the evaluation of significance will ultimately be a matter of professional judgement, as it is not considered that a fixed numerical threshold can be defined.

6.4.7.9 The main sources of GHG emissions arising from the construction, operation and maintenance and decommissioning of the Morgan Offshore Wind Project generation assets would be:

- Embodied carbon of materials used for construction and maintenance of the generation assets.
- GHG emission savings from the Morgan Offshore Wind Project generation assets operational life contributing to national grid decarbonisation.
- Fuel/energy use in vessels for the Morgan Offshore Wind Project generation assets construction, operation and maintenance and eventual decommissioning.
- GHG emissions arising from land use change as a result of the Morgan Offshore Wind Project generation assets.

6.4.8 Potential cumulative effects

6.4.8.1 All developments which emit GHGs have the potential to impact the atmospheric mass of GHGs as a receptor, and so may have a cumulative impact on climate change. Consequently, cumulative effects due to other specific local development projects are not individually identified but would be taken into account when evaluating the impact of the Morgan Offshore Wind Project generation assets by defining the atmospheric mass of GHGs as a high sensitivity receptor.

6.4.9 Potential inter-related effects

6.4.9.1 Inter-related effects of climate change will be considered individually within the relevant topic chapters of the ES rather than within the Climate change chapter of the ES.

6.4.10 Potential transboundary impacts

6.4.10.1 A screening of transboundary impacts has been carried out and is presented in part 3, Annex A: Transboundary Impacts Screening, of the EIA Scoping Report. This screening exercise identified that there is potential for transboundary impacts upon climate change due to construction, operation and maintenance, and decommissioning impacts of the Morgan Offshore Wind Project generation assets.

6.4.10.2 All developments which emit GHGs have the potential to impact the atmospheric mass of GHGs as a receptor, and so may have a transboundary impact on climate change. Each country has its own policy and targets concerning carbon and climate change which are intended to limit GHG emissions to acceptable levels within that country's defined budget and international commitments.

6.5 Noise and vibration

6.5.1 Introduction

6.5.1.1 This section of the Environmental Impact Assessment (EIA) Scoping Report identifies the noise and vibration receptors of relevance to the Morgan Offshore Wind Project generation assets and considers the potential impacts arising from the construction, operation and maintenance, and decommissioning phase of the generation assets.

6.5.1.2 This section of the EIA Scoping Report also sets out the proposed scope of the EIA and methodology to be used in the assessment of noise and vibration impacts for the generation assets.

6.5.1.3 The potential impacts arising from underwater noise and vibration generated during the construction, operation and maintenance, and decommissioning phases of the generation assets are described in part 2: section 3.2: Underwater noise, of the EIA Scoping Report.

6.5.2 Study area

6.5.2.1 The Morgan noise and vibration study area for the generation assets will consider the potential impacts on noise sensitive receptors arising from the construction, operation and maintenance, and decommissioning of the generation assets.

6.5.2.2 The Morgan noise and vibration study area for the generation assets will focus on receptors (landward of Mean High Water Springs (MHWS)) where potential impacts are most likely to occur on receptors sensitive to noise and vibration. As such, the Morgan noise and vibration study area for the generation assets will be defined as:

- Noise sensitive receptors located within 50km of the Morgan Array Scoping Boundary where construction piling is required. Noise generated during the construction of the generation assets (e.g. foundation piling) may coincide with noise sensitive receptors located landward of MHWS.

6.5.2.3 The Morgan noise and vibration study area for the generation assets will be reviewed and modified in response to additional environmental and/or design constraints identified during the EIA process.

6.5.3 Data sources

6.5.3.1 Due to the temporary nature of the noise impact (i.e. piling works), it is not proposed to carry out any specific baseline sound monitoring in relation to the generation assets. The thresholds within Category A of Table E.1 BS 5228-1:2009+A1:2014 will be used as a basis for the assessment. These are the lowest thresholds, and therefore provide a robust case for the assessment regardless of the baseline sound levels.

6.5.4 Baseline environment

6.5.4.1 The closest onshore areas to the Morgan Array Scoping Boundary are areas of suburban and rural coastline. Such areas are generally subject to low levels of noise from anthropogenic sources such as road traffic and industry, but can experience high levels of background noise from weather sources and the sea.

6.5.4.2 There are no statutory or non-statutory designations specifically related to matters of noise and vibration, or how it should be controlled. However, early engagement with the relevant Local Authority EHO will be undertaken to ensure the noise and vibration assessment is robust and proportionate.

6.5.5 Potential project impacts

6.5.5.1 A range of potential impacts on noise and vibration have been identified which may occur during the construction, operation and maintenance, and decommissioning phases of the generation assets.

6.5.5.2 The impacts that have been scoped into the assessment are outlined in Table 6.15 together with a description of any additional data collection (e.g. site-specific surveys) and supporting analyses (e.g. modelling) that will be required to enable a full assessment of the impacts.

6.5.5.3 Potential impacts scoped out of the assessment are presented in Table 6.16, with justification.

Table 6.15: Impacts proposed to be scoped into the project assessment for noise and vibration (project phase refers to construction (C), operation and maintenance (O) and decommissioning (D)).

Impact	Project phase			Justification	Data collection and analysis required to characterise the baseline environment	Summary of proposed approach to assessment
	C	O	D			
The impact of noise and vibration generated by offshore construction and decommissioning activities on human receptors.	✓	×	✓	Activities required for the construction and decommissioning of the generation assets would generate noise and vibration emissions which could adversely affect the health of human receptors.	Human receptors sensitive to noise and vibration located within the Morgan noise and vibration study area for the generation assets will be identified using desk-based analysis. As the lowest thresholds within the relevant standard (BS 5228) would be applied for the assessment, baseline data collection would not be required to support the assessment.	Predicted noise and vibration levels arising from construction and decommissioning activities will be calculated using modelling, in accordance with the methodology in BS 5228, where applicable. In some cases, such as where separation distances exceed the threshold in BS 5228, an alternative methodology such as International Standard Organisation (ISO) 9613-2 or Nord2000 may be used. The impact of noise and vibration on human receptors will be assessed in accordance with BS 5228 guidance. The significance of likely effects will be determined in accordance with IEMA Guidelines for Environmental Noise Impact Assessment (2014).

Table 6.16: Impacts proposed to be scoped out of the project assessment for noise and vibration.

Impact	Justification
The impact of noise and vibration generated during operation and maintenance of the generation assets.	The generation assets are located sufficiently far from onshore human receptors that noise and vibration impacts from operation and maintenance activities are likely to be negligible.

6.5.6 Measures adopted as part of the project

6.5.6.1 No measures adopted as part of the project have been identified relevant to noise and vibration arising from the generation assets.

6.5.6.2 The requirement for and feasibility of any mitigation measures will be dependent on the significance of effects and will be consulted upon with statutory and non-statutory consultees throughout the EIA process.

6.5.7 Proposed assessment methodology

6.5.7.1 The noise and vibration assessment for the generation assets will be undertaken in accordance with the methodology set out in part 1, section 4: EIA methodology, of the EIA Scoping Report, in addition to the following established guidance:

- BS 5228 – Code of practice for noise and vibration control on construction and open sites – Part 1: Noise and Part 2: Vibration (2014).
- IEMA – Guidelines for Environmental Noise Impact Assessment (2014).
- ISO 9613 Acoustics – Attenuation of sound during propagation outdoors - Part 2: General method of calculation (1996).
- Nord2000 – Comprehensive Sound Propagation Model - Part 1: Propagation in an Atmosphere without Significant Refraction and Part 2: Propagation in an Atmosphere with Refraction (2006).

6.5.8 Potential cumulative effects

6.5.8.1 There is potential for cumulative effects to occur on noise sensitive receptors arising from the Morgan Offshore Wind Project generation assets alongside other developments. Potential cumulative effects with respect to noise and vibration will be considered within the ES.

6.5.8.2 The cumulative effects assessment would be undertaken in accordance with the methodology set out in part 1, section 4: EIA methodology, of the EIA Scoping Report.

6.5.9 Potential inter-related effects

6.5.9.1 The assessment of potential inter-related effects will be considered in the Noise and vibration ES chapter. It will include consideration of project lifetime effects and receptor-led effects, in line with the approach outlined in part 1, section 4: EIA methodology, of the EIA Scoping Report.

6.5.10 Potential transboundary impacts

6.5.10.1 A screening of transboundary impacts has been carried out and is presented in part 3, Annex A: Transboundary Impacts Screening, of the EIA Scoping Report. This screening exercise identified that there is no potential for transboundary impacts upon noise and vibration due to construction, operation and maintenance, and decommissioning impacts of the Morgan Offshore Wind Project generation assets.

7 Other environmental topics

7.1 Introduction

7.1.1.1 This section of the Environmental Impact Assessment (EIA) Scoping Report sets out the approach for the other environmental topics that are required to be considered within the EIA process under Schedule 4 of The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 (the 2017 EIA Regulations) for which no Environmental Statement (ES) chapter is proposed. The section identifies the following:

- Environmental topics where information will be submitted in support of the Development Consent Order (DCO) application for the Morgan Offshore Wind Project generation assets
- Environmental topics which are proposed to be scoped out of the EIA
- Environmental topics which are considered elsewhere in the ES.

7.2 Topics with supporting information in the ES

7.2.1 Human health

7.2.1.1 The potential impacts on human health arising from the construction, operation and maintenance, and decommissioning of the generation assets will be considered in the following topic chapters of the ES where relevant:

- physical processes
- commercial fisheries
- shipping and navigation
- other sea users
- socio-economics and community.

7.2.1.2 Therefore, the details in relation to impacts on human health will be provided in the main topic chapters within the ES. In addition, the potential inter-related effects between each of the environmental topics listed above on human health will also be considered within the topic chapters of the ES.

7.2.1.3 It is proposed that a technical appendix be provided to draw the information relevant to human health together and to sign post where further details can be found. This appendix will include an overall conclusion regarding the significance of effects on human health.

7.2.1.4 The scope of the human health statement will be informed through consultation with the relevant statutory and non-statutory consultees, such as the Health and Safety Executive (HSE) and Environmental Health Officers (EHOs) from the Local Authorities.

7.2.2 Waste

7.2.2.1 The Applicant intends to submit a Waste Management Plan (WMP) in support of the application for development consent for the Morgan Offshore

Wind Project generation assets, which would be included as a technical appendix to the ES.

7.2.2.2 Contractors will be required to follow the measures set out in the WMP for managing waste and recording the movement of waste from the area of construction to the waste management facilities. Contractors will also be required to follow the best practice measures within the Environmental Management Plan. On that basis, the potential impacts arising from the disposal and recovery of waste during construction of the generation assets are unlikely to give rise to significant effects. Therefore, no standalone chapter within the ES is considered to be necessary.

7.2.2.3 The WMP will identify the likely waste arisings from the construction of the generation assets and set out appropriate measures for managing the waste in accordance with the waste hierarchy principle. These measures will include measures to reduce waste; to use less harmful alternative materials; opportunities to use materials with recycled content; to provide appropriate waste storage; and the utilisation licensed/registered waste carriers.

7.2.2.4 The WMP will be prepared in accordance with the relevant legislation, policy, and guidance including:

- Environmental Protection Act 1990
- Environment Act 1995
- Hazardous Waste (England and Wales) Regulations 2005 (as amended)
- Waste Management (England and Wales) Regulations 2006
- Waste (England and Wales) Regulations 2011 (as amended)
- The Environmental Permitting (England and Wales Regulations) 2016.

7.2.2.5 The roles and responsibilities of person(s) overseeing the implementation of waste management procedures during the construction phase will be identified in the WMP, including relevant mandatory training requirements (e.g. toolbox talks, method statements).

7.2.2.6 The WMP will also set out requirements for ongoing monitoring (e.g. regular site inspections) to ensure that construction waste is being managed appropriately according to the waste management procedures prescribed in the WMP.

Waste impacts proposed to be scoped out

<u>Operational waste</u>

7.2.2.7 Operational waste (e.g. materials from maintenance activities) would be segregated, recycled (where possible) and disposed of in accordance with collection procedures as agreed by the relevant regulator, including the Marine Management Organisation (MMO) and the Environment Agency. Operational waste collection procedures will be included in an Operational Management Plan (OMP) for the generation assets.

7.2.2.8 On this basis the potential impact arising from operational waste is unlikely to be significant and is proposed to be scoped out of the EIA.

7.3 Topics proposed to be scoped out

7.3.1.1 The following topics are proposed to be scoped out of the EIA process.

7.3.2 Local planning policy context

7.3.2.1 A description of the consenting process and the Planning Act will be provided within the introductory chapters of the ES.

7.3.2.2 For each environmental topic, the relevant legislative and planning policy context will be described within each topic chapter of the ES. The assessment of each topic included in the ES will consider the requirements and objectives set out in national, regional and local planning policy where relevant and appropriate.

7.3.2.3 In addition, a Planning Statement will be submitted in support of the application for development consent, which will outline how the generation assets comply with relevant local plans and planning policy.

7.3.2.4 Taking the information above into account, and in the interest of supporting proportionate EIA, it is proposed that a standalone chapter addressing local planning policy context is not required and should be scoped out of the EIA process.

7.3.3 Daylight, sunlight and microclimate

7.3.3.1 The generation assets will comprise wind turbine generators, wind turbine foundations, inter-array cables, interconnector cables, offshore substation platforms and associated infrastructure. The location of the generation assets is not likely to result in significant effects relating to daylight and sunlight. In addition, the nature of the generation assets is not likely to result in microclimate changes and therefore this topic is proposed to be scoped out of the EIA.

7.3.3.2 The effects of the Morgan Offshore Wind Project generation assets on climate change would be considered separately in the Climate change chapter of the ES, as described in part 2: section 6.4: Climate change, of the EIA Scoping Report.

7.3.4 Heat and Radiation

Heat

7.3.4.1 Construction, operation and maintenance, and decommissioning of the generation assets are unlikely to generate significant levels of heat.

7.3.4.2 The technical specification of the offshore substation platforms will consider any heat generated within the design and this would, as is usual practice, prevent any overheating or heat effects.

7.3.4.3 With these measures in place, it is not considered likely that significant effects in relation to heat will occur.

Radiation

7.3.4.4 Electric and magnetic fields (EMFs) are part of the natural world, and are also produced wherever electricity is generated, transmitted or used. Public exposure to power-frequency EMFs comes from a range of sources including household wiring and appliances, low-voltage distribution power lines or underground cables, and high-voltage transmission power lines or underground cables. Exposure to static EMFs comes from the Earth's natural magnetic field, atmospheric electrical field, and human sources such as appliances and electric rail lines.

7.3.4.5 It is considered that activities required to facilitate construction and decommissioning of the generation assets would generate negligible levels of EMFs.

7.3.4.6 Operation of the offshore wind turbines, offshore substation platforms and inter-array and interconnector cables, would produce EMFs due to the voltage and flow of current through electrical infrastructure. Potential EMF impacts from subsea cables will be considered in the Fish and shellfish ecology chapter of the ES.

7.3.4.7 Based on the information above it is proposed that a standalone chapter addressing heat and radiation is not required and should be scoped out of the EIA process.

7.4 Topics covered elsewhere in the ES

7.4.1.1 In order to avoid duplication and to ensure a proportionate EIA process, the following topics are not proposed to be subject to standalone chapters or appendices within the ES.

7.4.1.2 These environmental topics are already covered within the scope of work proposed in part 2, sections 3 to 6, of this EIA Scoping Report. Therefore, no further assessment is considered to be required.

7.4.2 Other residues and emissions

7.4.2.1 The potential impacts of residues and emissions (e.g. dust, pollutants, light, noise, vibration) arising from the construction, operation and maintenance, and decommissioning of the generation assets will be considered in the following topic chapters of the ES where relevant:

- Physical processes (impacts of sediment releases)
- Benthic subtidal and intertidal ecology; fish and shellfish ecology; marine mammals and offshore ornithology (impacts of emissions to water and noise emissions on ecological receptors)
- Underwater noise (impacts of noise emissions and vibration)
- Seascape, landscape and visual resources (impacts of light).

7.4.2.2 On the basis that the potential impacts will be assessed in the relevant topic chapters of the ES, and in the interest of supporting proportionate EIA, it is proposed that a standalone chapter addressing the likely effects of emissions and residues is not required.

7.4.3 Material assets

7.4.3.1 The potential impacts on material assets arising from the construction, operation and maintenance, and decommissioning of the generation assets will be considered in the following topic chapters of the ES:

- marine archaeology
- commercial fisheries
- shipping and navigation
- other sea users
- socio-economics and community
- aviation and radar.

7.4.3.2 On the basis that the potential impacts will be assessed in the relevant topic chapters of the ES, and in the interest of supporting proportionate EIA, it is proposed that a standalone chapter addressing the likely significant effects of the generation assets on material assets is not required and should be scoped out of the EIA process.

7.4.4 Major accidents and disasters

7.4.4.1 The 2017 EIA Regulations require that the significant effects to be assessed on population and human health, biodiversity, land, soil, water, air and climate, material assets, cultural heritage and the landscape, include, where relevant, those significant effects arising from the vulnerability of the proposed development to major accidents and disasters.

7.4.4.2 As such, risk of major accidents and disasters will be considered, where applicable, in the relevant topic chapter of the EIA, as described below.

7.4.4.3 A description of how major accidents and disasters have been considered in the design of the Morgan Offshore Wind Project generation assets will be outlined in the project description chapter of the PEIR and ES.

Biological environment

7.4.4.4 The biological environment topic chapters of the ES will consider the risk of major accidents and disasters relating to:

- Accidental pollution:
  - part 2, section 4.1: Benthic subtidal and intertidal ecology, of the EIA Scoping Report
  - part 2, section 4.2: Fish and shellfish ecology, of the EIA Scoping Report
  - part 2, section 4.3: Marine mammals, of the EIA Scoping Report.

Human environment

7.4.4.5 The human environment topic chapters of the ES will consider the risk of major accidents and disasters relating to:

- Vessel to vessel collision risk:
  - part 2, section 5.2: Shipping and navigation, of the EIA Scoping Report
- Vessel allision (contact) risk:
  - part 2, section 5.2: Shipping and navigation, of the EIA Scoping Report
- Risk of vessel anchor and gear snagging:

  - part 2, section 5.2: Shipping and navigation, of the EIA Scoping Report
- Reduction of under keel clearance:
  - part 2, section 5.2: Shipping and navigation, of the EIA Scoping Report
- Reduction of emergency response capability and reduced access for Search and Rescue (SAR) responders:
  - part 2, section 5.2: Shipping and navigation, of the EIA Scoping Report
- Creation of physical obstacles to aircraft operations:
  - part 2, section 6.3: Aviation and radar, of the EIA Scoping Report.

8 Generation assets summary

8.1 Overview

8.1.1.1 The information set out in this Environmental Impact Assessment (EIA) Scoping Report is provided to support the Applicant's request for a Scoping Opinion from the Secretary of State in relation to the development of the Morgan Offshore Wind Project generation assets.

8.1.1.2 As the Morgan Offshore Wind Project is an offshore generating station with a capacity of greater than 100MW located in English waters, it is a Nationally Significant Infrastructure Project (NSIP) requiring a Development Consent Order (DCO) under the Planning Act 2008. The application for development consent will comprise full details of the Morgan Offshore Wind Project generation assets and will be accompanied by an Environmental Statement (ES), which will present the findings of the EIA process.

8.1.1.3 In accordance with the Round 4 bid, the proposed capacity of the Morgan Offshore Wind Project generation assets is 1,500MW. The Morgan Array Scoping Boundary (i.e. the area within which the offshore wind turbines will be located) is located in the east Irish sea, 22.3km (12nm) from the Isle of Man and 36.2km (19.5nm) from the northwest coast of England (when measured from Mean High Water Springs (MHWS)).

8.1.1.4 This EIA Scoping Report has identified the main aspects of the offshore (and where relevant, onshore) physical, biological and human environment likely to be significantly affected by the construction, operation and maintenance and decommissioning of the Morgan Offshore Wind Project generation assets.

8.1.1.5 Table 8.1 provides an overview of the potential impacts that are proposed to be scoped into (considered further) or scoped out of (not considered further) the EIA process for the Morgan Offshore Wind Project generation assets.

Table 8.1: Summary of potential impacts of the Morgan Offshore Wind Project generation assets (project phase refers to construction (C), operation and maintenance (O) and decommissioning (D)).

Impact	Project phase		
	C	O	D
Section 3: Offshore physical environment			
Physical processes			
Impacts to the wave regime due to presence of infrastructure and the associated potential impacts along adjacent shorelines.	✓	✓	✓
Increase in suspended sediments due to construction, operation and maintenance and/or decommissioning related activities, and the potential impact to physical features.	✓	✓	✓
Impacts to the tidal regime due to presence of infrastructure and the associated potential impacts along adjacent shorelines.	✓	✓	✓
Impacts to sediment transport and sediment transport pathways due to presence of infrastructure and associated potential impacts to physical features and bathymetry.	✓	✓	✓

Impact	Project phase		
	C	O	D
Changes to bathymetry due to depressions left by jack-up vessels.	×	×	×
Scour of seabed sediments during the operation and maintenance phase	×	×	×
Underwater noise			
Effects of underwater noise on marine life due to construction, operation and maintenance and decommissioning vessels and rigs	✓	✓	✓
Effects of underwater noise on marine life due to impact driven and drilled pile installations for the wind turbine and offshore substation platform foundations	✓	×	×
Effects of underwater noise on marine life due to jacket or monopile cutting and removal	×	×	✓
Effects of underwater noise from wind turbine operation during operation and maintenance	×	✓	×
Effects of underwater noise on marine life due to clearance of unexploded ordnance (UXO) detonation	✓	×	×
Effects of the particle motion element of underwater noise on fish and shellfish receptors	✓	×	✓
Effects of the particle motion element of underwater noise on marine mammals during all phases.	×	×	×
Section 4: Offshore biological environment			
Benthic subtidal and intertidal ecology			
Increased suspended sediment concentrations (SSC) and associated deposition.	✓	✓	✓
Temporary habitat loss/disturbance.	✓	✓	✓
Long term habitat loss.	✓	✓	×
Increased risk of introduction and spread of invasive non-native species (INNS).	✓	×	✓
Colonisation of hard structures.	×	✓	×
Changes in physical processes.	×	✓	×
Removal of hard substrates.	×	×	✓
Impacts to benthic invertebrates due to electromagnetic fields (EMF).	×	×	×
Accidental pollution during construction, operation and maintenance and decommissioning.	×	×	×
Impacts from the release of sediment-bound contaminants.	×	×	×
Fish and shellfish ecology			
Temporary habitat loss/disturbance.	✓	✓	✓
Underwater noise impacting fish and shellfish receptors.	✓	×	✓
Increased suspended sediment concentrations (SSCs) and associated sediment deposition.	✓	✓	✓
Long term habitat loss.	✓	✓	✓
Electromagnetic Fields (EMF) from subsea electrical cabling.	×	✓	×
Colonisation of hard structures.	✓	✓	✓
Accidental pollution during construction, operation and maintenance and decommissioning phases.	×	×	×
Underwater noise from wind turbine operation during operation and maintenance phase.	×	×	×
Underwater noise from vessels during all phases.	×	×	×

Impact	Project phase		
	C	O	D
Impacts from the release of sediment-bound contaminants.	×	×	×
Marine mammals			
Injury and disturbance from underwater noise generated from piling.	✓	×	×
Injury and disturbance from underwater noise generation from unexploded ordnance (UXO) detonation.	✓	×	×
Disturbance to marine mammals from vessel use and other (non-piling) noise producing activities.	✓	✓	✓
Injury to marine mammals due to collision with vessels.	✓	✓	✓
Effects on marine mammals due to changes in prey availability.	✓	✓	✓
Disturbance to marine mammals from pre-construction surveys.	✓	×	×
Accidental pollution during all phases.	×	×	×
Increased suspended sediment concentrations (SSC) and associated sediment deposition during all phases.	×	×	×
Impact of EMF (from surface lain or buried cables) during the operation and maintenance phase.	×	×	×
Disturbance to marine mammals from operational noise from wind turbine operation during the operation and maintenance phase.	×	×	×
Offshore ornithology			
Disturbance and displacement from airborne noise, underwater noise and presence of vessels and infrastructure.	✓	✓	✓
Indirect impacts from underwater noise affecting prey species.	✓	×	✓
Temporary habitat loss/disturbance and increased suspended sediment concentrations (SSCs).	✓	✓	✓
Collision risk.	×	✓	×
Barrier to movement.	×	✓	×
Direct disturbance and displacement impacts from underwater noise during operation and maintenance and decommissioning phases.	×	×	×
Accidental pollution during all phases of the Morgan Offshore Wind Project generation assets.	×	×	×
Section 5: Offshore human environment			
Commercial fisheries			
Loss or restricted access to fishing grounds.	✓	✓	✓
Displacement of fishing activity into other areas.	✓	✓	✓
Interference with fishing activity.	✓	✓	✓
Temporary increase in steaming distances.	✓	×	✓
Loss or damage to fishing gear due to snagging.	×	✓	×
Potential impacts on commercially important fish and shellfish resources.	✓	✓	✓
Supply chain opportunities for local fishing vessels	✓	✓	✓
Increased steaming distances during the operation and maintenance phase.	×	×	×
Shipping and navigation			

Impact	Project phase		
	C	O	D
Deviations to commercial routes.	✓	✓	✓
Increased vessel to vessel collision risk.	✓	✓	✓
Increased allision (contact) risk to vessels.	✓	✓	✓
Increased risk of anchor and gear snagging for commercial vessels and commercial fishing vessels (in transit).	✓	✓	✓
Reduction of under keel clearance	×	✓	×
Reduction of emergency response capability due to increased incident rates and reduced access for SAR responders.	✓	✓	✓
Interference with marine navigation, communications and position fixing equipment.	×	✓	×
Marine archaeology			
Sediment disturbance and deposition leading to indirect impacts on archaeological receptors.	✓	✓	✓
Direct damage to archaeological receptors.	✓	✓	✓
Alteration of sediment transport regimes.	×	✓	×
Other sea users			
Displacement of recreational activities.	✓	✓	✓
Impacts to existing cables or pipelines or restrictions on access to cables or pipelines.	✓	✓	✓
Reduction or restriction of oil and gas exploration activities (including surveys, drilling and the placement of infrastructure) within the Morgan Array Scoping Boundary.	✓	✓	✓
Interference with the performance of REWS located on oil and gas platforms.	×	✓	×
Interference with offshore microwave fixed communication links.	×	✓	×
Increased suspended sediment concentrations and associated deposition affecting recreational diving sites.	×	×	×
Increased suspended sediment concentrations and associated deposition affecting aggregate extraction areas.	×	×	×
Alterations to sediment transport pathways affecting aggregate extraction areas.	×	×	×
Section 6: Offshore and onshore combined topics			
Seascape, landscape and visual resources			
The impact of the generation assets on seascape and landscape character.	✓	✓	✓
The impact of the generation assets on publicly accessible views	✓	✓	✓
The impact of construction, operation and maintenance and decommissioning of the generation assets on seascape and landscape character and visual resources located beyond the Morgan seascape, landscape and visual study area for the generation assets.	×	×	×
The impact of operation and maintenance of the inter-array and interconnector cables on seascape and landscape character and visual resources.	×	×	×
The impact of decommissioning of the inter-array and interconnector cables on seascape and landscape character and visual resources.	×	×	×
Socio-economics and community			
The impact of disruption on tourism and recreation receptors.	✓	✓	✓
The impact on economic receptors including employment, GVA, and supply chain demand.	✓	✓	✓
The impact of increased employment opportunities.	✓	✓	✓

Impact	Project phase		
	C	O	D
The impact on the demand for housing, accommodation and local services.	✓	✓	✓
Tourism and community effects within the NIA.	×	×	×
Aviation and radar			
Potential interference to the NATS Lowther Hill, Great Dun Fell and St Anne's PSRs, and the BAE Warton PSR, Manchester Airport PSR, Liverpool Airport PSR and Ronaldsway Airport PSR.	×	✓	×
Potential impact on Ronaldsway Airport Minimum Safe Altitude (MSA) and Instrument Flight Procedures (IFP) through the creation of physical obstructions.	✓	✓	✓
Creation of physical obstacles to aircraft operations.	✓	✓	✓
Physical obstruction and potential for disruption to helicopter access/egress to/from offshore oil and gas platforms.	✓	✓	✓
Obstruction to SAR helicopter operations.	✓	✓	✓
Potential disruption to HMRs due to presence of wind turbines.	×	×	×
Increased helicopter traffic to and from the Morgan Offshore Wind Project generation assets may affect available airspace for other users.	×	×	×
Disruption to meteorological radar.	×	×	×
Impacts to SSR systems.	×	×	×
Climate change			
The impact of GHG emissions arising from the consumption of materials and activities required to facilitate the operation and maintenance phase.	×	✓	×
The impact of GHG emissions arising from land-use change.	✓	✓	✓
The impact of GHG emissions arising from the manufacturing and installation of the generation assets.	✓	×	×
The impact of GHG emissions arising from decommissioning works (e.g. plant, fuel and vessel use) and the recovery (or disposal) of materials.	×	×	✓
The impact of estimated abatement of UK Grid emissions during the operation and maintenance phase.	×	✓	×
The vulnerability of the generation assets to climate change during the construction, operation and maintenance and decommissioning phase.	×	×	×
Inter-related effects of climate change during the construction, operation and maintenance and decommissioning of the generation assets.	×	×	×
Noise and vibration			
The impact of noise and vibration generated by offshore construction and decommissioning activities on human receptors.	✓	×	✓
The impact of noise and vibration generated during operation and maintenance of the generation assets.	×	×	×
Topics to be scoped out			
Daylight, sunlight and microclimate	×	×	×
Local planning policy context	×	×	×
Heat	×	×	×
Radiation	×	×	×

8.2 Cumulative effects

8.2.1.1 This EIA Scoping Report has proposed an approach to Cumulative Effects Assessment (CEA) that is consistent with the Planning Inspectorate’s Advice Note Seventeen: Cumulative Effects Assessment (The Planning Inspectorate, 2019) and the RenewableUK Cumulative Impact Assessment Guidelines, specifically Guiding Principle 4 and Guiding Principle 7 (RenewableUK, 2013).

8.2.1.2 A detailed CEA will be undertaken to support the ES, in line with the methodology outlined in part 1, section 4: EIA methodology, of this EIA Scoping Report.

8.3 Transboundary impacts

8.3.1.1 A transboundary screening assessment for the Morgan Offshore Wind Project generation assets has been undertaken and is presented in part 3, Annex A: Transboundary Impacts Screening, of the EIA Scoping Report. This screening has been carried out in accordance with the Planning Inspectorate’s Advice Note Twelve: Transboundary Impacts and Process (The Planning Inspectorate, 2020).

8.3.1.2 Based on what is currently known of the likely spatial scale of effects arising from the Morgan Offshore Wind Project generation assets and the economic interests of other states in the vicinity, transboundary impacts have been screened into the EIA process for the following topics:

- fish and shellfish ecology
- marine mammals
- offshore ornithology
- commercial fisheries
- shipping and navigation
- climate change.

8.4 Consultation

8.4.1.1 Before an application for a DCO is submitted to the Secretary of State, extensive consultation with key stakeholders (local authorities, statutory bodies, local communities and interest groups) is required. The proposed approach to stakeholder consultation during the pre-application phase is outlined in part 1, section 5: Consultation process, of the EIA Scoping Report.

8.4.1.2 Feedback provided within the Scoping Opinion, co-ordinated by the Secretary of State, will be taken into account as part of the ongoing EIA process for the Morgan Offshore Wind Project generation assets. In parallel to seeking a Scoping Opinion, the Applicant will carry out its Phase 1 public consultation. Over the consultation period, a number of events are proposed, which are likely to include online events, public exhibitions and pop-up events. Anyone who could potentially be affected by, or may have an active interest in, the Morgan Offshore Wind Project generation assets is encouraged to participate.

8.5 Next steps

8.5.1.1 Consultees are invited to consider the information presented in this EIA Scoping Report and advise on whether or not they agree with the conclusions. Several broad questions are presented below to encourage reflection on the key elements discussed in this EIA Scoping Report:

- Are there any additional baseline data sources available that could be used to inform the EIA?
- Does the reader agree that the proposed study areas are appropriate for each of the EIA topics?
- Have all potential impacts resulting from the Morgan Offshore Wind Project generation assets been identified for each of the EIA topics within this EIA Scoping Report?
- Does the reader agree with the impacts to be scoped in, and out, of the assessment?
- For those impacts scoped in, does the reader agree that the methods described are sufficient to inform a robust impact assessment?
- Are there any specific developments or infrastructure schemes which should be taken into account when considering potential cumulative effects?

8.5.1.2 Following receipt of the Scoping Opinion from the Secretary of State, a Preliminary Environmental Information Report (PEIR) is planned to be produced and consulted on during Q1 2023. The PEIR will provide an initial statement of the environmental information available for the Morgan Offshore Wind Project generation assets, including descriptions of the likely environmental effects and measures adopted as part of the project. The PEIR is intended to allow statutory consultees, local communities and interested parties to understand the nature, scale, location and likely significant environmental effects of the Morgan Offshore Wind Project generation assets, such that they can make an informed contribution to the process of pre-application consultation under the Planning Act 2008 and to the EIA process.

8.5.1.3 The Applicant expects it will further refine the Morgan Offshore Wind Project generation assets based upon the consultation responses received from the pre-application consultation in addition to environmental constraints identified during the EIA process. The final results of the EIA will be presented in an ES and a summary of all consultation responses received will be presented in a Consultation Report, both of which will accompany the application for development consent which is planned to be submitted to the Secretary of State in Q1 2024.

9 References

9.1 Introduction

None.

9.2 Site selection and alternatives

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9.3 Offshore physical environment

9.3.1 Physical processes

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9.4 Offshore biological environment

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Part 3: Annexes

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Glossary

Term	Meaning
Crown Dependency	The Crown Dependencies are not part of the UK but are self-governing dependencies of the Crown. This means they have their own directly elected legislative assemblies, administrative, fiscal and legal systems and their own courts of law.
Exclusive Economic Zone	An Exclusive Economic Zone (EEZ) is an area of the sea under the territorial ownership of a single country. This area is guaranteed by UN Convention on the Law of the Sea (UNCLOS).
Morgan Array Scoping Boundary	The Morgan Array Scoping Boundary within which the wind turbines, foundations, inter-array cables, interconnector cables and offshore substation platforms (OSPs) will be located.
Morgan Offshore Wind Project generation assets	The Morgan Offshore Wind Project generation assets is comprised of the generation assets and associated activities.
Transboundary Impact	Impacts that may arise from an activity within one state that affect the environment or other interests of another state.

Acronyms

Acronym	Meaning
CAA	Civil Aviation Authority
DCO	Development Consent Order
dML	Deemed Marine Licence
EEZ	Exclusive Economic Zone
EMF	Electromagnetic Field
ES	Environmental Statement
EU	European Union
GHG	Green House Gas
HRA	Habitats Regulations Assessment
MCAA	Marine and Coastal Access Act
MCZ	Marine Conservation Zone
MHWS	Mean High Water Springs
MLWS	Mean Low Water Springs
MMO	Marine Management Organisation
NSIP	Nationally Significant Infrastructure Project
PEIR	Preliminary Environmental Information Report
PSR	Primary Surveillance Radar
rMCZ	Recommended MCZ
SAC	Special Area of Conservation
SPA	Special Protection Area
SSC	Suspended Sediment Concentration
UNECE	United Nations Economic Commission for Europe
UXO	Unexploded Ordnance
ZoI	Zone of Influence

Units

Unit	Description
GW	Gigawatt
kV	Kilovolt
km	Kilometres
km^2	Kilometres squared
m	Metre
nm	Nautical Mile

1 Annex A – Transboundary Impacts Screening

1.1 Introduction

1.1.1 Background

1.1.1.1 Energie Baden-Württemberg (EnBW) and bp are jointly developing the Morgan Offshore Wind Project generation assets through their project company Morgan Offshore Wind Limited (the Applicant). The Morgan Array Scoping Boundary (the area within which the offshore wind turbines will be located) is 322.25km^2 in area and is located in the east Irish sea, 22.3km from the Isle of Man and 36.2km from the northwest coast of England. In accordance with the Round 4 bid the proposed capacity of the Morgan Offshore Wind Project generation assets is 1500MW (Figure 1.1).

1.1.1.2 Transboundary impacts relate to those impacts that may arise from an activity within one state that affect the environment or other interests of another state. This transboundary screening annex of the Environmental Impact Assessment (EIA) Scoping Report sets out the screening assessment of the potential for such effects to occur on the environment or interests of other states as a result of the Morgan Offshore Wind Project generation assets, based on what is currently known of the likely spatial scale of effects drawing on information presented in part 2, Generation assets, of the EIA Scoping Report, and the interests of other states in the vicinity.

1.1.1.3 This annex is intended to provide information to The Planning Inspectorate such that the Secretary of State can evaluate the likelihood of such effects occurring and the need, if any, for transboundary consultation with other states during the pre-application period. The screening of transboundary effects will be revisited during the Morgan Offshore Wind Project generation assets pre-application phase once the preliminary assessments are completed to ensure that any significant transboundary effects are fully considered within the Environmental Statement (ES) submitted alongside the application for development consent.

1.2 Legislative context

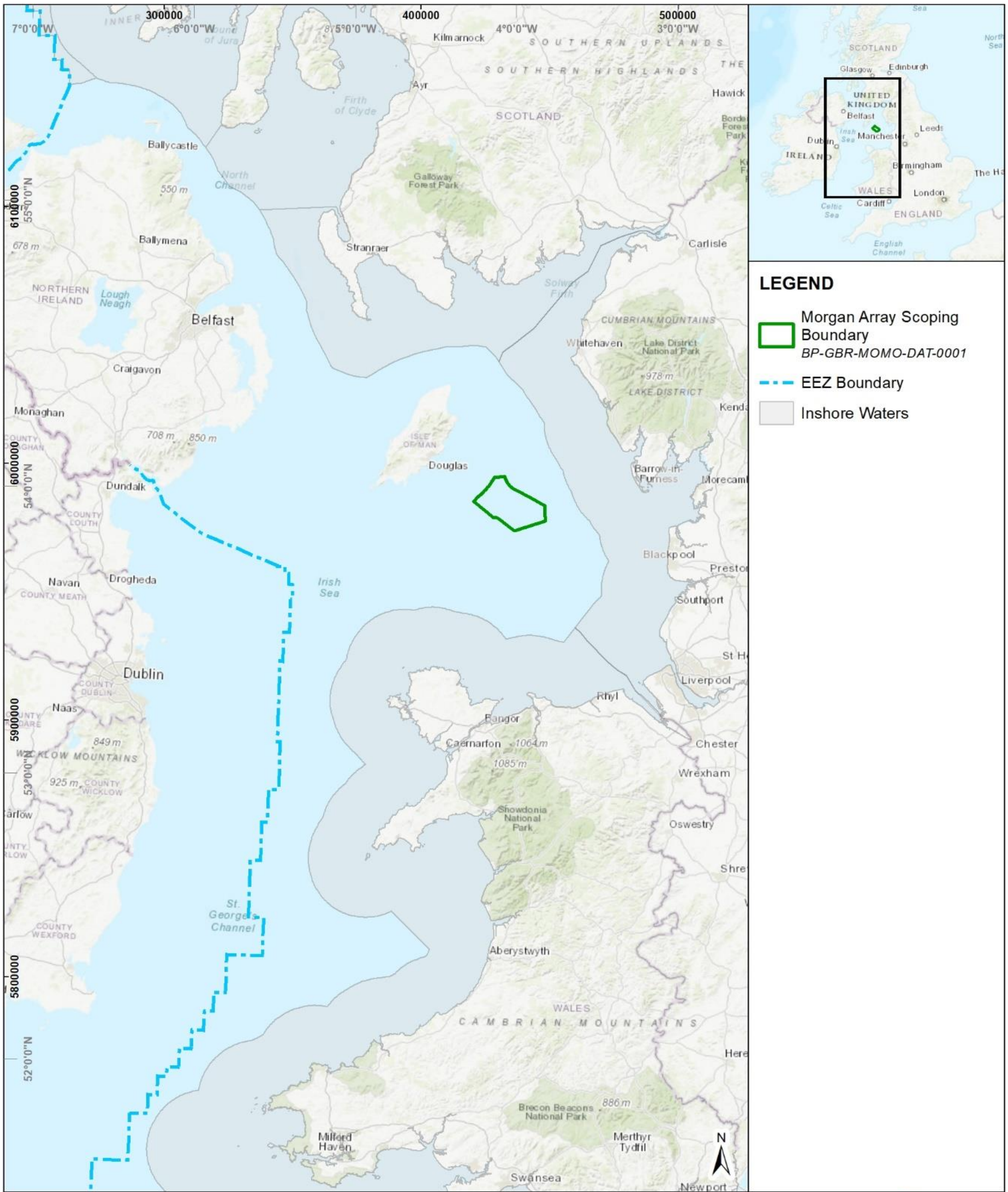
1.2.1.1 The need to consider transboundary impacts has been embodied by The United Nations Economic Commission for Europe (UNECE) Convention on Environmental Impact Assessment in a Transboundary Context, adopted in 1991 in the Finnish city of Espoo and commonly referred to as the 'Espoo Convention'. The Convention requires that assessments are extended across borders between Parties to the Convention when a planned activity may cause significant adverse transboundary impacts.

1.2.1.2 The Espoo Convention has been ratified by the United Kingdom (on behalf of the United Kingdom of Great Britain and Northern Ireland, the Bailiwick of Jersey, the Bailiwick of Guernsey, the Isle of Man and Gibraltar) and the European Union (EU). It is aimed at preventing, mitigating and monitoring environmental damage by ensuring that explicit consideration is given to transboundary environmental factors before a final decision is made as to whether to approve a project. The Espoo Convention requires that the Party of origin notifies affected Parties about activities listed in Appendix I of the Convention (which includes ‘major installations for the harnessing of wind power for energy production (wind farms)’) and likely to cause a significant adverse transboundary impact.

1.2.1.3 The Isle of Man is a Crown Dependency of the UK and is therefore not considered to be a transboundary consultee for the Morgan Offshore Wind Project generation assets. As such, potential impacts upon environmental receptors within the Isle of Man, which will be fully addressed in the EIA, are not considered to be transboundary.

1.2.1.4 The Espoo Convention has been implemented by EU Directive 2011/92/EU, as amended by Directive 2014/52/EU, on the assessment of the effects of certain public and private projects on the environment (the EIA Directive). As noted in part 1, section 2: Policy and legislation, of the EIA Scoping Report, following the UK’s departure from the EU, the United Kingdom (UK) has no direct obligations under the Directive, however, the requirements established under the Directive (as transposed into UK law) continue to apply.

1.2.1.5 The EIA Directive is transposed into UK law by the Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 (as amended) for Nationally Significant Infrastructure Projects (NSIPs) (the 2017 EIA Regulations). Regulation 32 of the 2017 EIA Regulations sets out a prescribed process of consultation and notification in relation to transboundary impacts. In addition, The Planning Inspectorate’s Advice Note Twelve: Transboundary Impacts (The Planning Inspectorate, 2020) sets out the procedures for consultation in association with an application for a Development Consent Order (DCO) where such a development may have significant transboundary impacts.



Service Layer Credits: Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community

Data Sources: Client, Marine Management Organisation, Marine Scotland, Natural Resources Wales

EnBW bp rps — Partners in UK offshore wind

Project Name:
MORGAN OFFSHORE WIND PROJECT

0 5 10 20 30 nm
0 10 20 40 60 km

Drawing Number:
RPSE-MG-SCR-004-00

Drawing Title:
LOCATION OF THE PROPOSED MORGAN ARRAY SCOPING BOUNDARY AND RELEVANT JURISDICTIONAL BOUNDARIES

Geodetic Information:
Datum: ETRS 1989
Projection: ETRS 1989 UTM Zone 30N

VER	DATE	DETAILS	BY	CHECK
00	23/05/22	First Issue	NG	AB
-	-	-	-	-

Figure 1.1: Location of the proposed Morgan Offshore Wind Project generation assets and relevant jurisdictional boundaries.

1.2.1.6 The Planning Inspectorate's Advice Note Twelve (The Planning Inspectorate, 2020) sets out the procedures for consultation in association with an application for a DCO, where such development may have significant transboundary impacts. The note sets out the roles of The Planning Inspectorate, other states and developers. Developers have no formal role under the Regulation 32 process, as the duties prescribed by Regulation 32 in notifying and consulting with other states on potential transboundary impacts are the responsibility of the Secretary of State. However, developers are advised to:

- Consider, when preparing documents for consultation and application, that The Planning Inspectorate may notify the relevant state of their particular project.
- Carry out preparatory work to complete a transboundary screening matrix to assist the Secretary of State in determining the potential for likely significant effects on the environment in other states.
- Submit the transboundary screening matrix along with the scoping request, if a scoping opinion is sought by the developer.

1.2.1.7 This transboundary annex is provided in response to this advice. It provides information about the Morgan Offshore Wind Project generation assets which will be the subject of the DCO application and sets out information relating to the potential effects of the scheme and the interests of the other states in the vicinity, in order to assist The Planning Inspectorate in forming a view on the likelihood of significant transboundary effects arising from the Morgan Offshore Wind Project generation assets. The information contained within the Annex to Advice Note Twelve, which sets out the criteria and relevant considerations that will be taken into account by The Planning Inspectorate during screening, have also been used in the preparation of this transboundary screening annex.

1.3 Consultation

1.3.1.1 The Applicant will conduct pre-application consultation for the Morgan Offshore Wind Project generation assets in accordance with the Planning Act 2008 plus associated guidance and regulations, including the 2017 EIA Regulations. If there are potential transboundary impacts, the Applicant will consider how best to consult with the relevant states.

1.4 Screening of transboundary impacts

1.4.1.1 A series of screening matrices for potential transboundary impacts associated with the Morgan Offshore Wind Project generation assets are presented for the offshore physical and biological environment (Table 1.2), offshore human environment (Table 1.3) and offshore and onshore combined topics (Table 1.4). These screening matrices have been based upon an initial understanding of the potential impacts arising from the Morgan Offshore Wind Project generation assets (on the basis of the project description presented in part 1, section 3: Project description, of the EIA Scoping Report) gathered during the EIA Scoping process and follow the suggested format set out by The Planning Inspectorate (2020).

1.4.1.2 The screening matrices consider all potential transboundary impacts that may occur from all phases of the Morgan Offshore Wind Project generation assets (i.e. construction, operation and maintenance, and decommissioning phases). The matrices also address the predicted spatial and temporal scale of potential transboundary impacts for those interests that are proposed to be screened into the assessment within the ES.

1.4.1.3 Potential effects upon European designated sites within other states are considered separately within the screening process for the Habitats Regulations Assessment (HRA).

1.4.1.4 The distance of the Morgan Offshore Wind Project generation assets from the jurisdictional boundary of the nearest other state is presented in Table 1.1 and shown on Figure 1.1.

Table 1.1: Summary of approximate distance to the nearest applicable states.

State	Distance from the Morgan Array Scoping Boundary to nearest border (km)
Ireland	77.3

1.4.2 Offshore transboundary impacts

Physical and biological environment

1.4.2.1 A transboundary screening matrix has been completed for offshore transboundary effects for the offshore physical and biological environment and is presented in Table 1.2. The conclusions of the transboundary screening for each offshore physical and biological environment topic are presented in the following sections, together with additional justification.

<u>Physical processes</u>

1.4.2.2 The offshore components of the Morgan Offshore Wind Project generation assets and the Morgan physical processes study area for the generation assets are located within UK and Isle of Man territorial waters. Any impacts on physical processes are likely to be confined to within one tidal excursion of the Morgan Offshore Wind Project generation assets (i.e. potential changes to the wave regime, tidal regime and sediment transport due to the presence of infrastructure, and potential changes in suspended sediment concentrations due to construction and maintenance activities). Therefore, no transboundary impacts upon physical processes are anticipated and it is proposed that transboundary impacts upon physical processes are screened out of the EIA process.

<u>Benthic subtidal and intertidal ecology</u>

1.4.2.3 It is considered that there is no pathway by which direct or indirect effects arising from the Morgan Offshore Wind Project generation assets could significantly affect the benthic subtidal or intertidal ecology of another state. The extent of any predicted impacts upon benthic subtidal and intertidal ecological receptors is likely to be limited to the footprint of the Morgan Offshore Wind Project generation assets (for temporary and long-term habitat loss and colonisation or removal of hard substrates) and within one tidal excursion of the Morgan Offshore Wind Project generation assets (for changes in suspended sediment concentrations and associated deposition and changes in physical processes). Therefore, potential transboundary impacts upon benthic subtidal and intertidal ecology are not anticipated and it is proposed that transboundary impacts on benthic subtidal and intertidal ecology are screened out of the EIA process.

Fish and shellfish ecology

1.4.2.4 There is potential for transboundary impacts upon fish and shellfish ecology due to construction, operation and maintenance and decommissioning impacts of the Morgan Offshore Wind Project generation assets.

1.4.2.5 These include direct impacts due to underwater noise from piling operations and indirect impacts caused by loss of fish and shellfish habitat or disturbance to habitat due to increased sediment concentrations (SSCs) and associated sediment deposition from the installation and/or decommissioning of foundations and cables.

1.4.2.6 These activities have the potential to directly affect Annex II migratory fish species that are listed as features of European sites in other states, or species that are of commercial importance for fishing fleets of other states. Indirect effects may include loss of or disturbance to fish spawning and nursery habitats in the Irish Sea that are important for migratory fish species either designated as Annex II species or of commercial importance to other states. The fish and shellfish receptors likely to be present within the Morgan fish and shellfish ecology study area for the generation assets are outlined in part 2, section 4.2: Fish and shellfish ecology, of the EIA Scoping Report, and include a number of commercially important species as well as diadromous species likely to be found in the area. Part 2, section 4.2: Fish and shellfish ecology, of the EIA Scoping Report, also identifies the spawning and nursery grounds located within and around the Morgan Array Scoping Boundary.

1.4.2.7 The probability of impacts occurring during construction is high, particularly as a result of underwater noise from piling, although the extent cannot be determined at this stage and will be subject to the EIA. The majority of impacts during construction are however considered likely to be short term and temporary. The operation and maintenance phase is considered less likely to result in significant impacts, due to effects being highly limited spatially (i.e. within the boundaries of the Morgan Offshore Wind Project generation assets), although the effects associated with long term habitat loss are, by nature, longer term effects which may be reversible depending on the decommissioning strategy.

1.4.2.8 Therefore, it is proposed that transboundary impacts on fish and shellfish ecology and their nature conservation interests are screened into the EIA process. Potential impacts upon fish as a qualifying feature of European sites and the National Site Network occurring within the Morgan fish and shellfish ecology study area for the generation assets or where there is a clear impact/receptor pathway on these sites and features, or both, will be considered within the HRA.

Marine mammals

1.4.2.9 There is potential for transboundary impacts upon marine mammals due to the mobile nature of marine mammal species and the proximity of the

Morgan Offshore Wind Project generation assets to the border of Ireland. The marine mammal species likely to be present in the Morgan marine mammal study area for the generation assets are outlined in part 2, section 4.3: Marine mammals, of the EIA Scoping Report, and include harbour porpoise, bottlenose dolphin and grey seal.

1.4.2.10 Direct impacts may occur due to underwater noise generated during construction and decommissioning, including noise associated with construction activities and vessel activity. Pile driving during the installation of foundations and pre-construction clearance of unexploded ordnance (UXO) are key impacts linked to elevated underwater noise. Indirect impacts to marine mammal receptors from changes in prey availability could occur as a result of e.g. habitat loss, underwater noise, increased suspended sediment concentrations (SSCs) and associated sediment deposition and other impacts scoped in for fish and shellfish receptors. The operation and maintenance phase is considered less likely to result in significant effects.

1.4.2.11 The probability of impacts to marine mammals occurring during construction is high, particularly as a result of underwater noise from piling and UXO clearance, although the extent cannot be determined at this stage and will be subject to the EIA. The majority of impacts during construction are however considered likely to be short term and temporary.

1.4.2.12 Therefore, it is proposed that transboundary impacts upon marine mammals and their nature conservation interests are screened into the EIA process. Potential impacts upon marine mammals as a qualifying feature of European sites and the National Site Network occurring within the Morgan regional marine mammal study area for the generation assets and/or where there is a clear impact/receptor pathway on these sites and features, will be considered within the HRA.

<u>Offshore ornithology</u>

1.4.2.13 There is potential for transboundary impacts upon ornithological receptors due to the wide foraging and migratory ranges of typical bird species in the Irish Sea. In addition, a number of bird species that have been recorded in the vicinity of the Morgan Offshore Wind Project generation assets include those that are listed as qualifying features of European sites in other states. The bird species likely to be present in the Morgan Array Scoping Boundary are outlined in part 2, section 4.4: Offshore ornithology, of the EIA Scoping Report, and include guillemot, razorbill, kittiwake, Manx shearwater and northern gannet, in addition to herring gull, fulmar, 'commic' tern and other gull species.

1.4.2.14 The key direct impacts for ornithological receptors are likely to arise during the operation and maintenance phase as a result of collision risk with rotating turbine blades which may result in direct mortality of individuals and barrier to movement caused by the physical presence of structures which may prevent clear transit of birds between foraging and breeding sites, or on migration. Direct impacts to ornithological receptors may, however, also occur due to temporary habitat loss/disturbance across all phases of the Morgan Offshore Wind Project generation assets and permanent habitat loss during the operation and maintenance phase. Indirect impacts may cause disturbance to prey (fish) species from important bird feeding areas or changes to prey availability due to changes to physical processes and habitat as a result of the presence of operational infrastructure.

1.4.2.15 It is likely that there will be impacts to ornithological receptors occurring during the operation and maintenance phase, particularly as a result of disturbance and displacement and collision risk. The magnitude of these impacts is not known at this stage and will be subject to assessment in the EIA. Unlike the majority of impacts during construction, which are considered likely to be short term and temporary, impacts during the operation and maintenance phase are likely to be long term, continuous and of varying spatial extent depending on the species, although it is likely that they will be reversible following the decommissioning of the Morgan Offshore Wind Project generation assets.

1.4.2.16 Therefore, it is proposed that transboundary impacts upon birds and their nature conservation interests are screened into the EIA process. Potential impacts upon birds as a qualifying feature of European sites and the National Site Network, that are within foraging range of the Morgan Offshore Wind Project generation assets, will be considered within the HRA.

Table 1.2: Offshore transboundary screening matrix for the Morgan Offshore Wind Project generation assets – offshore physical and biological environment.

Screening criteria	Physical processes	Benthic subtidal and intertidal ecology	Fish and shellfish ecology	Marine mammals	Offshore ornithology
Characteristics of the development	For a detailed description, see part 1, section 3: Project description, of the EIA Scoping Report. In accordance with the Round 4 bid, the proposed capacity of the Morgan Offshore Wind Project generation assets is 1500MW. Key components of the Morgan Offshore Wind Project generation assets include: offshore wind turbines, foundations, scour protection, inter-array cables, interconnector cables and offshore substation platforms. The Morgan Offshore Wind Project generation assets will include all associated offshore infrastructure (including up to 107 wind turbines).				
Location of development (including existing use) and geographical area	The Morgan Array Scoping Boundary is 322.25 km^2 and is located in the east Irish Sea, 22.3km from the Isle of Man, 36.2 km from the northwest coast of England, and 77.3km from the Irish EEZ (i.e. the median line between UK and Irish waters).				
Environmental importance	No significant transboundary impacts are predicted (see section 1.4.2).	No significant transboundary impacts are predicted (see section 1.4.2).	Potential transboundary impact (see section 1.4.2).	Potential transboundary impact (see section 1.4.2).	Potential transboundary impact (see section 1.4.2).
Potential impacts and carrier					
Extent					
Magnitude	The magnitude of the impacts (taking into consideration the spatial extent, duration, frequency and reversibility of the impact) will be subject to the assessment to be undertaken for the EIA and has, therefore, not been determined at this stage.				
Probability	No significant transboundary impacts are predicted (see section 1.4.2).	No significant transboundary impacts are predicted (see section 1.4.2).	Potential transboundary impact (see section 1.4.2).	Potential transboundary impact (see section 1.4.2).	Potential transboundary impact (see section 1.4.2).
Duration					
Frequency					
Reversibility					
Cumulative impacts	See part 2, section 3.1: Physical processes, of the EIA Scoping Report.	See part 2, section 4.1: Benthic subtidal and intertidal ecology, of the EIA Scoping Report.	See part 2, section 4.2: Fish and shellfish ecology, of the EIA Scoping Report.	See part 2, section 4.3: Marine mammals, of the EIA Scoping Report.	See part 2, section 4.4: Offshore ornithology, of the EIA Scoping Report.

Human environment

1.4.2.17 A transboundary screening matrix has been completed for offshore transboundary effects for the offshore human environment and is presented in Table 1.3. The conclusions of the transboundary screening for each offshore human environment topic are presented in the following sections, together with additional justification.

Commercial fisheries

1.4.2.18 The commercial fisheries likely to be operating in the Morgan commercial fisheries study areas for the generation assets are outlined in part 2, section 5.1: Commercial fisheries, of the EIA Scoping Report, and include fleets from other states, including Ireland and Belgium. Due to the highly mobile nature of both commercial fish species and fishing fleets, there is potential for transboundary impacts upon commercial fisheries to arise from two sources:

- Effects on commercial fishing fleets as a result of impacts from the Morgan Offshore Wind Project generation assets on commercially important fish and shellfish resources.
- Effects on commercial fishing fleets as a result of constraints on commercial fishing activities operating in the vicinity of the Morgan Offshore Wind Project generation assets. These effects may include loss or restricted access to fishing grounds and potential displacement of fishing activity into other areas.

1.4.2.19 The probability of impacts occurring during the operation and maintenance phase is likely to be high, particularly as a result of the presence of the offshore infrastructure associated with the Morgan Offshore Wind Project generation assets, although the extent cannot be determined at this stage and will therefore be subject to assessment in the EIA. Although such impacts have the potential to be long term, it is likely that following completion of construction some fishing activity may be able to resume, depending upon the final design of the infrastructure, and that any impacts would be reversible after decommissioning. The construction phase is considered less likely to result in significant impacts although the effects associated with the presence of infrastructure will progressively increase as the development is progressed.

1.4.2.20 Therefore, it is proposed that transboundary impacts upon commercial fisheries are screened into the EIA process.

Shipping and navigation

1.4.2.21 The Morgan Offshore Wind Project generation assets is situated in the east Irish Sea where a number of shipping routes presently operate. The shipping and navigation baseline for the Morgan Array Scoping Boundary is outlined in part 2, section 5.2: Shipping and navigation, of the EIA Scoping Report.

1.4.2.22 There is potential for transboundary impacts upon shipping routes which transit to/from other states, including Ireland. The probability of impacts occurring during the operation and maintenance phase is likely to be high, particularly as a result of the presence of the offshore infrastructure associated with the Morgan Offshore Wind Project generation assets, and the extent of the impact will be subject to assessment in the EIA. Although such impacts would be long term, it is likely that they would be reversible after decommissioning, as it is anticipated that all structures above the seabed will be completely removed. The construction phase is considered less likely to result in significant impacts although the effects associated with the presence of infrastructure on shipping and navigation will progressively increase as the development is progressed.

1.4.2.23 Therefore, it is proposed that transboundary impacts upon shipping and navigation are screened into the EIA process.

Marine archaeology

1.4.2.24 The marine archaeology baseline for the Morgan Array Scoping Boundary is outlined in part 2, section 5.3: Marine archaeology, of the EIA Scoping Report.

1.4.2.25 The extent of any predicted impacts upon marine archaeology receptors are likely to be limited to the Morgan Offshore Wind Project generation assets footprint. As the Morgan marine archaeology study area for the generation assets are located entirely within UK and Isle of Man territorial waters, there is considered to be no pathway for transboundary impacts.

1.4.2.26 Therefore, there is no potential for transboundary impacts upon marine archaeology and it is proposed that transboundary impacts on marine archaeology are scoped out of the EIA process.

Other sea users

1.4.2.27 The other sea users baseline for the Morgan other sea users study area for the generation assets is outlined in part 2, section 5.4: Other sea users, of the EIA Scoping Report.

1.4.2.28 Potential transboundary impacts associated with the Morgan Offshore Wind Project generation assets identified for other sea users receptors include displacement of recreational sailing and motor cruising activities between the UK and Ireland. The extent of any potential impacts on recreational activities is likely to be localised and short term, as individual vessels may be displaced along their routes due to construction, maintenance or decommissioning activities occurring at any one location. Potential impacts on recreational activities are also likely to be infrequent, due to the likely lower levels of offshore cruising and racing between the UK and Ireland.

1.4.2.29 Therefore, it is considered that there is no potential for significant transboundary impacts upon other users receptors and it is proposed that transboundary impacts upon other sea users are screened out of the EIA process.

Table 1.3: Offshore transboundary screening matrix for the Morgan Offshore Wind Project – offshore human environment.

Screening criteria	Commercial fisheries	Shipping and navigation	Marine archaeology	Other sea users
Characteristics of the development	For a detailed description, see part 1, section 3: Project description, of the EIA Scoping Report. In accordance with the Round 4 bid the proposed capacity of the Morgan Offshore Wind Project generation assets is 1500MW. Key components of the Morgan Offshore Wind Project generation assets include: offshore wind turbines, foundations, scour protection, inter-array cables, interconnector cables and offshore substation platforms. The Morgan Offshore Wind Project generation assets will include all associated offshore infrastructure (including up to 107 wind turbines).			
Location of development (including existing use) and geographical area	The Morgan Array Scoping Boundary is 322.25 km^2 and is located in the east Irish Sea, 22.3km from the Isle of Man, 36.2 km from the northwest coast of England, and 77.3km from the Irish EEZ (i.e. the median line between UK and Irish waters).			
Environmental importance	Potential transboundary impact (see section 1.4.2).	Potential transboundary impact (see section 1.4.2).	No significant transboundary impacts are predicted (see section 1.4.2).	No significant transboundary impacts are predicted (see section 1.4.2).
Potential impacts and carrier				
Extent				
Magnitude	The magnitude of the impacts (taking into consideration the spatial extent, duration, frequency and reversibility of the impact) will be subject to the assessment to be undertaken for the EIA and has, therefore, not been determined at this stage.			
Probability	Potential transboundary impact (see section 1.4.2).	Potential transboundary impact (see section 1.4.2).	No significant transboundary impacts are predicted (see section 1.4.2).	No significant transboundary impacts are predicted (see section 1.4.2).
Duration				
Frequency				
Reversibility				
Cumulative impacts	See part 2, section 5.1: Commercial fisheries, of the EIA Scoping Report.	See part 2, section 5.2: Shipping and navigation, of the EIA Scoping Report.	See part 2, section 5.3: Marine archaeology, of the EIA Scoping Report.	See part 2, section 5.4: Other sea users, of the EIA Scoping Report.

1.4.3 Offshore and onshore combined topics transboundary impacts

1.4.3.1 A transboundary screening matrix has been completed for those topics falling under the offshore and onshore combined topics and this is presented in Table 1.4. The conclusions of the transboundary screening for each combined topic are presented in the following sections, together with additional justification.

Seascape, landscape and visual resources

1.4.3.2 The seascape, landscape and visual resources baseline for the Morgan seascape, landscape and visual resources study area for the generation assets is outlined in part 2, section 6.1: Seascape, landscape and visual resources, of the EIA Scoping Report.

1.4.3.3 The extent of potential impacts to seascape, landscape and visual resources receptors arising from the Morgan Offshore Wind Project generation assets is considered to be focused on receptors based in the UK and the Isle of Man, with any potential impacts at the UK/Ireland boundary considered to be transient and negligible.

1.4.3.4 Therefore, significant transboundary impacts upon seascape, landscape and visual resources are not anticipated and it is proposed that transboundary impacts on seascape, landscape and visual resources are scoped out of the EIA process.

Socio-economics and community

1.4.3.5 The socio-economics baseline for the Morgan Offshore Wind Project generation assets is outlined in part 2, section 6.2: Socio-economics and community, of the EIA Scoping Report.

1.4.3.6 There is unlikely to be potential transboundary impacts upon socio-economics and community due to the construction, operation and maintenance and decommissioning of the Morgan Offshore Wind Project generation assets. The initial short list of ports under consideration to support the construction, operation and maintenance and decommissioning of the Morgan Offshore Wind Project generation assets identified in part 2, section 6.2: Socio-economics and community, of the EIA Scoping Report, are located within the UK. The Morgan Offshore Wind Project generation assets will also promote opportunities for local procurement, skills development and recruitment.

1.4.3.7 Therefore, significant transboundary impacts upon socio-economics and community are not anticipated and it is proposed that transboundary impacts on socio-economics and community are scoped out of the EIA process.

Aviation and radar

1.4.3.8 The aviation and radar baseline for the Morgan Array Scoping Boundary is outlined in part 2, section 6.3: Aviation and radar, of the EIA Scoping Report.

1.4.3.9 Potential impacts upon aviation and radar include interference with Primary Surveillance Radar (PSR), creation of physical obstacles to low flying aircraft, obstruction and disruption to helicopter access/egress to/from oil and gas platforms, and obstruction to Search and Rescue (SAR) operations. All potential receptors identified are located in the UK and the Isle of Man and therefore no transboundary effects are predicted.

1.4.3.10 Therefore, no transboundary impacts upon aviation and radar are anticipated and it is proposed that transboundary impacts upon aviation and radar are screened out of the EIA process.

Climate change

1.4.3.11 The climate change baseline for the Morgan Offshore Wind Project generation assets is outlined in part 2, section 6.4: Climate change, of the EIA Scoping Report.

1.4.3.12 Potential transboundary impacts associated with the Morgan Offshore Wind Project generation assets have been identified in part 2, section 6.4: Climate change, of the EIA Scoping Report, whilst noting that over the lifetime of the Morgan Offshore Wind Project, potential transboundary impacts will be beneficial. All development processes which emit Green House Gases (GHGs) have the potential to impact the atmospheric mass of GHGs as a receptor, and may have a transboundary impact on climate change. Transboundary effects due to other specific international development projects will be taken into account when evaluating the impact of the Morgan Offshore Wind Project generation assets by defining the atmospheric mass of GHGs as a high sensitivity receptor.

1.4.3.13 It is therefore proposed that transboundary impacts on climate change are screened into the EIA process.

Noise and vibration

1.4.3.14 Any noise and vibration impacts arising from the construction, operation and maintenance, and decommissioning of the Morgan Offshore Wind Project generation assets are most likely to occur on noise sensitive receptors located within the Morgan noise and vibration study area for the generation assets (see part 2, section 6.5: Noise and vibration, of the EIA Scoping Report). There is no pathway by which direct or indirect effects arising from the Morgan Offshore Wind Project generation assets could result in significant noise and vibration effects in another state.

1.4.3.15 It is therefore proposed that transboundary impacts on noise and vibration are screened out of the EIA process.

Table 1.4: Offshore and onshore combined topics transboundary screening matrix for the Morgan Offshore Wind Project generation assets.

Screening criteria	Seascape, landscape and visual resources	Socio-economics and community	Aviation and radar	Climate change	Noise and vibration
Characteristics of the development	For a detailed description, see part 1, section 3: Project description, of the EIA Scoping Report. In accordance with the Round 4 bid the proposed capacity of the Morgan Offshore Wind Project generation assets is 1500MW. Key components of the Morgan Offshore Wind Project generation assets include: offshore wind turbines, foundations, scour protection, inter-array cables, interconnector cables and offshore substation platforms. The Morgan Offshore Wind Project generation assets will include all associated offshore infrastructure (including up to 107 wind turbines).				
Location of development (including existing use) and geographical area	The Morgan Array Scoping Boundary is 322.25 km^2 and is located in the east Irish Sea, 22.3km from the Isle of Man, 36.2 km from the northwest coast of England, and 77.3km from the Irish EEZ (i.e. the median line between UK and Irish waters).				
Environmental importance	No significant transboundary impacts are predicted (see section 1.4.3).	No significant transboundary impacts are predicted (see section 1.4.3).	No significant transboundary impacts are predicted (see section 1.4.3).	Potential transboundary impact (see section 1.4.3).	No significant transboundary impacts are predicted (see section 1.4.3).
Potential impacts and carrier					
Extent					
Magnitude	The magnitude of the impacts (taking into consideration the spatial extent, duration, frequency and reversibility of the impact) will be subject to the assessment to be undertaken for the EIA and has, therefore, not been determined at this stage.				
Probability	No significant transboundary impacts are predicted (see section 1.4.3).	No significant transboundary impacts are predicted (see section 1.4.3).	No significant transboundary impacts are predicted (see section 1.4.3).	Potential transboundary impact (see section 1.4.3).	No significant transboundary impacts are predicted (see section 1.4.3).
Duration					
Frequency					
Reversibility					
Cumulative impacts	See part 2, section 6.1: Seascape, landscape and visual resources, of the EIA Scoping Report.	See part 2, section 6.2: Socio-economics and community, of the EIA Scoping Report.	See part 2, section 6.3: Aviation and radar, of the EIA Scoping Report.	See part 2, section 6.4: Climate change, of the EIA Scoping Report.	See part 2, section 6.5: Noise and vibration, of the EIA Scoping Report.

1.5 Conclusions

1.5.1.1 This annex has been prepared in accordance with The Planning Inspectorate’s Advice Note twelve and associated Annex. The primary purpose of this annex is to provide a screening assessment of potential transboundary impacts arising from the Morgan Offshore Wind Project generation assets which have the potential to affect other states.

1.5.1.2 On the basis of the current information available, as detailed within this EIA Scoping Report, the Morgan Offshore Wind Project generation assets is considered likely to have a significant effect on the environment in other states for the following topics, which have been screened into the EIA process:

- fish and shellfish ecology
- marine mammals
- offshore ornithology
- commercial fisheries
- shipping and navigation
- climate change.

2 Annex B – Marine Conservation Zone Screening

2.1 Introduction

2.1.1 Background

2.1.1.1 Consideration of Marine Conservation Zones (MCZs) is required for any Marine Licence application or Development Consent Order (DCO) application which includes a deemed Marine Licence (dML). Under section 126 of the Marine and Coastal Access Act 2009 (MCAA), the Marine Management Organisation (MMO) has specific duties with regards to MCZs and marine licence decision making.

2.1.1.2 Guidance issued by the MMO in 'Marine Conservation Zones and marine licensing' (MMO, 2013) outlines how MCZ assessments can be undertaken and recommends a staged approach. Initially, a screening exercise should be undertaken to identify whether section 126 should apply to a project and which MCZs may potentially be impacted. If the project is screened in, it is then considered under a two-staged assessment process, specifically a 'Stage 1 Assessment' followed by a 'Stage 2 Assessment'. Further detail on these stages is provided in section 2.2 below.

2.1.1.3 Section 2.2 of this annex provides a summary of the proposed approach to the MCZ assessment for the Morgan Offshore Wind Project generation assets, which will be presented in the Preliminary Environmental Information Report (PEIR) and Environmental Statement (ES).

2.1.1.4 Section 2.3 of this annex presents the results of a preliminary screening of MCZs for the Morgan Offshore Wind Project generation assets, which the Applicant proposes to carry forward for consideration in the MCZ assessment in the PEIR and ES.

2.2 Methodology

2.2.1.1 The following sections outline the proposed approach to the Morgan Offshore Wind Project generation assets MCZ assessment. A standalone MCZ assessment will be prepared and presented as an appendix to the PEIR and ES.

2.2.2 Preliminary Screening

2.2.2.1 To determine whether section 126 of the MCAA applies and an MCZ assessment is required for the Morgan Offshore Wind Project generation assets, a preliminary screening has been carried out. According to MMO guidance (MMO, 2013), section 126 of the MCAA is applicable if both of the following apply:

- The licensable activity is taking place within or near an area being put forward or already designated as an MCZ.
- The activity is capable of affecting (other than insignificantly) either (i) the protected features of an MCZ; or (ii) any ecological or geomorphological process on which the conservation of any protected feature of an MCZ is (wholly or in part) dependant.

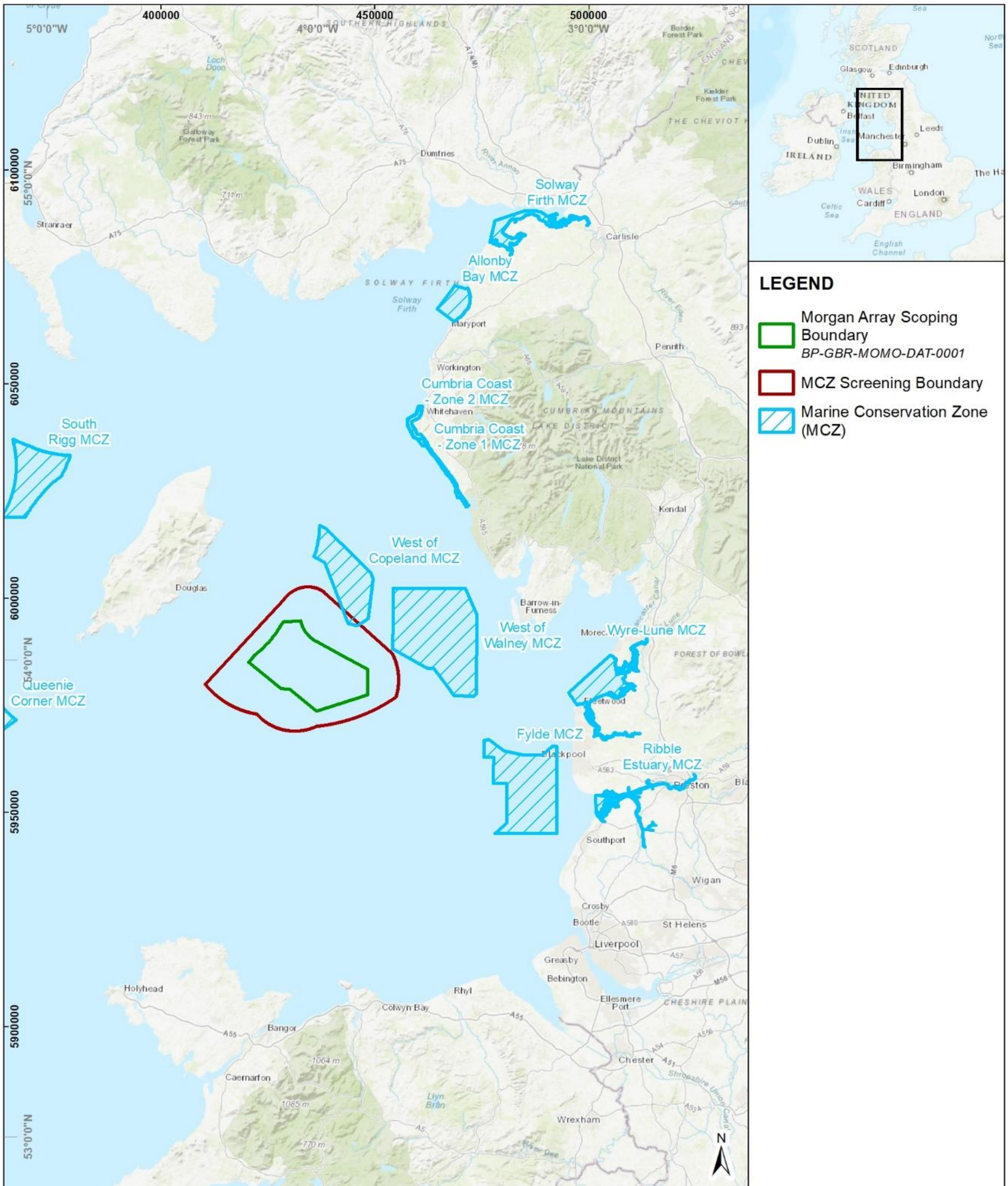
2.2.2.2 The MMO recommends the use of a risk-based approach when determining the 'nearness' of an activity to MCZs, including applying an appropriate buffer zone to the MCZ features under consideration as well as a consideration of risks associated with activities occurring at greater distances from features of the MCZ(s).

2.2.2.3 The preliminary screening stage undertaken in this MCZ Screening Annex considers the proximity of the Morgan Array Scoping Boundary to MCZs. To determine the 'nearness' of the activities associated with the Morgan Offshore Wind Project generation assets, the following screening criteria are proposed:

- Direct impacts to benthic features of MCZs will only occur as a result of the Morgan Offshore Wind Project generation assets and therefore will be within the Morgan Array Scoping Boundary.
- Indirect impacts to benthic features of the MCZs (e.g. increases in suspended sediment concentrations and associated deposition) may occur within one spring tidal excursion from the Morgan Array Scoping Boundary. One spring (mean) tidal excursion from the Morgan Array Scoping Boundary is therefore predicted to be the maximum extent of the Zone of Influence (ZoI) for benthic ecology MCZ features. This distance will be used as the screening boundary for MCZs (the Morgan MCZ Screening Boundary) (Figure 2.1).
- Direct impacts to fish features of MCZs (i.e. smelt (*Osmeridae*)) will occur within the Morgan Array Scoping Boundary. Whilst underwater noise originating within the Morgan Array Scoping Boundary may extend beyond these boundaries, smelt are a coastal and estuarine species and are unlikely to travel offshore into the Morgan Array Scoping Boundary (Fish Base, 2022). The screening boundary defined above for benthic features (i.e. one spring mean tidal excursion from the Morgan Array Scoping Boundary) is therefore also considered appropriate for impacts to fish features of MCZs.

2.2.2.4 Within the MCZ assessment to be presented in the PEIR and ES, further screening criteria will be considered. If the preliminary screening stage identifies that the proposed activity is within, or near, an MCZ, consideration will then be given as to whether there is the potential for a significant impact upon the MCZ. In determining 'insignificance', MMO guidance (MMO, 2013) states that this should take into account the likelihood of an activity causing an effect, the magnitude of the effect should it occur, and the potential risk any such effect may cause on either the protected features of an MCZ or any ecological or geomorphological process on which the conservation of any protected feature of an MCZ is (wholly or in part) dependant. It is proposed that this will be determined for the Morgan Offshore Wind Project generation assets through the assessments made in the relevant offshore ecology technical PEIR and ES chapter, and cross referenced in the MCZ assessment which will accompany the PEIR and ES.

2.2.2.5 Between the preliminary screening presented in this MCZ Screening Annex and the Stage 1 assessment, there may be a level of refinement of the Morgan Offshore Wind Project generation assets design. The preliminary screening has been undertaken on a precautionary basis, on the maximum design scenario, therefore any potential impacts on MCZs will be less than presented in the preliminary screening. This is further described in part 1, section 4: EIA methodology, of the EIA Scoping Report.



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Data Sources: Client, Natural England.

Partners in UK offshore wind

Project Name: MORGAN OFFSHORE WIND PROJECT

0 2.5 5 10 15 20 nm
0 5 10 20 30 40 km

Drawing Number: RPSE-MG-SCR-003-00

Drawing Title: MORGAN PRELIMINARY MCZ SCREENING

Geodetic Information:
Datum: ETRS 1989
Projection: ETRS 1989 UTM Zone 30N

VER	DATE	DETAILS	BY	CHECK
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Figure 2.1: Proposed Morgan Marine Conservation Zone (MCZ) Screening Boundary.

2.2.3 Stage 1 Assessment

2.2.3.1 The Stage 1 assessment (if/as required) will be presented in the PEIR and ES and will consider whether the condition in section 126(6) of the MCAA can be met; namely can the decision maker be satisfied there is no significant risk of the activity hindering the achievement of the conservation objectives stated for the MCZ. MMO guidance (MMO, 2013) suggests that the decision maker would use the information supplied by the applicant with the licence application, advice from the Statutory Nature Conservation Bodies (SNCBs) and any other relevant information to determine whether:

- There is no significant risk of the activity hindering the achievement of the conservation objectives stated for the MCZ.
- In addition, the MMO can exercise its functions to further the conservation objectives stated for the MCZ.

2.2.3.2 At this stage, the conservation objectives for the MCZ features will need to be considered. The conservation objectives for MCZ features are high level criteria describing the desired condition of the MCZ features. There are two objectives for features within an MCZ:

- Whether the features are in the desired favourable condition and need to be maintained in this condition.
- Whether the features are not in the desired favourable condition and need to be recovered to that condition.

2.2.3.3 The MCZ assessment will therefore consider whether the Morgan Offshore Wind Project generation assets could potentially affect, and hinder, these conservation objectives for each of the MCZs screened into the assessment. Within this stage of the assessment, the MMO advise that ‘hinder’ would be any act that could, either alone or in combination:

- In the case of a conservation objective of ‘maintain’, increase the likelihood that the current status of a protected feature would go downwards (e.g. from favourable to degraded) either immediately or in the future (i.e. these protected features would be placed on a downward trend), or
- In the case of a conservation objective of ‘recover’, decrease the likelihood that the current status of a protected feature could move upwards (e.g. from degraded to favourable) either immediately or in the future (i.e. these protected features would be placed on a flat or downward trend).

2.2.3.4 If neither of the criteria in section 126(6) of the MCAA can be met, the Stage 1 assessment will also consider whether the condition in section 127(7)(a) of the MCAA can be met and must determine whether:

- There is no other means of proceeding with the act which would create a substantially lower risk of hindering the achievement of the conservation objectives stated for the MCZ. This should include proceeding with it (a) in another manner, or (b) at another location.

2.2.3.5 If mitigation to reduce the impacts to an acceptable level cannot be secured, and there are no other alternative locations, then a Stage 2 assessment will be required.

2.2.4 Stage 2 Assessment

2.2.4.1 The Stage 2 MCZ assessment (if/as required) will be presented in the PEIR and ES. It will consider whether the conditions in section 126(7)(b) and (c) of the MCAA can be met, and the socio-economic impact of the plan or project together with the risk of environmental damage. There are two parts to the Stage 2 assessment process:

- Does the public benefit in proceeding with the project clearly outweigh the risk of damage to the environment that will be created by proceeding with it?
- If the above is true, can the applicant satisfy that they can secure, or undertake arrangements to secure, measures of equivalent environmental benefit for the damage the project will have on the MCZ features?

2.2.4.2 In determining ‘public benefit’ the MMO will consider benefits at a national, regional or local level. Guidance from the MMO on what constitutes measures of equivalent environmental benefit states that measures can be based on those considered appropriate when securing compensatory habitat for projects deemed to have an adverse effect on internationally designated sites under the Habitats Directive.

2.3 Results: Preliminary MCZ screening

2.3.1.1 MCZs which coincide with the Morgan MCZ Screening Boundary (Figure 2.1) are shown in Table 2.1 and Table 2.2. These MCZs will be screened into the Stage 1 Assessment on the basis that the construction, operation and maintenance, and decommissioning of the Morgan Offshore Wind Project generation assets has the potential to directly and indirectly affect the interest features of these sites. On that basis, the following MCZs have been identified as being relevant:

- West of Copeland MCZ, which is within the northern boundary of the Morgan MCZ Screening Boundary (Figure 2.1).
- West of Walney MCZ, which is located just outside the Morgan MCZ Screening Boundary (Figure 2.1). However, it has been included due to its proximity to this boundary.

Table 2.1: Summary of MCZs within the vicinity of the Morgan Offshore Wind Project generation assets (includes MCZs screened into the MCZ assessment in bold).

Designated Site	Distance to the Morgan MCZ Screening Boundary (km)	Features
West of Copeland MCZ	**0**	• **Subtidal coarse sediment** • **Subtidal sand** • **Subtidal mixed sediment**
West of Walney MCZ	**0.84**	• **Subtidal sand** • **Subtidal mud** • **Sea pen and burrowing megafauna communities**

2.3.2 West of Copeland MCZ

2.3.2.1 West of Copeland MCZ is located on the northern boundary of the Morgan MCZ Screening Boundary (Figure 2.1) and was designated in 2019. The West of Copeland MCZ is located in the eastern Irish Sea and covers an area of 158km^2.

2.3.2.2 The West of Copeland MCZ is designated for subtidal sand, subtidal coarse sediment and subtidal mixed sediments. This range of habitats supports a wide variety of species including bivalve molluscs (such as *Venus* clams and razor clams), worms, sea urchins, anemones, starfish, crabs and sea mats (Natural England, 2019).

2.3.2.3 The designated features of the West of Copeland MCZ and their general management approaches are outlined in Table 2.2.

2.3.3 West of Walney MCZ

2.3.3.1 The West of Walney MCZ is located just outside the Morgan MCZ Screening Boundary (Figure 2.1) and was designated in 2016. The West of Walney MCZ is located in the eastern Irish Sea, 8km west of Walney Island.

2.3.3.2 The MCZ protects an area of seabed of approximately 388km^2 in mainly inshore waters but also offshore waters. The West of Walney MCZ is designated for subtidal sands, subtidal muds and sea pen and burrowing megafauna communities. The subtidal mud is an important habitat for a range of animals including worms, molluscs, sea urchins, crustaceans, including the commercially important Norway lobster and sea pens. Sea pen and burrowing megafauna communities occur on the subtidal mud habitats and are listed as a protected feature of the MCZ. Collectively these animals create a network of burrows and tunnels, helping to shelter other small creatures and allow oxygen to penetrate deeper into the sediment. The subtidal sands within the MCZ support high densities of burrowing brittle stars, along with flatfish (Natural England, 2018).

2.3.3.3 The designated features of the West of Walney MCZ and their general management approach are outlined in Table 2.2.

Table 2.2: Sites proposed to be screened into the MCZ assessment, their designated features and general management approach.

Designated Sites	Features	Type of feature	General management approach
West of Copeland MCZ	Subtidal sand	Broadscale marine habitat	Maintain in favourable condition
	Subtidal coarse sediment	Broadscale marine habitat	Recover to favourable condition
	Subtidal mixed sediment	Broadscale marine habitat	Recover to favourable condition
West of Walney MCZ	Subtidal sand	Broadscale marine habitat	Recover to favourable condition
	Subtidal mud	Broadscale marine habitat	Recover to favourable condition
	Sea pen and burrowing megafauna communities	Habitat Feature of Conservation Importance	Recover to favourable condition

2.3.3.4 A full screening exercise will be undertaken and presented in the PEIR and ES to confirm the MCZs which may be carried forward for consideration in the Stage 1 assessment (building on the preliminary screening assessment presented above).

3 References

3.1 Annex A – Transboundary Impacts Screening

Department of Energy and Climate Change (DECC) (2015) Guidelines on the assessment of transboundary impacts of energy developments on Natura 2000 sites outside the UK. Department of Energy and Climate Change, London.

The Planning Inspectorate (2020) Advice Note Twelve: Transboundary Impacts and Process: https://infrastructure.planninginspectorate.gov.uk/legislation-and-advice/advice-notes/advice-note-twelve-transboundary-impacts-and-process/. [Accessed 25 January 2022].

3.2 Annex B – Marine Conservation Zone Screening

Fish Base (2022) Osmerus eperlanus, European Smelt. Available: https://www.fishbase.se/summary/osmerus-eperlanus.html. Accessed January 2022

Marine Management Organisation (2013) Marine conservation zones and marine licensing. April 2012. Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/410273/Marine_conservation_zones_and_marine_licensing.pdf

Natural England (2019) West of Copeland Marine Conservation Zone Fact Sheet, Available: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/915435/mcz-west-copeland-2019.pdf. Accessed November 2021.

Natural England (2018) Natural England and JNCC Conservation Advice for Marine Protected Areas, West of Walney MCZ, Site Information, Updated March 2018. Available: https://designatedsites.naturalengland.org.uk/Marine/MarineSiteDetail.aspx?SiteCode=UKMCZ0045&SiteName=walney&SiteNameDisplay=West%20of%20Walney%20MCZ&countyCode=&responsiblePerson=&SeaArea=&IFCAArea=&NumMarineSeasonality=&HasCA=1#SiteInfo Accessed: November 2021.