Partners in UK offshore wind

MORGAN OFFSHORE WIND PROJECT: GENERATION ASSETS

Preliminary Environmental Information Report

Volume 2, chapter 13: Marine archaeology

Image of an offshore wind farm

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Final

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Volume 4, annex 13.1: Marine archaeology technical report of the PEIR

Glossary

Term	Meaning
Gazetteer	A geographical index or dictionary.
Glaciolacustrine	Sediments deposited into lakes that have come from glaciers are called glaciolacustrine deposits. These lakes include ice margin lakes or other types formed from glacial erosion or deposition. Sediments in the bedload and suspended load are carried into lakes and deposited.
Glaciomarine	An environment containing both glacial ice and marine water.
Palaeochannel	A geological term describing a remnant of an inactive river or stream channel that has been filled or buried by younger sediment.
Palaeoenvironmental	An environment of a past geological age.

Acronyms

Acronym	Description
AEZ	Archaeological Exclusion Zone
AHEF	Archaeology and Heritage Engagement Forum
AMAPs	Areas of Maritime Archaeological Potential
BULSI	Burial, use, loss, survival and investigation
CEA	Cumulative effects assessment
HE	Historic England
HER	Historic Environment Record
HSC	Historic Seascape Character
JNAPC	Joint Nautical Archaeology Policy Committee
MBES	Multibeam Bathymetry
MDS	Maximum Design Scenario
MLWS	Mean Low Water Springs
MPS	Marine Policy Statement
NMRW	National Monuments Record Wales
NPS	National Policy Statement
NSIPs	Nationally Significant Infrastructure Projects
PAD	Protocol for Archaeological Discoveries
PEIR	Preliminary Environmental Information Report
RCAHMW	Royal Commission on the Ancient and Historical Monuments of Wales
SBP	Sub-bottom Profiler
SSS	Sidescan Sonar
SLVIA	Seascape, Landscape and Visual Impact Assessment
TAEZ	Temporary Archaeological Exclusion Zone
WSI	Written Scheme of Investigation

Units

Unit	Description
%	Percentage
km	Kilometres
km^2	Square kilometres
m	Metres
nm	Nautical miles (distance; 1nm = 1.852km)

13. Marine archaeology

13.1 Introduction

13.1.1 Overview

13.1.1.1 This chapter of the Preliminary Environmental Information Report (PEIR) presents the assessment of the potential impact of the Morgan Offshore Wind Project Generation Assets (hereafter referred to as the Morgan Generation Assets) on marine archaeology. Specifically, this chapter considers the potential impact of the Morgan Generation Assets seaward of Mean Low Water Springs (MLWS) during the construction, operation and maintenance, and decommissioning phases.

13.1.1.2 This chapter also draws upon information contained within volume 4, annex 13.1: Marine archaeology technical report of the PEIR.

13.1.2 Purpose of chapter

13.1.2.1 The primary purpose of the PEIR is outlined in volume 1, chapter 1: Introduction of the PEIR. In summary, the primary purpose of an Environmental Statement is to support the Development Consent Order (DCO) application for the Morgan Generation Assets under the Planning Act 2008 (the 2008 Act). The PEIR constitutes the Preliminary Environmental Information Report for the Morgan Generation Assets and sets out the findings of the EIA to date to support the pre-application consultation activities required under the 2008 Act. The EIA will be finalised following completion of pre-application consultation and the Environmental Statement will accompany the application to the Secretary of State for Development Consent.

13.1.2.2 The PEIR forms the basis for statutory Consultation which will last for 47 days and conclude on 4 June 2023. At this point, comments received on the PEIR will be reviewed and incorporated (where appropriate) into the Environmental Statement, which will be submitted in support of the application for Development Consent scheduled for quarter one of 2024.

13.1.2.3 In particular, this PEIR chapter:

- Presents the existing environmental baseline established from desk studies, site-specific surveys and consultation
- Identifies any assumptions and limitations encountered in compiling the environmental information
- Presents the potential environmental effects on marine archaeology arising from the Morgan Generation Assets, based on the information gathered and the analysis and assessments undertaken
- Highlights any necessary monitoring and/or mitigation measures which could prevent, minimise, reduce or offset the possible environmental effects of the Morgan Generation Assets on marine archaeology.

13.1.3 Study area

13.1.3.1 The Morgan marine archaeology study area consists of the Morgan Array Area with an additional 2km buffer. This is shown in Figure 13.1. This study area was used as the search area for obtaining records from relevant archive databases. This wider Morgan marine archaeology study area allows for a greater understanding of the wider archaeological baseline environment, with the dual purpose of enabling any archaeological trends within the region to be recognised and to allow any archaeological sites identified to be represented in a broader archaeological context. Physical processes modelling carried out for the Morgan Array Area (volume 2, chapter 6: Physical processes of the PEIR) has shown that changes to the tidal regime are limited to the immediate Morgan Array Area. Therefore, changes in marine physical process beyond the 2km Morgan marine archaeology study area are so minimal as to be negligible and thus a 2km buffer is considered adequate in which to assess potential impacts upon marine archaeology.

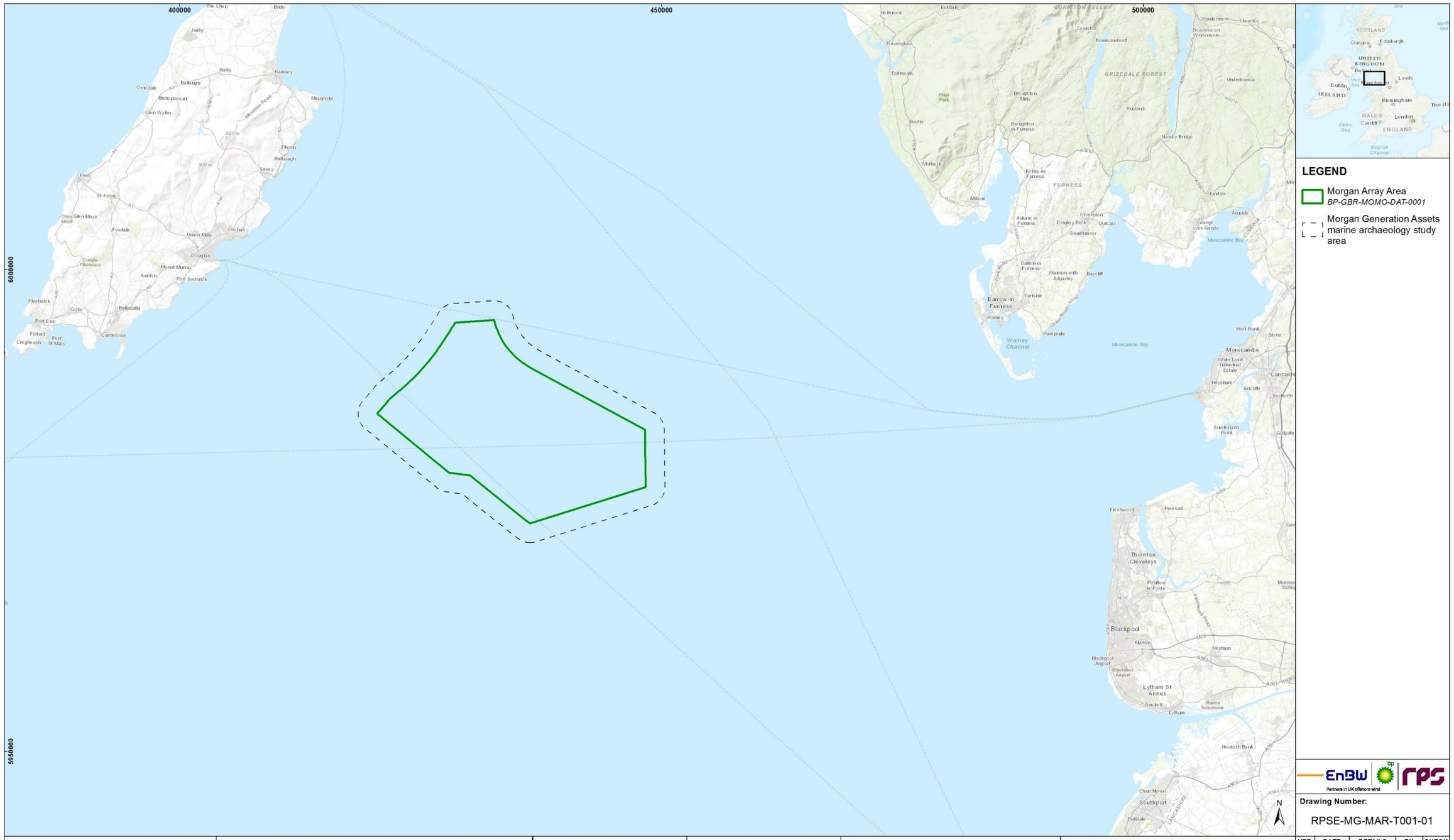

Figure 13.1: Morgan Generation Assets marine archaeology study area.

13.2 Policy context

13.2.1 National Policy Statements

13.2.1.1 Planning policy on renewable energy infrastructure is presented in volume 1, chapter 2: Policy and legislation of the PEIR. Planning policy on offshore renewable energy Nationally Significant Infrastructure Projects (NSIPs), specifically in relation to marine archaeology, is contained in the Overarching National Policy Statement (NPS) for Energy (EN-1; DECC, 2011a) and the NPS for Renewable Energy Infrastructure (EN-3, DECC, 2011b).

13.2.1.2 NPS EN-1 and NPS EN-3 include guidance on what matters are to be considered in the assessment. These are summarised in Table 13.1 below. NPS EN-1 and NPS EN-3 also highlight a number of factors relating to the determination of an application and in relation to mitigation.

13.2.1.3 In addition to NPS EN-3, the Marine Policy Statement (MPS), in paragraph 2.6.6.3, states that heritage assets in the marine environment "should be conserved through marine planning in a manner appropriate and proportionate to their significance", adding that, "opportunities should be taken to contribute to our knowledge and understanding of our past by capturing evidence from the historic environment and making this publicly available, particularly if a heritage asset is to be lost".

13.2.1.4 With reference to non-designated heritage assets in the UK marine environment the MPS states, in paragraph 2.6.6.5, that the "Many heritage assets with archaeological interest in these areas are not currently designated as scheduled monuments or protected wreck sites but are demonstrably of equivalent significance. The absence of designation…does not necessarily indicate lower significance and the marine plan authority should consider them subject to the same policy principles as designated heritage assets…based on information and advice from the relevant regulator and advisors".

13.2.1.5 When considering possible damage to or destruction of heritage assets by development proposals, the MPS states in paragraph 2.6.6.9 that "the marine plan authority should identify and require suitable mitigating actions to record and advance understanding of the significance of the heritage asset before it is lost".

13.2.1.6 Further advice in relation specifically to the Morgan Generation Assets has been sought through consultation with the statutory authorities and from The Planning Inspectorate's Scoping Opinion (section 13.2.3 and Table 13.4).

13.2.1.7 Table 13.1 refers to the current NPSs, specifically NPS EN-1 (DECC, 2011a) and NPS EN-3 (DECC, 2011b). If the NPSs are updated prior to the application for Development Consent, the revised NPSs will be fully considered in relation to marine archaeology within the Environmental Statement.

Table 13.1: Summary of the NPS EN-1 and NPS EN-3 provisions relevant to marine archaeology.

Summary of NPS EN-3 and EN-1 provisions relevant to marine archaeology	How and where considered in the PEIR
Consultation with all relevant statutory consultees is to be carried out at an early stage (paragraph 2.6.140 of NPS EN-3).	Consultation with relevant statutory and non-statutory stakeholders has been carried out from the early stages of the Morgan Generation Assets. See section 13.2.3 and Table 13.4 for further details.
Assessments should include a desk-based assessment that should take into account any geotechnical or geophysical surveys that have been undertaken to inform the wind farm design (paragraph 2.6.141 of NPS EN-3).	A marine archaeology desk-based assessment and technical report has been produced which informs the archaeological assessment (see volume 4, annex 13.1: Marine archaeology technical report of the PEIR). The archaeological review of geophysical data is included in section 13.4 below and in volume 4, annex 13.1: Marine archaeology technical report of the PEIR.
Assessment should include any beneficial effects on the historic environment, for example through improved access or new knowledge (paragraph 2.6.142 of NPS EN-3).	The EIA has considered the potential adverse and beneficial impacts on the historic environment during each phase of the Morgan Generation Assets (see section 13.7.3). The mitigation measures adopted as part of Morgan Generation Assets including any future geophysical and geotechnical surveys undertaken will produce new archaeological data and understandings of the historic marine environment of the area. This is a beneficial outcome of the Morgan Generation Assets. This is discussed further in section 13.8 below.
Decision-making is based on being satisfied that the proposed development has been designed sensitively, taking into account known heritage assets and their status. Any negative effects will be weighed against the public interests of the Morgan Generation Assets (paragraph 2.6.144 of NPS EN-3).	Measures adopted as part of the Morgan Generation Assets have been designed sensitively. Mitigation is primarily by avoidance and the Morgan Generation Assets has been designed to avoid known sensitive receptors through provision of Archaeological Exclusion Zone's (AEZs) and Temporary Archaeological Exclusion Zones (TAEZs) (section 13.7). Any potential adverse effects have been assessed in this chapter in section 13.8.
The most effective form of protection for important heritage assets can be achieved through implementing exclusion zones around the heritage assets which stop development activities within their area (paragraph 2.6.145 of NPS EN-3).	Morgan Generation Assets will incorporate AEZs, where appropriate, as stated in the measures adopted as part of Morgan Generation Assets (see section 13.7). AEZs are discussed further in the Outline Written Scheme of Investigation (WSI) and Protocol for Archaeological Discoveries (PAD) to be submitted with the EIA.

Table 13.2: Summary of the MPS.

Summary of key points in MPS relevant to marine archaeology	How and where considered in the PEIR
Heritage assets in the marine environment "should be conserved through marine planning in a manner appropriate and proportionate to their significance" and "opportunities should be taken to contribute to our knowledge and understanding of our past by capturing evidence from the historic environment and making this publicly available, particularly if a heritage asset is to be lost" (paragraph 2.6.6.3 of MPS)	The PEIR has considered the significance of all known and potential heritage assets within the Morgan marine archaeology study area. This is discussed further in section 13.8 below. The mitigation measures adopted as part of Morgan Offshore Wind Project including any future geophysical and geotechnical surveys undertaken will produce new archaeological data and understandings of the historic marine environment of the area. The results of these investigations will ultimately be made publicly available. This is discussed further in section 13.7 below.
The absence of designation…does not necessarily indicate lower significance and the marine plan authority should consider them [non designated heritage assets] subject to the same policy principles as designated heritage assets…based on information and advice from the relevant regulator and advisors (paragraph 2.6.6.5, of MPS)	The PEIR has considered the significance of all known and potential heritage assets within the Morgan marine archaeology study area. This is discussed further in section 13.8 below. Consultation to date with the relevant regulator and advisors is set out in Table 13.4 and will be ongoing.
The marine plan authority should identify and require suitable mitigating actions to record and advance understanding of the significance of the heritage asset before it is lost (paragraph 2.6.6.9 of MPS)	The mitigation measures adopted as part of Morgan Offshore Wind Project including any future geophysical and geotechnical surveys undertaken will produce new archaeological data and understandings of the historic marine environment of the area. The results of these investigations will ultimately be made publicly available. This is discussed further in section 13.7 below. An outline WSI prepared to support the EIA which will set out the high level mitigation strategy for approval by the regulator and advisors.

13.2.2 Regional Policy Statements - North West Inshore and North West Offshore Coast Marine Plans

13.2.2.1 The assessment of potential changes to marine archaeology has also been made with consideration to the specific policies set out in the North West Inshore and North West Offshore Coast Marine Plans (MMO, 2021). Key provisions are set out in Table 13.3 along with details as to how these have been addressed within the assessment.

Table 13.3: North West Inshore and North West Offshore Marine Plan policies relevant to marine archaeology.

Policy	Key provisions	How and where considered in the PEIR
NW-HER-1	This policy aims to conserve and enhance marine and coastal heritage assets by considering the potential for harm to their significance. This consideration will not be limited to designated assets and extends to those non-designated assets that are, or have the potential to become, significant. The policy will ensure that assets are considered in the decision-making process and will make provisions for those assets that are discovered during developments.	The potential for harm to the significance of marine heritage assets by the Morgan Generation Assets has been assessed in section 13.7.3, which includes the assessment of non-designated marine heritage assets identified within the Morgan marine archaeology study area. Mitigation measures have been adopted as part of the Morgan Generation Assets to protect the known archaeology assets and make provisions for those assets that are discovered during the Morgan Generation Assets in the form of the production of an Outline WSI and PAD to be submitted with the EIA.

13.2.3 Legislation

13.2.3.1 This chapter of the PEIR has considered the legislative framework as defined by:

- Protection of Wrecks Act 1973
- Ancient Monuments and Archaeological Areas Act 1979 (as amended)
- Protection of Military Remains Act 1986
- The Merchant Shipping Act 1995.

13.2.3.2 Full details of the legislation, policy and guidance considered in the development of this marine archaeology chapter are presented in volume 4, annex 13.1: Marine archaeology technical report of the PEIR.

13.2.4 Guidance

13.2.4.1 This chapter of the PEIR has been developed in accordance with the following guidelines:

- Historic England's (HE) Conservation Principles, Policies and Guidance for the Sustainable Management of the Historic Environment (English Heritage (now Historic England), 2008)
- Code of Conduct (Chartered Institute for Archaeologists, 2014)
- Standard and Guidance for Historic Environment Desk Based Assessment (Chartered Institute for Archaeologists, 2014 (updated 2020))
- COWRIE Historic Environment Guidance for the Offshore Renewable Energy Sector (Wessex Archaeology, 2007a)
- Offshore Renewables protocol for Archaeological Discoveries (The Crown Estate, 2014)
- Offshore Geotechnical Investigations and Historic Environment Analysis: Guidance for the Renewable Energy Sector (Gribble and Leather, 2010)

- Archaeological Written Schemes of Investigation for Offshore Wind Farm Projects (The Crown Estate, 2021).

13.3 Consultation

13.3.1.1 A summary of the key issues raised during consultation activities undertaken to date specific to marine archaeology is presented in Table 13.4 below, together with how these issues have been considered in the production of this PEIR chapter.

Table 13.4: Summary of key consultation issues raised during consultation activities undertaken for the Morgan Generation Assets relevant to marine archaeology.

Date	Consultee and type of response	Issues raised	Response to issue raised and/or were considered in this chapter
June 2022	The Planning Inspectorate. Scoping response.	The Environmental Statement should provide further detail on the proposed seabed preparation activities and identify the worse-case scenario assessed in relation to seabed disturbance. The need for dredging, quantities of material and likely disposal location should be identified and likely significant effects assessed in the Environmental Statement. The Inspectorate understands that the requirements for Unexploded Ordnance (UXO) clearance are not known at this stage and that a dedicated UXO survey will be conducted prior to construction. The Environmental Statement must explain the informed assumptions applied to establish the MDS assessed.	Seabed preparation activities are assessed in section 13.8 of this chapter. UXO is addressed in the volume 1, chapter 3: Project description of the PEIR.
June 2022	The Planning Inspectorate. Scoping response.	The Environmental Statement should provide a full description of the nature of the operation and maintenance activities, including type, frequency, and potential for overlapping activities with those associated with existing and planned wind farms in the area, or set out the assumptions made where exact information is not known.	The operation and maintenance activities are presented in Table 13.13 of this chapter. Cumulative impacts for operation and maintenance activities are assessed in section 13.9 of this chapter.
June 2022	The Planning Inspectorate. Scoping response.	In light of the number of ongoing developments within the vicinity of the Proposed Development application site, the Environmental Statement should clearly state which developments will be assumed to be part of the baseline and those which are to be considered as other development for the purposes of the cumulative effects assessment.	Cumulative impacts are detailed and assessed in section 13.9 of this chapter.
June 2022	The Planning Inspectorate. Scoping response.	Some of the potential impacts to be assessed result from changes to marine physical processes. The study area to be used for the marine archaeological assessment is different to that proposed for the assessment of physical processes. The Environmental Statement should provide a justification for the reduced extent of the study area used in the marine archaeological assessment, in light of the potential for impacts from physical processes over a wider geographic extent.	The justification for the use of a 2km study area for marine archaeology is provided in section 13.1.3 of this chapter.
July 2022	Historic England. Scoping response.	We also noted the attention given in Section 5.3 to the Evidence plan process and in paragraph 5.3.1.4 the establishment of Expert Working Groups (EWG) is explained. However, it appears a historic environment EWG is not highlighted in this paragraph. While we appreciate the attention given to formalising engagement with Statutory Nature Conservation Bodies during pre-application, we consider it relevant that acknowledgement should be given to how the Evidence Plan Process and the establishment of other sectoral EWGs, such as for the historic environment, as occurs offshore, should also be acknowledged.	An Archaeology and Heritage Engagement Forum (AHEF) has been set up to cover both onshore and offshore heritage matters in relation to the Morgan Generation Assets. Historic England will be invited to attend.
July 2022	Historic England. Scoping response.	The Environmental Statement should define what a 'reasonable timescale' or 'short time period' would be within which recovery could occur so that an impact would be reversible/not permanent.	In the context of the marine archaeology impact assessment 'short term duration' is used when assessing indirect impacts such as sediment disturbance and deposition. Physical processes modelling has indicated that turbidity levels of sediments are expected to return to baseline within a couple of tidal cycles, this is considered a short term duration. Please see section 13.8 for full justification.
July 2022	Historic England. Scoping response.	In Section 5.3.4 (Baseline environment) (of the Morgan Environmental Statement Scoping Report), paragraph 5.3.4.4 makes the important acknowledgement that the absence of "archaeological survey" should not be interpreted as implying absence of submerged prehistoric environment potential. In the paragraphs under "Maritime archaeological potential", it is our advice that in consideration of the risk of encountering presently unknown cultural heritage (prehistoric environmental evidence or historic vessels and aircraft), that measures and procedures are established at an early stage of project planning. The benefit of adopting this approach is to ensure capacity is built in to inform design, so as to best deliver UK policy objectives for the protection of underwater cultural heritage.	Agreed. Mitigation measures have been adopted as part of the Morgan Generation Assets and are presented in section 13.7. These include the provision of an Outline WSI and PAD in order to establish measures and procedures should the project encounter presently unknown archaeological material/assets.

Date	Consultee and type of response	Issues raised	Response to issue raised and/or were considered in this chapter
July 2022	Historic England. Scoping response.	Regarding the statement made in paragraph 5.3.4.12 (of the Morgan EIA Scoping Report), it is important to factor-in seabed sedimentary conditions whereby wrecked vessels of considerable antiquity may have become buried and therefore the state of preservation could be very high. Furthermore, such heritage assets may be very difficult to identify with geophysical survey data which was gathered to generally characterise the area within which the development may occur. The risk that an anomaly with minimal 'signature' may represent buried archaeological material of considerable importance should always be factored in, such as alluded to in paragraph 5.3.4.17.	The potential impact of sediment disturbance and deposition has been assessed in section 13.8 of this chapter. Mitigation measures have been adopted as part of the Morgan Generation Assets and are presented in section 13.7. These include the provision of an Outline WSI and PAD in order to account for the possibility of encountering buried archaeological material.
July 2022	Historic England. Scoping response.	Given that the archaeological study area extends into the Isle of Man marine planning area, the Applicant is advised to include any relevant Isle of Man marine historic environment records within its data sources.	Historic Environment Record (HER) data was requested from Manx National Heritage at Scoping, who responded with the information that they held no data relevant to the Morgan marine archaeology study area.
July 2022	Historic England. Scoping response.	Consideration of the historic environment should also be factored into the approach to identifying potential cumulative effects (Section 6.1.8) and in Section 6.1.9 (Potential Inter-related effects) reference is made to consideration within the relevant topic chapters of the Environmental Statement "For example: Historic environment". We therefore require clarification if this will be a chapter included within the PEIR and Environmental Statement prepared for "Generation assets". We also noted that the EIA Scoping Report did not specifically include consideration of Historic Seascape Character and the methodological approach produced by Historic England as a means to support the UK's implementation of Council of Europe European Landscape Convention 2000 (https://www.coe.int/en/web/landscape), we therefore provide the following links for further information: • https://historicengland.org.uk/research/methods/characterisation/historic- seascapes/; and • https://archaeologydataservice.ac.uk/archives/view/hscirish_eh_2011/	Cumulative impacts and inter related effects have been assessed in this chapter in sections 13.10 and 13.12. These documents and data sources have been reviewed and included in Vol 4 Chapter 15: SLVIA, and is considered within volume 4, annex 13.1: Marine archaeology technical report of the PEIR.

13.4 Baseline environment

13.4.1 Methodology to inform baseline

13.4.1.1 Data used to compile this report consists of primary geophysical survey data (Table 13.6) and secondary information derived from a variety of sources (Table 13.5).

13.4.2 Desktop study

13.4.2.1 Information on marine archaeology within the Morgan marine archaeology study area was collected through a detailed desktop review of existing studies and datasets. These are summarised at Table 13.5 below.

13.4.2.2 The principal archaeological archives relating to the Morgan marine archaeology study area are the National Record of the Historic Environment (NRHE) as held by Historic England (HE) and the National Monuments Record Wales (NMRW) as held by RCAHMS. Data from the United Kingdom Hydrographic Office (UKHO) is a further resource, of which RPS holds in house and is utilised to corroborate positional information of known wrecks and obstructions on the seabed. Additional sources consulted include historic Ordnance Survey maps and Admiralty Charts. Manx National Heritage were also contacted and confirmed that they hold no records within the Morgan marine archaeology study area.

Table 13.5: Summary of key desktop data.

Title	Source	Year	Author
UKHO Wreck and Obstructions Data	UKHO	2022	United Kingdom Hydrographic Office (UKHO)
Historic Environment Record Data	National Record of the Historic Environment (NRHE)	2021	Historic England
Historic Environment Record Data	National Monuments Record Wales (NMRW)	2021	Royal Commission on the Ancient and Historical Monuments of Wales (RCAHMW)
Historic Seascape Characterisation: The Irish Sea (English Sector)	Archaeology Data Service (ADS)	2011	Historic England
Submerged Landscapes Data	EMODnet Geology	2022	British Geological Survey

13.4.3 Site specific surveys

13.4.3.1 In order to inform the PEIR, site-specific surveys were undertaken, and the statutory consultees notified. A summary of the surveys undertaken to inform the marine archaeology impact assessment is outlined in Table 13.6 below.

13.4.3.2 A comprehensive marine geophysical survey was carried out for the Morgan Array Area. The survey comprised multi-beam bathymetry; side-scan sonar and sub-bottom profile surveys, to inform a detailed understanding of the topography and underlying geological formations of the seabed. An archaeological review of the geophysical data has been carried out and is presented in volume 4, annex 13.1: Marine archaeology technical report of the PEIR.

Table 13.6: Summary of site-specific survey data.

Title	Extent of survey	Overview of survey	Survey contractor	Date	Reference to further information
Sidescan Sonar (SSS)	Morgan Array Area	Geophysical survey to characterise the marine archaeology of the Morgan Array Area.	Gardline	July 2021 to September 2021	volume 4, annex 13.1: Marine archaeology technical report of the PEIR.
Multibeam Bathymetry (MBES)	Morgan Array Area	Geophysical survey to characterise the marine archaeology of the Morgan Array Area.	XOCEAN	June 2021 to March 2022	volume 4, annex 13.1: Marine archaeology technical report of the PEIR.
Sub-bottom Profiler (SBP)	Morgan Array Area	Geophysical survey to characterise the marine archaeology of the Morgan Array Area.	Gardline	July 2021 to September 2021	volume 4, annex 13.1: Marine archaeology technical report of the PEIR.

13.4.4 Baseline environment

13.4.4.1 Marine archaeology is considered within the following categories:

- Submerged prehistoric archaeology: This includes paleochannels and other inundated terrestrial landforms that may preserve sequences of sediment of paleoenvironmental interest, Palaeolithic and Mesolithic sites and artefacts
- Maritime archaeology: relates generally to craft or vessels and any of their associated structures and/or cargo
- Aviation archaeology: this comprises all military and civilian aircraft crash sites and related wreckage.

13.4.4.2 Archaeology is considered in terms of periods that represent timeframes which are defined and categorised by the culture of the people of the time. Notable changes in culture and activities are indicated by changes in chronological periods. Dates are referred to as BC (Before Christ), or AD (anno domini). The chronological periods and their corresponding date ranges that are considered within the report are provided in Table 13.7.

Table 13.7: Overview of British archaeological chronology.

Period	Date Range
Palaeolithic	c. 900,000 to 12,000 BC
Mesolithic	12,000 to 4,000 BC
Neolithic	4,000 to 2,500 BC
Bronze Age	2,500 to 800 BC
Iron Age	800 BC to AD 43
Romano-British	AD 43 to 410
Early Medieval	AD 410 to 1066
Medieval	AD 1066 to 1500
Post-medieval	AD 1500 to 1800
19th century	AD 1800 to 1899
Modern	AD 1900 to present day

Submerged prehistoric archaeology

13.4.4.3 The prehistoric archaeological record of the British Isles covers the period from the earliest hominin occupation more than 780,000 BP (Before Present) to the Roman invasion of Britain in 43 AD. During this long span of time, sea level fluctuations caused by three major glaciations (the Anglian, Wolstonian and the Devensian) have shaped the submerged prehistoric landscape within the Morgan marine archaeology study area. The changes in sea level have at times exposed the seabed floor creating a terrestrial and potentially habitable environment, suitable for hominin occupation and exploitation. The submerged prehistoric archaeological potential of the Morgan marine archaeology study area is summarised below and further information is presented in volume 4, annex 13.1: Marine archaeology technical report of the PEIR.

13.4.4.4 Geological periods referred to in this section are defined by the date ranges presented in Table 13.8.

Table 13.8: Geological periods.

Period	Date Range	Notes
Holocene	10,000 BP to Present Day	Mesolithic, Neolithic, Bronze Age, Iron Age, Roman, Medieval, Post Medieval and Modern periods. The Holocene is the current time period within the larger geological time scale known as the Quaternary Period.
Devensian from Post Late Glacial Maximum to Late Glacial Interstadial	18,000 BP to 10,000 BP	Coincides with the Late Upper Palaeolithic and the early Mesolithic.
Devensian up to Late Glacial Maximum	c. 73,000 to 18,000 BP	Arrival in the UK of Late Middle Palaeolithic Neanderthals, who were followed approximately 31,000 BP by Early Upper Palaeolithic, anatomically modern humans (Homo sapiens).
Ipswichian (interglacial)	c. 130,000 to c. 115,000 BP	Last interglacial period in the UK. Overlaps with the Late Middle Palaeolithic.
Wolstonian	c. 374,000 to c. 130,000 BP	Predominantly Pleistocene glaciation. Incorporates the earliest period of the Late Middle Palaeolithic.

Late Middle Palaeolithic (186,000-45,000 BP, 184,000–43,000 BC)

13.4.4.5 Evidence in the form of the presence of deposits representing the Wolstonian Glaciation indicate that the Morgan marine archaeology study area would have been subglacial during the Late Middle Palaeolithic. The analysis of seismic data from within the Morgan Array Area and evidence from the wider area suggests that deposits representing environments favourable for human occupation dating to this period are not likely to be present within the Morgan marine archaeology study area (Jackson *et al.*, 1995; Mellett *et al.*, 2015; Wood, 2022).

Upper Palaeolithic (45,000-10,000 BP, 43,000–8,000 BC)

13.4.4.6 The Devensian glaciation coincides with the Upper Palaeolithic and follows the Ipswichian Interglacial, which was the last period of glaciation to affect the UK. Deglaciation may have commenced from c. 20,000 BP with the Morgan marine archaeology study area being ice free by 18,000 BP. However, the proximity of the Morgan marine archaeology study area to areas of glaciation would suggest a very low potential for human occupation or activity, and therefore the presence of submerged prehistoric archaeological material dating to this period.

13.4.4.7 Sea level and landscape changes within the Morgan marine archaeology study area and it's surrounding environs during the Upper Palaeolithic are not conclusively understood. Some studies suggest that the Liverpool Bay area would have been an entirely marine environment during this time, whilst other evidence indicates that it would have been a partially terrestrial environment dominated by fluvial systems and related floodplains (Brooks *et al*., 2011, Jackson *et al*., 1995, Mellett *et al*., 2015 and Fitch *et al*., 2011). The West Coast Palaeolandscape Study and glaciolacustrine and glaciomarine deposits identified within the survey data support the latter in finding that areas of Liverpool Bay would have been terrestrial following the LGM and therefore potentially capable of supporting human habitation. The date around which the final submergence of the area took place is also not conclusive, with some studies (Brooks *et al*., 2011) indicating submergence of the Morgan Array Area c. 13,000 BP and others arguing for c. 6,000-7,000 BP (Fitch *et al*., 2011).

13.4.4.8 Even if the theory that the Morgan marine archaeology study area was a partially terrestrial environment during the Upper Palaeolithic is accepted, it would likely not have been a favourable environment for human exploitation. Permafrost would have been present in the area, limiting the growth of vegetation and therefore the availability of resources for human exploitation.

Mesolithic (10,000–6,000 BP, 12,000–4,000 BC)

13.4.4.9 Evidence from the site-specific geophysical survey conducted in the Morgan Array Area and modelling conducted as part of the West Coast Palaeolandscape Study (Fitch *et al*. 2011) suggests that the Morgan marine archaeology study area would have been partially intertidal during the Mesolithic. The intertidal represents an environment that is rich in available resources for human exploitation. The landscape would have been one of low energy river systems, kettle holes and water-filled incisions, these features may have also been focal points of prehistoric activity and kettle holes have the potential for Mesolithic and palaeoenvironmental assemblages as evidenced at other kettle hole sites in Killerby, North Yorkshire and Slotseng, Denmark (Hunter and Waddington 2018; Noe-Nygaard *et al.* 2007). The West Coast Palaeolandscape Study indicates that the Morgan Array Area may be situated adjacent to a kettle hole lake.

13.4.4.10 The debated chronology for the submergence of the Morgan marine archaeology study area is significant for this period as if the earlier date of 13,000 BP is accepted then the area would have been fully submerged by the advent of the Mesolithic and therefore incapable of sustaining human occupation. However, if the later date of 7000 to 6000 BP is accepted then the partially terrestrial environment may well have been inhabited by humans and represent the potential for the survival of archaeological material.

Maritime and aviation archaeology

Maritime archaeology potential

Early Prehistoric (Palaeolithic and Mesolithic)

13.4.4.11 There is currently no evidence in the UK for maritime archaeological remains pre-dating the start of the Holocene.

13.4.4.12 Watercraft may have been used in the rivers and estuaries during the Mesolithic for coastal journeys, fishing expeditions, and possibly longer journeys in favourable weather. However due to the paucity of evidence within the archaeological record and the extent of fluvial activity across the Morgan marine archaeology study area, the potential for the survival of any archaeology associated with the maritime environment from the Palaeolithic and Mesolithic periods is considered low.

Neolithic and Bronze Age

13.4.4.13 The potential for evidence of watercraft of vessels dating to the Neolithic period within the Morgan marine archaeology study area is considered to be low.

13.4.4.14 Evidence of Bronze Age maritime activity has been recorded throughout England with the discovery of a number of inland watercraft and sea faring vessels. No such examples have been recorded within or close to the Morgan marine archaeology study area however it is possible that similar crafts may have been utilised to traverse the area. Generally based on the available evidence the potential for the discovery of maritime archaeology dating to the Bronze Age is considered to be low.

Iron Age and Romano-British

13.4.4.15 Evidence of Iron Age maritime activity has been discovered in Britain in the form of Romano-Celtic boats which are examples of a new form of ship construction that was emerging in northwest Europe at the time. No evidence has been found within the Morgan marine archaeology study area and based on the available evidence the archaeological potential is considered to be low. The Roman occupation of Britain was by necessity a maritime endeavour, which would have required continuous transportation of resources and people to the military and civilian sites established by the Romans. Sites such as these can be found along Liverpool Bay and therefore it is likely that there would have been substantial Roman maritime traffic in this area. No evidence has been found within the Morgan marine archaeology study area and based on the available evidence the archaeological potential is considered to be low to moderate.

Early Medieval and Medieval

13.4.4.16 The Early Medieval period marked a change in ship construction techniques coinciding with the end of the Roman occupation of Britain in the 5th century AD and an increasing Anglo-Saxon presence in the form of Norse and Danish Vikings. Several examples have been recorded in Britain.

13.4.4.17 With the Medieval period came a boom in maritime trade across Europe and trade expanded across the Irish Sea at this time also, with Dublin becoming an increasingly important commercial port, contributing to the maritime transportation of goods through the Irish Sea. The rapid technological advances in ship construction during the medieval period can also be attributed to increased military campaigns.

13.4.4.18 Due to the large increase of maritime traffic that would have occurred in the Irish Sea during the early medieval and medieval period, the potential for the discovery of archaeological remains dating from this period is considered to be moderate.

Post Medieval and Modern

13.4.4.19 Records of known wreck sites and losses in UK waters are biased towards the Post-Medieval and Modern periods and therefore the precise locations of most wrecks pre-dating these periods in UK waters are not known. The majority of known and recorded wreck sites lie relatively close to the coast.

13.4.4.20 There was an increase of trade to and from Liverpool from the 16th century and the increase of military activity from the 18th century. From the 18th century onwards there was also rapid developments in shipbuilding technology including the advent of the steam engine and the use of iron hulls. These advances in shipbuilding mean that the incorporation of metal into ship design made shipwrecks more likely to survive on the seafloor and be identifiable in geophysical surveys.

13.4.4.21 Further advances in technology occurred during both World Wars and the east Irish Sea saw extensive activity associated with these periods, therefore the potential for the presence of modern military remains within the Morgan marine archaeology study area is high.

Aviation archaeology

13.4.4.22 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 Generation Assets. The potential for post-war aircraft remains to be discovered within the Morgan marine archaeology study area for the transmission 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.

13.4.4.23 One record relating to a potential aircraft crash site was returned from the UKHO (5418) and NRHE (909495) data within the Morgan marine archaeology study area (Figure 13.1) and considered 'live' by the UKHO. This relates to aircraft wreckage reported by divers in 1991. No wreck, or material of anthropogenic origin was identified within the geophysical data at the stated position.

Known and recorded maritime archaeology

13.4.4.24 Geophysical data collected for the Morgan Array Area recorded 52 anomalies of potential archaeological interest. Of these, five are considered to be high potential anomalies, five are of medium potential and 42 have been classed as low potential anomalies. The distribution of these anomalies are shown in Figure 13.2.

13.4.4.25 The 42 low potential anomalies have been assessed against all available evidence and as a result are considered unlikely to have any archaeological significance and so will not be discussed further in this chapter.

13.4.4.26 The five medium potential anomalies could represent marine archaeology sites from potential debris to wreck. These are shown in Figure 13.2 and presented in Table 13.9. Full details of the medium potential anomalies can be found in volume 4, annex 13.1: Marine archaeology technical report of the PEIR.

Table 13.9: Medium potential anomalies.

ID	Category
Morgan_005	Seabed disturbance
Morgan_0015	Unidentified debris
Morgan_0116	Potential debris
Morgan_0025	Potential wreck
Morgan_0030	Potential debris

13.4.4.27 Five high potential anomalies were identified within the Morgan Array Area (Figure 13.2), all five of which have also been recorded within the UKHO as named wrecks.

13.4.4.28 Morgan_008 (Figure 13.2) lies towards the northeast of the Morgan Array Area, approximately 1.4km south of the northeast edge. The anomaly is visible in both the SSS and MBES data and is recorded by the UKHO and NRHE as the Limesfield (UKHO 5463, NRHE 909403). A British steamship sunk by submarine UB57 on 7th February 1918 whilst on passage from Belfast to Preston with a cargo of cotton waste.

13.4.4.29 Morgan_0017 (Figure 13.2) lies in the east of the Morgan Array Area, approximately 4.3km west of the east boundary. The anomaly is visible in the SSS and MBES data and is recorded by the UKHO and NRHE as the Flying Meteor (UKHO 8250, NRHE 909493). A British paddle steamer tug built in 1864 and sank on 13th March 1874 whilst towing the barque Ravenbourne from Liverpool to Troon.

13.4.4.30 Morgan_0096 (Figure 13.2) lies approximately midway along the northeast edge of the Morgan Array Area, approximately 290m southwest of the boundary. The anomaly is visible in the SSS and MBES data and is recorded by the UKHO and NRHE as the Ben Rein (UKHO 5462, NRHE 909472). A British carrier built in 1905 and sunk by submarine UB57 on 7 February 1918. The crew were allowed to leave the vessel on a small boat and no casualties were reported. The vessel was on passage to Belfast from Liverpool with a general cargo.

13.4.4.31 Morgan_0097 (Figure 13.2) lies towards the south of the Morgan Array Area, approximately 5.6km north-northwest of the most southernly point. The anomaly is visible in the SSS and MBES data and is recorded by the UKHO, NRHE and NMRW (UKHO 7458, NRHE 909402, NMRW 506875) as the wreck of the Hibernian, a British steam ship built in 1875 and lost on 12 August 1894 following a collision with the British paddle steamer Prince of Wales whilst on passage from Garston to Glasgow.

13.4.4.32 Morgan_0009 (Figure 13.2) lies towards the south of the Morgan Array Area, approximately 2.3km northeast of the south boundary. The anomaly is visible in the SSS and MBES data and is recorded by the UKHO and NMRW (UKHO 7459, NMRW 506874) as the wreck of the Lucy, a small British steam ship built in 1899 and sunk on the 21 July 1910 whilst on passage from Weston Point to Douglas with a cargo of moulding.

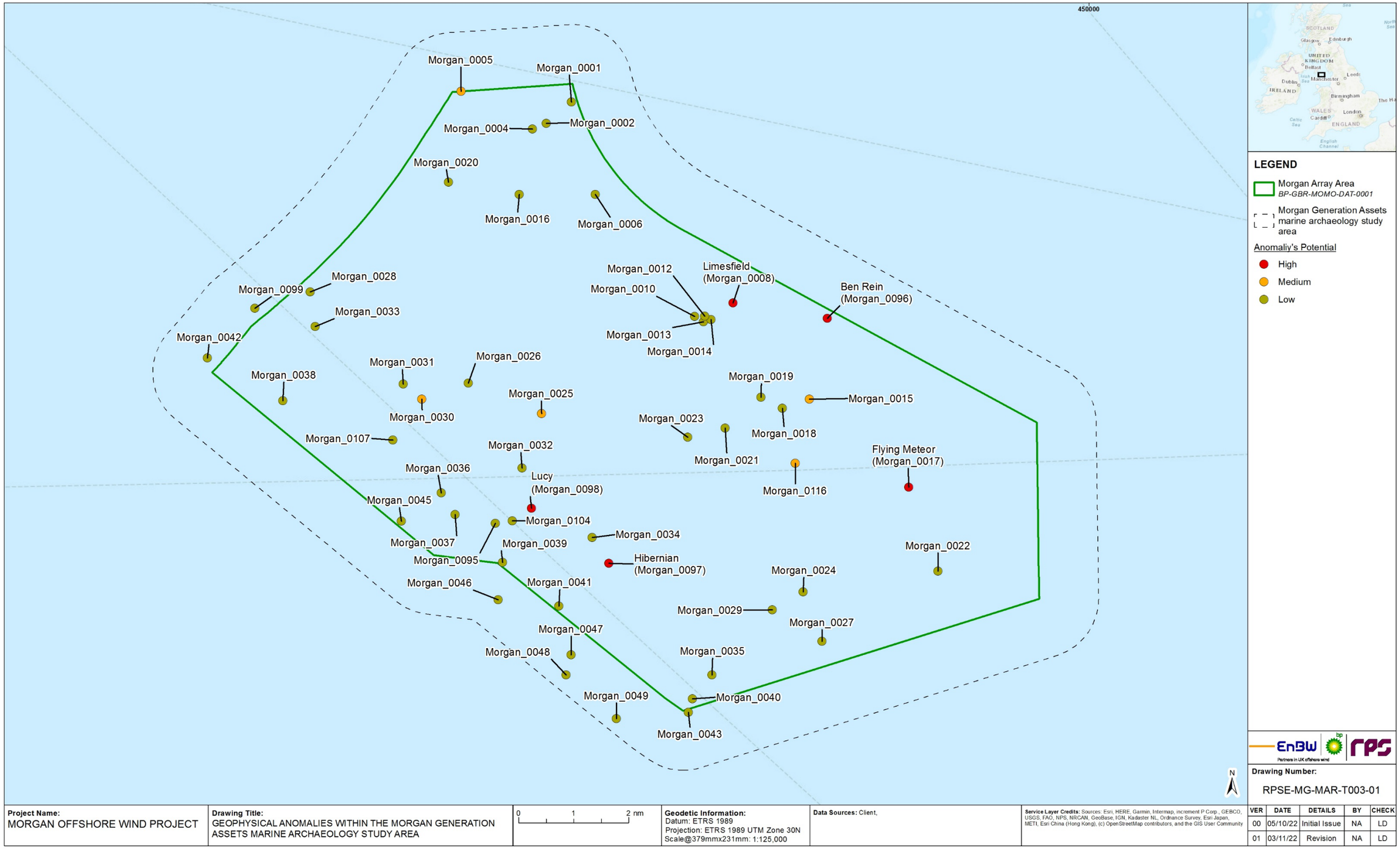

Figure 13.2: Geophysical Anomalies within the Morgan Generation Assets marine archaeology study area.

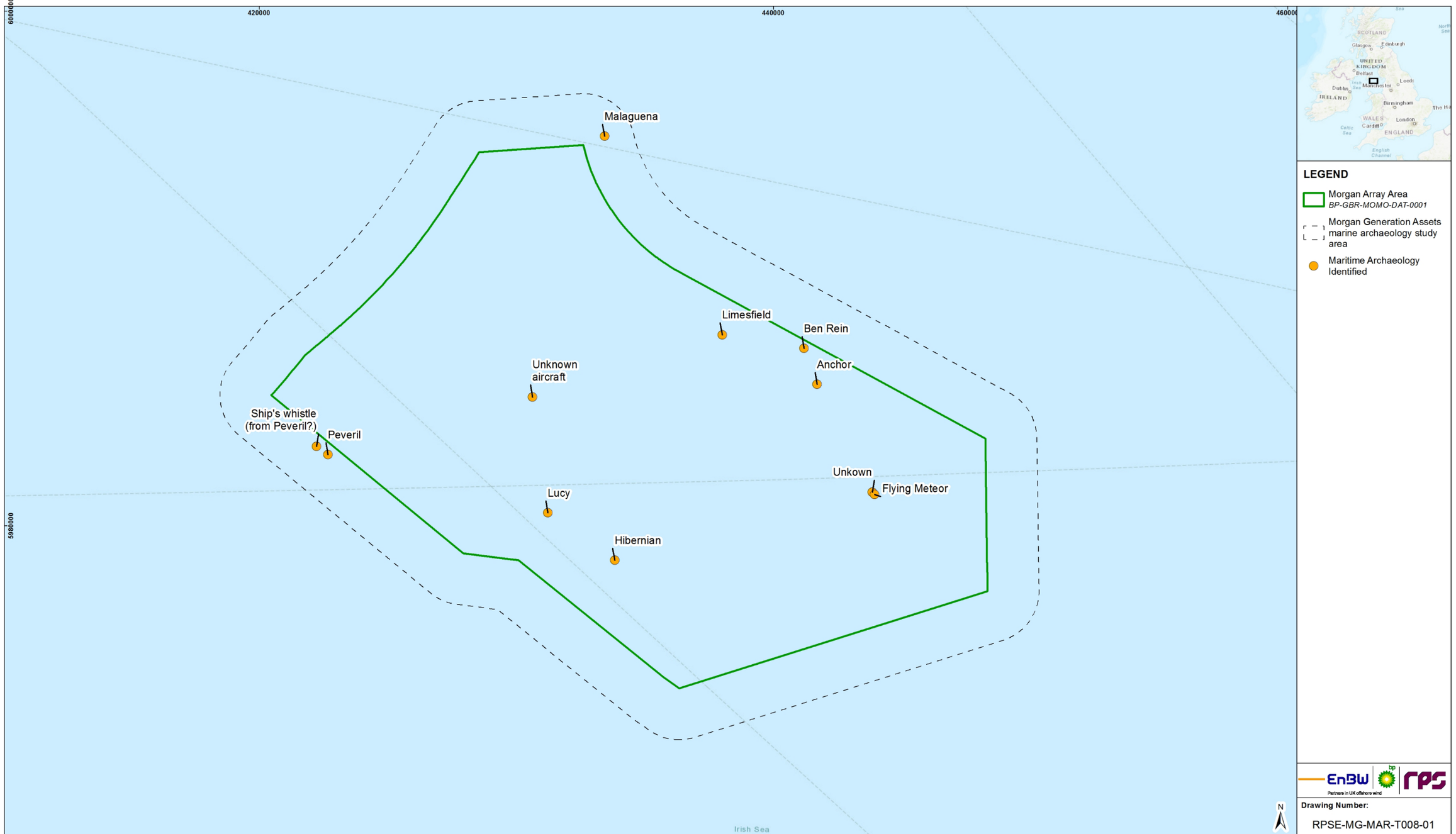

Figure 13.3: Maritime archaeology identified within the desktop data for the Morgan Generation Assets marine archaeology study area.

13.4.5 Future baseline scenario

13.4.5.1 The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 require that "an outline of the likely evolution thereof without implementation of the development as far as natural changes from the baseline scenario can be assessed with reasonable effort on the basis of the availability of environmental information and scientific knowledge" is included within the Environmental Statement. In the event that Morgan Generation Assets does not come forward, an assessment of the future baseline conditions has been carried out and is described within this section.

13.4.5.2 It is unlikely that significant change will occur to the marine archaeology of the Morgan marine archaeology study area over the next few decades. It is likely that sediment mobility will continue, and this natural process retains the potential to expose and re-bury marine archaeology, leading to their deterioration over time. It is also possible that new marine archaeology sites and wrecks will be exposed.

13.4.6 Data limitations

13.4.6.1 The records held by the United Kingdom Hydrographic Office (UKHO), NRHE and NMRW and the other sources used in this assessment are not a record of all surviving cultural heritage assets, rather a record of the discovery of a wide range of archaeological and historical components of the marine historic environment. The information held within these datasets is not complete and does not preclude the subsequent discovery of further elements of the historic environment that are, at present, unknown. In particular, this relates to buried archaeological features.

13.4.6.2 The interpretation of geophysical and hydrographic data is by its very nature, subjective. However, by using an experienced specialist who can analyse the form, size and characteristics of an anomaly, a reasonable degree of certainty can be achieved. Measurements can be taken in most data processing software, and whilst largely accurate, discrepancies can occur. Where there is uncertainty as to the potential of an anomaly or its origin, a precautionary approach is always taken to ensure the most appropriate mitigation for the historic environment is recommended. There may be instances where a contact may exist on the seabed but not be visible in the geophysical data. This may be due to the anomaly being covered by sediment or being obscured from the line of sight of the sonar, or due to poor quality data. The desk-based sources and the site-specific survey data examined represent a comprehensive and robust sequence of datasets and observations that allow for a detailed assessment of the archaeological constraints associated with the Morgan Array Area. Further geophysical and geotechnical survey analysis of the Morgan Array Area is planned and the results of which incorporated in the Environmental Statement.

13.5 Impact assessment methodology

13.5.1 Overview

13.5.1.1 The marine archaeology impact assessment has followed the methodology set out in volume 1, chapter 5: EIA methodology of the PEIR.

13.5.2 Impact assessment criteria

13.5.2.1 The criteria for determining the significance of effects is a two-stage process that involves defining the magnitude of the impacts and the sensitivity of the receptors. This section describes the criteria applied in this chapter to assign values to the magnitude of potential impacts and the sensitivity of the receptors. The terms used to define magnitude and sensitivity are based on those which are described in further detail in volume 1, chapter 5: EIA methodology of the PEIR.

13.5.2.2 The criteria for defining magnitude in this chapter are outlined in Table 13.10 below.

Table 13.10: Definition of terms relating to the magnitude of an impact.

Magnitude of impact	Definition
High	Total loss of, or major alteration to, key elements/features of the baseline (pre-development) conditions such that post development character/composition/attributes will be fundamentally changed and may be lost from the site altogether.
Medium	Loss of, or alteration to, more key elements/features of the baseline conditions such that post development character/composition/attributes of baseline will be partially changed.
Low	Minor shift away from baseline conditions. Change arising from the loss/alteration will be discernible but underlying character/composition/attributes of baseline condition will be similar to pre-development circumstances/patterns.
Negligible	Very slight change from baseline condition. Change barely distinguishable, approximating to the ‘no change’ situation.
No change	No change from baseline conditions.

13.5.2.3 The capability of a receptor to accommodate change and its ability to recover if affected is a function of its sensitivity. Receptor sensitivity is typically assessed via the following factors:

- Adaptability - the degree to which a receptor can avoid or adapt to an effect
- Tolerance - the ability of a receptor to accommodate temporary or permanent change without significant adverse impact
- Recoverability - the temporal scale over and extent to which a receptor will recover following an effect
- Value - a measure of the receptor's importance, rarity and worth.

13.5.2.4 Marine archaeology receptors cannot adapt, tolerate or recover from impacts resulting in damage or loss caused by development. As a result, the sensitivity of a receptor can only be determined through its value.

13.5.2.5 Based on HE's Conservation Principles, Policies and Guidance for the Sustainable Management of the Historic Environment (English Heritage, 2008) the significance of a historic asset 'embraces all the diverse cultural and natural heritage values that people associate with it, or which prompt them to respond to it'. Significance is determined by the following value criteria:

- Evidential value - deriving from the potential of a place to yield evidence about past human activity
- Historical value - deriving from the ways in which past people, events and aspects of life can be connected through a place to the present. It tends to be illustrative or associative
- Aesthetic value - deriving from the ways in which people draw sensory and intellectual stimulation from a place
- Communal value - deriving from the meanings of a place for the people who relate to it, or for whom it figures in their collective experience or memory. Communal values are closely bound up with historical (particularly associative) and aesthetic values but tend to have additional and specific aspects.

13.5.2.6 Historic England's Ships and Boats: Prehistory to Present - Selection Guide (Historic England, 2017) sets a criteria of value to shipwrecks specifically that is defined as:

- Period
- Rarity
- Documentation
- Group value
- Survival/condition
- Potential.

13.5.2.7 The criteria for defining value, and therefore sensitivity, in this chapter are outlined in Table 13.11 below.

Table 13.11: Definition of terms relating to the value (and therefore sensitivity) of the receptor.

Value	Definition
Very High	Singular or excellent example and/or significant or high potential to contribute to knowledge and understanding. Receptors with a demonstrable international or national dimension to their importance are likely to fall within this category. Wrecked ships and aircraft that are protected under the Protection of Wrecks Act 1973, Ancient Monuments and Archaeological Areas Act 1979 or Protection of Military Remains Act 1986 with an international dimension or their importance as well as as-yet undesignated sites that are demonstrably of very high archaeological value. Known submerged prehistoric sites and landscapes with a confirmed presence of largely in situ artefactual material or palaeogeographic features with demonstrable potential to include artefactual and/or palaeoenvironmental material, possibly as part of a prehistoric site or landscape.
High	Good example and/or high potential to contribute to knowledge and understanding. Includes shipwrecks and aircraft that are protected under the Protection of Wrecks Act 1973, Ancient Monuments and Archaeological Areas Act 1979 or Protection of Military Remains Act 1986 as well as as-yet undesignated sites that do not have statutory protection or equivalent significance, but have high potential based on an assessment of their importance in terms of build, use, loss, survival and investigation (BULSI). Prehistoric deposits with high potential to contribute to an understanding of the palaeoenvironment.
Medium	Average example and/or moderate potential to contribute to knowledge and understanding and/or outreach. Includes wrecks of ships and aircraft that do not have statutory protection or equivalent significance, but have moderate potential based on an assessment of their importance in terms of BULSI. Prehistoric deposits with moderate potential to contribute to an understanding of the palaeoenvironment.
Low	Below average example and/or low potential to contribute to knowledge and understanding and/or outreach. Includes wrecks of ships and aircraft that do not have statutory protection or equivalent significance, but have low potential based on an assessment of their importance in terms of BULSI. Prehistoric deposits with low potential to contribute to an understanding of the palaeoenvironment.
Negligible	Poor example and/or little or no potential to contribute to knowledge and understanding and/or outreach. Assets with little or no surviving archaeological interest.

13.5.2.8 The significance of the effect upon marine archaeology is determined by correlating the magnitude of the impact and the sensitivity of the receptor. The particular method employed for this assessment is presented in Table 13.12. Where a range of significance of effect is presented the final assessment for each effect is based upon expert judgement.

13.5.2.9 For the purposes of this assessment, any effects with a significance level of minor or less have been concluded to be not significant in terms of the EIA Regulations.

Table 13.12: Matrix used for the assessment of the significance of the effect.

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
High	No change	Minor	Minor or Moderate	Moderate or Major	Major
Very High	No change	Minor	Moderate or Major	Major	Major

13.6 Key parameters for assessment

13.6.1 Maximum design scenario

13.6.1.1 The MDS identified in Table 13.13 have been selected as those having the potential to result in the greatest effect on an identified receptor or receptor group. These scenarios have been selected from the Project Design Envelope provided in volume 1, chapter 3: Project description of the PEIR. Effects of greater adverse significance are not predicted to arise should any other design scenario, based on details within the Project Design Envelope (e.g. different infrastructure layout), to that assessed here be taken forward in the final design scheme.

13.6.1.2 In assessing the effects of the Morgan Generation Assets on marine archaeology the assessment has been undertaken on the basis of i) the greatest area of near-surface sediments disturbed and ii) the greatest penetration depth of foundations. These two assessments are undertaken as they have very different effects on the marine historic environment, making it difficult to identify which option can best be said to represent the greatest effect.

13.6.1.3 Impacts on Historic Seascape Character (HSC) are considered in the Seascape, Landscape and Visual Impact Assessment (SLVIA) chapter (volume 2, chapter 25 of the PEIR).

Table 13.13: MDS considered for assessment of potential impacts on marine archaeology.

*C=construction, Operation and maintenance, D=decommissioning

Potential Impact	Phase C	Phase O	Phase D	MDS	Justification
Sediment disturbance and deposition leading to indirect impacts on marine archaeology receptors. (the exposure or burial of receptors).	✓	✓	✓	**Construction phase** Site preparation: Sandwave clearance: • Sandwave clearance activities undertaken over a 12 + 3 month duration within the wider four year construction programme • Wind turbines and Offshore Substation Platform (OSP) foundations: the MDS assumes that sandwave clearance for wind turbine foundations and that clearance is required at up to 60% of locations. Spoil volume per location has been calculated on the basis of 41 locations supporting the largest suction bucket four legged jacket foundation with an associated base diameter of 205m to an average depth of 7.5m. This equates to a total spoil volume of 10,149,455m^3 and a volume of 247,548m^3 per location • Inter-array cables: sandwave clearance along 250km of cable length, with a width of 104m, to an average depth of 5.1m. Total spoil volume of 11,843,641m^3 • Interconnector cables: sandwave clearance along 30km of cable length, with a width of 104m, to an average depth of 5.1m. Total spoil volume of 3,060,814m^3 • Removal of up to 46km of disused cables. Foundation installation: • Undertaken over an approximate 12 month duration • Wind turbines: installation of up to 68 monopiles of 16m diameter, drilled to a depth of 60m at a rate of up to 0.89m/h. Two monopiles installed concurrently. Spoil volume of 13,460m^3 per pile. • OSPs: installation of one OSP with foundations consisting of two 16m monopiles, drilled to a depth of 60m at a rate of up to 0.73m/h. Two monopiles installed concurrently. Spoil volume of 13,460m^3 per pile. Cable installation: • Inter-array cables: Installation via trenching of up to 500km of cable, with a trench width of up to 3m and a depth of up to 3m. Total spoil volume of 2,250,000m^3. Installed over a period of approximately 12 months • Interconnector cables: installation via jetting of up to 60km of cable, with a trench width of up to 3m and a depth of up to 3m. Total spoil volume of 270,000m^3. Installed over a period of approximately four-months **Operations and maintenance phase** • Project lifetime of 35 years • Inter-array cables: repair of up 8km of cable in one event every three years. Reburial of up to 20km of cable in one event every five years • Interconnector cables: repair of up to 20km of cable in each of three events every 10 years. Reburial of up to 3km of cable in one event every five years **Decommissioning phase** • Cables and scour and cable protection will remain in situ. If suction caissons are removed using the overpressure to release them then SSC will be temporarily increased.	Site preparation: The volume of material to be cleared from individual sandwaves will vary according to the local dimensions of the sandwave (height, length, and shape) and the level to which the sandwave must be reduced. These details are not fully known at this stage, however based on the available data, it is anticipated that the sandwaves requiring clearance in the array area are likely to be in the range 15m in height. Site clearance activities may be undertaken using a range of techniques, the suction hopper dredger will result in the greatest increase in suspended sediment and largest plume extent as material is released near the water surface during the disposal of material. Boulder clearance activities will result in minimal increases in SSCs and have therefore not been considered in the assessment. Foundation installation: Installation of foundations via augured (drilled) operations results in the release of the largest volume of sediment. The greatest volume of sediment disturbance by drilling at individual foundation locations and across the site as a whole is associated with the largest diameter monopile for wind turbines. The selected OSP scenario represents the greatest volume of sediment to be released for a drilling event. The greatest drilling rate represents the maximum level of increase in SSC. Cable installation: Cable routes inevitably include a variety of seabed material and in some areas 3m depth may not be achieved or may be of a coarser nature which settles in the vicinity of the cable route. The assessment therefore considers the upper bound in terms of suspended sediment and dispersion potential. Cables may be buried by ploughing, trenching or jetting with jetting mobilising the greatest volume of material to increase SSCs. Operations and maintenance phase: The greatest foreseeable number of cable reburial and repair events is considered to the MDS for sediment dispersion.

Potential Impact	Phase C	Phase O	Phase D	MDS	Justification
Direct damage to marine archaeology receptors (e.g. wrecks, debris, submerged prehistoric receptors (palaeolandscapes and associated archaeological receptors)	✓	✓	✓	**Construction phase** Up to 1,509,530m^2 of seabed loss over the lifetime of the Morgan Generation Assets associated with the following: • Presence of foundations and scour protection: up to 755,890m^2 of seabed loss comprising: – Wind turbines: up to 735,488m^2 from the presence of up to 68 wind turbine foundations on suction bucket 4-legged jacket foundations with associated scour protection – OSPs: up to 20,402m^2 from two OSPs on suction bucket 4-legged jacket foundations with associated scour protection • Presence of cable protection: up to 620,000m^2 of seabed loss comprising: – Inter-array cable protection: 500,000m^2 associated with up to 10% of 500km of inter-array cables (10m width of cable protection). – Interconnector cable protection: 120,000m^2 for up to 20% of 60km of interconnector cables (10m width of cable protection). • Presence of cable crossing protection: up to 133,640m^2 of seabed loss comprising: – Cable protection for cable crossings for inter-array cables: 128,640m^2 from 67 cable crossings (each up to 60m in length and 32m in width) – Cable protection for cable crossings for interconnector cables: 5,000m^2 from 10 cable crossings (each up to 50m in length and 20m in width) • Operations and maintenance phase up to 35 years. **Operation and maintenance phase** Up to 11,566,500m^2 of seabed loss/disturbance due to: • Up to 2,026,500m^2 of seabed loss/disturbance due to jack-ups at wind turbines and OSPs over the lifetime of the Morgan Offshore Wind Project for the following: – Up to 937 major component replacements (one every four years for each location) for wind turbines – 12 major component replacements (three over the lifetime per OSP) for OSPs – Four access ladder replacements and four modifications to/replacement of J-tubes for wind turbines – Four access ladder replacements and four modifications to/replacement of J-tubes for OSPs • Up to 9,540,000m^2 of seabed loss/disturbance due to inter-array and interconnector cables – Inter-array cables: up to 20,000m for reburial events every five years and up to 8km for cable repair events every three years (assuming 20m width seabed disturbance for repair and remedial burial) – Interconnector cables: up to 3km for reburial events with one event every five years and up to 20km of cable in each of three events every 10 years for repair events (assuming 20m width seabed disturbance for repair and remedial burial) **Decommissioning phase** Up to 1,453,250m^2 of permanent subtidal seabed loss due to scour and cable protection left *in situ* post decommissioning.	Largest wind turbine and OSP foundation type and associated scour protection, maximum length of cables and cable protection resulting in greatest extent of seabed loss. MDS for decommissioning assumes removal of the foundations, if any additional infrastructure is decommissioned, this will result in a reduced area of seabed loss. Greatest amount of cable and scour protection resulting in the largest area of infrastructure to be left *in situ* after decommissioning.
Direct damage to deeply buried marine archaeology receptors – submerged prehistoric receptors (palaeolandscapes and associated archaeological receptors)	✓			As above for “Direct damage to archaeological receptors”. • Up to 10,816m^2 seabed disturbance from installation of up to 68 wind turbines with 4-legged suction bucket foundations.	Maximum depth of seabed disturbance of foundation installation represents the maximum impact to submerged prehistoric archaeological receptors.

Potential Impact	Phase C	Phase O	Phase D	MDS	Justification
Alteration of sediment transport regimes.		✓		**Operations and maintenance phase** • Wind turbines: 68 installations with four-legged suction bucket foundations, each jacket leg with a diameter of 5m, spaced 48m apart, and each bucket with a diameter of 16m. Scour protection to a height of 2.5m. Total footprint of 10,816 m^2 per wind turbine • OSPs: four installations with four-legged suction bucket foundations, each jacket leg with a diameter of 3m, spaced 30m apart, and each bucket with a diameter of 14m. Scour protection to a height of 2.5m. Total footprint of 6,241m^2 footprint per OSP • Inter-array cables: cable protection along 50km of the cable, with a height of up to 3m and up to 10m width. Up to 67 cable crossings, each crossing has a height of up to 4m, a width of up to 32m and a length of up to 60m • Interconnector cables: cable protection along 12km of the cable, with a height of up to 3m and up to 10m width. Up to ten cable crossings, each crossing has a height of up to 3m, a width of up to 20m and a length of up to 50m.	This provides the largest obstruction to flow in the water column. See volume 2, chapter 6: Physical processes of the PEIR.

13.6.2 Impacts scoped out of the assessment

13.6.2.1 On the basis of the baseline environment and the description of development outlined in volume 1, chapter 3: Project description of the PEIR, no impacts are proposed to be scoped out of the assessment for marine archaeology.

13.7 Measures adopted as part of the Morgan Generation Assets

13.7.1 Overview

13.7.1.1 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 the location or design envelope of the Morgan Offshore Wind Project which are integrated into the application for consent. These measures are secured through the consent itself through the description of the development and the parameters secured in the DCO and/or marine licences (referred to as primary mitigation in IEMA, 2016).
- Measures required to meet legislative requirements, or actions that are generally standard practice used to manage commonly occurring environmental effects and are secured through the DCO requirements and/or the conditions of the marine licences (referred to as tertiary mitigation in IEMA, 2016).

Table 13.14: Measures adopted as part of the Morgan Generation Assets.

Measures adopted as part of the Morgan Generation Assets	Justification	How the measure will be secured
Primary measures: Measures included as part of the project design		
The identification and implementation of AEZs around those sites identified as having high and medium archaeological potential (Table 13.16). Further details of which to be provided in the Outline WSI submitted at application. Final wind turbine locations to avoid any known archaeological constraints identified in pre-construction site investigation surveys through micrositing.	To avoid direct impacts on sites of identified archaeological significance.	Proposed to be secured through a condition in the marine licence(s).
The identification and implementation of Temporary Archaeological Exclusion Zones (TAEZs) based on all available information including the stated positional accuracy, the recorded size of the target and the potential archaeological significance around those records for wrecks and obstructions outside of the survey data coverage but within the Morgan Generation Assets boundary. Further details of which to be provided in the Outline WSI submitted at application.	To avoid impacts on sites of archaeological importance.	Proposed to be secured through a condition in the marine licence(s).
Archaeological input into specifications for, and archaeological analysis of, any further pre-construction geophysical and geotechnical surveys. Further details of which to be provided in the Outline WSI submitted at application.	To identify any sites of archaeological importance that may require further investigation, avoidance or engagement with the Statutory Historic Body. To offset the impacts of the Morgan Generation Assets on sediments of geoarchaeological/palaeoenvironmental importance and enhance knowledge of the offshore marine archaeological resource.	Proposed to be secured through a condition in the marine licence(s).
Morgan Generation Assets archaeologists to be consulted in the preparation of any pre-construction ROV/diver surveys and, if appropriate, in monitoring/checking of data. Further details of which to be provided in the Outline WSI submitted at application.	To identify any sites of archaeological importance that may require further investigation, avoidance or engagement with the Statutory Historic Body.	Proposed to be secured through a condition in the marine licence(s).
Operational awareness of the location of those archaeological anomalies identified as having a low potential. Reporting through the agreed PAD will be undertaken should material of potential archaeological interest be encountered. Further details of which to be provided in the Outline WSI submitted at application.	To identify any sites of archaeological importance that may require further investigation, avoidance or engagement with the Statutory Historic Body.	Proposed to be secured through a condition in the marine licence(s).
Archaeologists to be consulted in the preparation of pre-construction cable route clearance or other pre-construction clearance operation and, if appropriate, to carry out archaeological monitoring of such work. Further details of which to be provided in the Outline WSI submitted at application.	To record archaeological remains that may be affected by pre-construction clearance operation.	Proposed to be secured through a condition in the marine licence(s).
Mitigation of unavoidable direct impacts on known sites of archaeological significance: Options include i) preservation by record; ii) stabilisation; iii) detailed analysis and safeguarding of otherwise comparable sites elsewhere. Further details of which to be provided in the Outline WSI submitted at application.	To offset the effects of disturbance/destruction of irreplaceable archaeological remains.	Proposed to be secured through a condition in the marine licence(s).
Tertiary measures: Measures required to meet legislative requirements, or adopted standard industry practice		
Development and adherence to a WSI and PAD	The Outline WSI will be submitted alongside the application and will contain a method statement for pre-construction surveys and details of monitoring requirements. The PAD will ensure the protection and, if necessary recording of previously unknown sites/objects of archaeological significance affected by the development.	Proposed to be secured through a condition in the marine licence(s).

13.7.2 rchaeological exclusion zones (AEZs)

13.7.2.1 Best practice favours the preservation in situ of archaeological remains, therefore the ideal preferred mitigation for archaeological remains is avoidance (COWRIE, 2011). For the Morgan Generation Assets, AEZs have been proposed that prohibit development-related activities within their extents, which vary depending upon the nature of the site. The final Morgan Generation Assets layout will take into account these preliminary zones, which may evolve or be removed (with the agreement of the MMO and HE) as the Morgan Generation Assets progresses, subject to layout designs and additional subsequent surveys that may be required.

13.7.2.2 All AEZs agreed with the statutory historic body, through the Offshore WSI, will be marked on the Design Plan. If impacts cannot be avoided, measures to reduce, remedy or offset disturbance will be agreed.

13.7.2.3 In view of their potential archaeological significance, AEZs (either in the form of individual AEZs or clusters) will be placed around the five anomalies classified as being of high archaeological potential and the five anomalies classed as being of medium potential that have been identified within the Morgan Array Area. These anomalies have been recommended AEZs based on the size of the anomaly, the extents of any debris, the potential significance of the anomaly, the potential impact of the development and the seabed dynamics within the area.

13.7.2.4 Dependant of the form of the anomaly, AEZs have either been recommended as a radius' from the centre point of the anomaly or as a distance from the extents. Particularly in the case of shipwrecks, which tend to be longer in length than width, the use of a circle provides unequal protection around the extents. This not only impacts the protection afforded but does not present proportional mitigation.

13.7.2.5 The proposed AEZs are listed in Table 13.15 and shown in Figure 13.4. Scope is allowed for their amendment in light of further evidence and with the involvement of consultees. Further details of AEZs and archaeological monitoring will be provided in the Outline WSI and PAD. AEZs can be different sizes depending on the size of the archaeological anomaly and the extent to which there is associated debris present on the seabed.

13.7.2.6 The AEZs identified for the Morgan marine archaeology study area have been reviewed against desk based and site-specific data, and as a result of this review AEZ's have been identified of varying sizes according to the size and spread of the individual archaeological receptor.

13.7.2.7 AEZs are presented as either extents or radius, extents indicates the distance proposed from the furthest extents of the archaeological anomaly whilst a radius AEZ is one that is measured as a circumference from the central point of the anomaly.

Table 13.15: Proposed AEZs within the Morgan marine archaeology study area.

ID	Description	Potential	Eastings	Northings	AEZ (m)
Morgan_0098	Wreck	High	431235.40	5980516.90	50m extents
Morgan_0005	Seabed disturbance	Medium	428856.55	5994556.41	50m radius
Morgan_0030	Unidentified debris	Medium	427532.81	5984191.77	25m radius
Morgan_0116	Unidentified debris	Medium	440109.49	5982030.42	30m radius
Morgan_0017	Wreck	High	443931.72	5981226.52	50m extents
Morgan_0097	Wreck	High	433834.14	5978659.42	50m extents
Morgan_0008	Wreck	High	438011.85	5987429.65	50m extents
Morgan_0096	Wreck	High	441193.65	5986904.68	50m extents
Morgan_0015	Unidentified debris	Medium	440592.83	5984185.02	25m radius
Morgan_0025	Potential debris	Medium	431565.53	5983703.41	35m radius

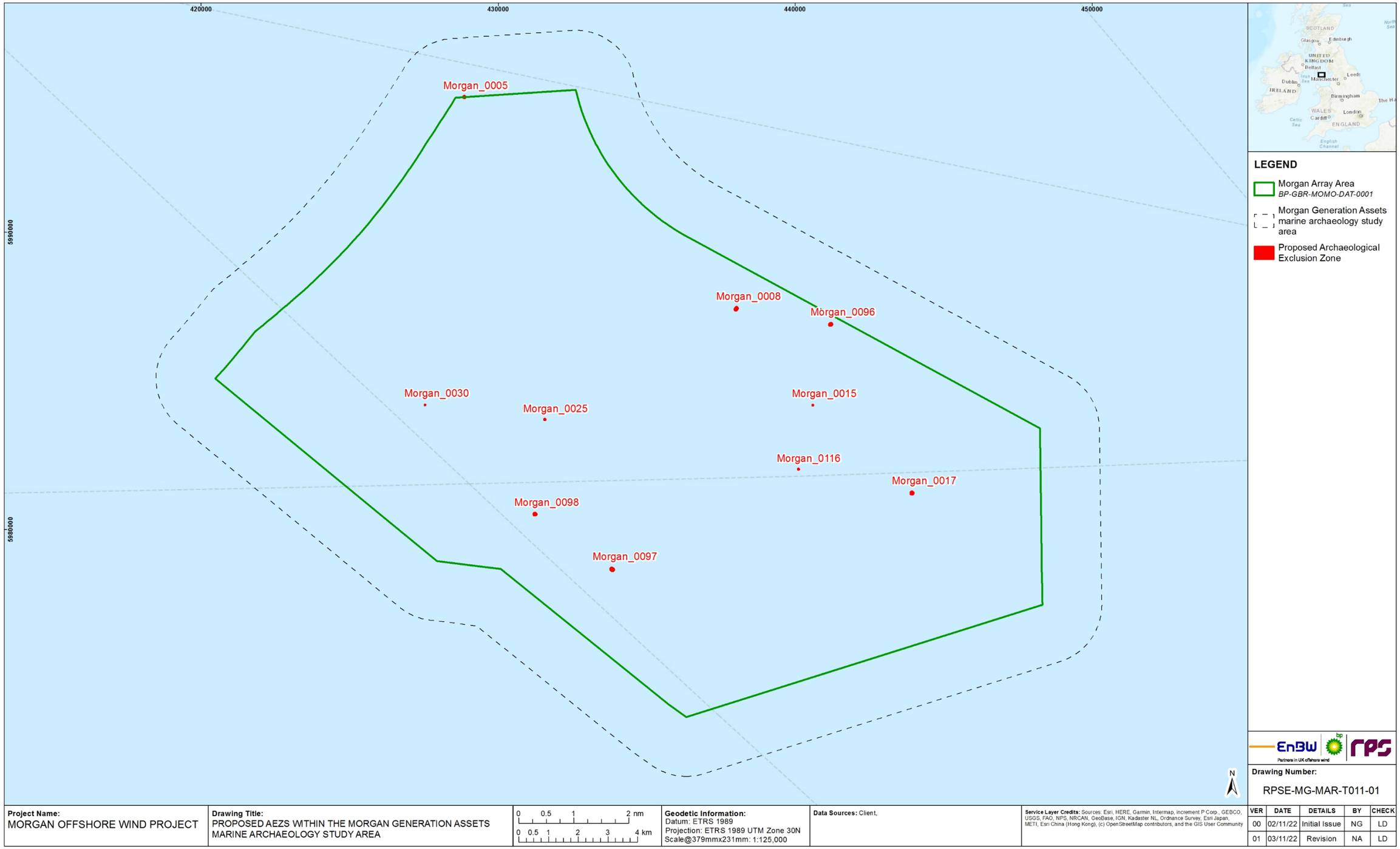

Figure 13.4: Proposed AEZs within the Morgan marine archaeology study area.

13.7.3 Preservation by record

13.7.3.1 Where preservation in situ is not practicable, disturbance of archaeological sites or material will be offset by appropriate and satisfactory measures, also known as 'preservation by record'. In these circumstances, the effects of the Morgan Generation Assets will be offset by carrying out excavation and recording prior to the impact occurring (COWRIE, 2011).

13.7.3.2 It is likely that previously unknown wrecks, archaeological sites or material may only be encountered during the course of the construction, maintenance and/or decommissioning of Morgan Generation Assets. Procedures will therefore be put in place to allow for such eventualities.

13.7.3.3 The Offshore Renewables Protocol for Archaeological Discoveries (The Crown Estate, 2014) will be followed, which will involve the reporting of archaeological discoveries made during the lifetime of the Morgan Generation Assets. This protocol covers the reporting and investigating of unexpected archaeological discoveries encountered during construction, operation and maintenance and decommissioning activities, informed by the guidance of a marine archaeologist specialised in working with PADs for offshore wind farm projects. This protocol further makes provision for the implementation of TAEZs around areas of possible archaeological interest, for prompt archaeological advice and, if necessary, for archaeological inspection of important features prior to further construction, maintenance or decommissioning activities in the vicinity. It complies with the Merchant Shipping Act 1995, including notification to the Receiver of Wrecks, in accordance with the Code of Practice for Seabed Developers (Joint Nautical Archaeology Policy Committee (JNAPC) 2006).

13.7.3.4 In view of the potential for the presence of palaeolandscapes, associated prehistoric sites and unidentified wrecks, archaeological monitoring is deemed as appropriate where seabed material is brought to the surface. These proposals may be refined on the basis of the results of any further marine geophysical, geotechnical or diver/ROV+ surveys.

13.8 Assessment of significant effects

13.8.1 Overview

13.8.1.1 The impacts of the construction, operation and maintenance, and decommissioning phases of the Morgan Generation Assets have been assessed on marine archaeology. The potential impacts arising from the construction, operation and maintenance and decommissioning phases of the Morgan Generation Assets are listed in Table 13.13, along with the MDS against which each impact has been assessed.

13.8.1.2 A description of the potential effect on marine archaeology receptors caused by each identified impact is given below.

13.8.2 Sediment disturbance and deposition leading to indirect impacts on marine archaeology receptors.

13.8.2.1 The construction, operation and maintenance and decommissioning of the Morgan Generation Assets may lead to sediment disturbance and deposition leading to indirect impacts on marine archaeology receptors. The MDS is represented by sandwave clearance, foundation installation and cable installation and is summarised in Table 13.13.

13.8.2.2 The disturbance of sediment/seabed deposits can result in the exposure of known marine archaeology receptors (i.e. wreck sites) and the exposure of as yet unknown wreck sites and associated materials. Such activities can also result in the burial of known receptors.

Construction, operation and maintenance and decommissioning phases

Magnitude of impact

13.8.2.3 The project design includes the provision of site preparation/sandwave clearance activities which have the potential to increase suspended sediment concentrations in the construction phase with associated deposition. Sandwave clearance was calculated for 60% of the wind turbine and OSP foundations at a width of 205m and a depth of 7.5m. The MDS for sandwave clearance for cable installation assumes up to 50% of the 500km length of the inter array cable with a width of 104m, to an average depth of 5.1m. Similarly, the MDS for sandwave clearance at the same depth and width may be required along up to 60% of 60km of the interconnector with modelling assuming a clearance dredging rate of 10,000 m^3/h and a 3% spill of material during the dredging phase.

13.8.2.4 In practice, plough dredging which mobilises a much smaller amount of sediment into suspension at the seabed and has reduced sediment plume concentrations and extents compared to other types of dredging activities may be undertaken. However, the physical processes modelling simulated the use of a suction hopper dredger with a phasing representative of the scale of the sandwaves; dredging, and then depositing material within the cable corridor as it progressed along the route, resulting in higher quantification of sedimentation compared to plough dredging.

13.8.2.5 The installation of infrastructure within the Morgan Offshore Array Area may lead to increased suspended sediment concentrations and associated deposition. For increased SSC plumes, the MDS is for the drilled installation of up to 68 monopiles of 16m diameter. Included is the installation of the largest single OSP with foundations consisting of two 16m monopiles, drilled to a depth of 60m. Up to two monopiles may be installed concurrently.

13.8.2.6 The modelled scenarios examined a range of locations across the Morgan Array Area with two concurrent drilling operations at adjacent locations. The drilled pile installations are anticipated to generate plumes with a suspended sediment level of <50mg/l. These levels would be localised and only persist for a short period. Concentrations within the wider plume envelope are much lower, typically <1mg/l a short distance from the discharge locations. Following the cessation of drilling the turbidity levels reduce within a few hours as tidal currents reduce. Some of the finer material associated with the drilling process is re-suspended during successive tides as it is redistributed but turbidity levels remain low. The sedimentation beyond the immediate drilling location is indiscernible (less than 0.1mm). This is due to the relatively slow drilling rate (0.73m/hour), allowing the fine sediment to be widely dispersed while the larger material settles at the release point due to the limited current speed.

13.8.2.7 For the installation of inter-array cables (500km) and interconnector cables (60km) a trench of up to 3m in width and 3m in depth with a triangular cross section may be excavated. For the inter-array cable installation, the sediment plumes are much larger than those for the pile installation. The reason for this is twofold, firstly there is a large amount of sediment mobilised (98,400m3 of material was mobilised during the two day simulation along the 21.9km modelled route) and secondly there was elevated tidal currents on successive tides which remobilised material over the extended period of installation. Peak plume concentrations are highest at around 500mg/l (at the release site) with the sediment settling during slack water becoming resuspended in the form of an amalgamated plume. Sedimentation of 50mm depth occurs at the trench site, with sediment depths reducing moving away from the trench but remaining in the sediment cell and retained in the sediment transport system.

13.8.2.8 Following the completion of the works the turbidity levels return to baseline within a couple of tidal cycles. It would however be anticipated that spring tides following the works may mobilise and redistribute unconsolidated seabed material deposited at the end of the construction phase; this material will therefore be incorporated into the existing transport regime. Following installation, the native seabed material settles close to where it is mobilised and remains in situ. This would be expected as the baseline modelling indicated that sediment transport potential is limited across the Morgan Array Area. The sedimentation is concentrated along the installation route as material effectively returns to the vicinity from where it was disturbed. Sedimentation depths of <0.5mm arise beyond the immediate vicinity of the trench the day after drilling cessation and therefore would be indistinguishable from the existing seabed sediment.

13.8.2.9 Therefore, sediment disturbance and deposition leading to indirect impacts on marine archaeology receptors during the construction, operation and maintenance and decommissioning of the Morgan Generation Assets is predicted to be of local spatial extent, short term duration, high reversibility. It is predicted that the impact will affect marine archaeology indirectly. The magnitude is therefore considered to be low.

Sensitivity of the receptor

13.8.2.10 The east Irish Sea has historically been an area of high maritime activity and the number of shipwrecks associated with the area highlight the potential for more discoveries to arise. The marine archaeology receptors are vulnerable sites that can be exposed further by disturbance activities.

13.8.2.11 The marine archaeology receptors are deemed to be of high vulnerability, low recoverability and of varying value. The sensitivity of the receptors are therefore considered to be high.

Significance of the effect

13.8.2.12 The measures adopted as part of the Morgan Generation Assets outlined in section 13.7 include measures to ensure that any newly exposed archaeological assets are recorded.

13.8.2.13 Overall, the magnitude of the impact is deemed to be low and the sensitivity of the receptor is considered to be high. Based on professional judgement and the physical processes modelling, the effect will, therefore, be of **minor adverse** significance, which is not significant in EIA terms.

13.8.3 Direct damage to maritime archaeology receptors (e.g. wrecks, debris, submerged prehistoric receptors (palaeolandscapes and associated archaeological receptors)

13.8.3.1 The seabed activities to facilitate the construction, operation and maintenance and decommissioning of the Morgan Generation Assets have the potential to impact both maritime archaeology receptors and submerged prehistoric receptors within the Morgan marine archaeology study area.

Construction, operation and maintenance and decommissioning phases

Magnitude of impact

13.8.3.2 The MDS for the construction phase is comprised of seabed preparation activities for foundations and cables; geotechnical survey activities in the intertidal zone; installation of up to 107 wind turbines and four OSPs, with associated scour protection; the installation of inter-array and interconnector cables and associated cable protection; and any associated jack-up vessel and vessel anchoring activities.

13.8.3.3 The MDS for the operational and maintenance phase is comprised of component replacement activities using jack-up vessels, inter-array and interconnector cable repair or reburial activities, and any associated vessel anchor deployments.

13.8.3.4 Decommissioning of the Morgan Generation Assets infrastructure will involve cable decommissioning and any associated jack-up vessel and vessel anchoring activities. For the purposes of this assessment, the impacts of operation and maintenance and decommissioning activities are predicted to be no greater than those for construction, as set out above.

13.8.3.5 These activities have the potential to directly and permanently impact upon marine archaeology receptors and areas of archaeological potential that lie concealed below the covering sands. These activities also have the potential to expose previously unrecorded marine archaeology receptors.

13.8.3.6 As described in section 13.7, borehole data acquired from geotechnical surveys will be reviewed by a marine archaeologist and the findings will be communicated to HE. Archaeological Exclusion Zones will be established around each known shipwreck site and potential site, within which no installation activities will take place unless permitted by HE. Pre-construction site investigation surveys will be reviewed by a marine archaeologist to inform the refined layout of infrastructure around any newly identified archaeological constraints. Provision will also be made for the recording of any new discoveries.

13.8.3.7 The impact is predicted to be of local spatial extent, long term duration and with no reversibility. It is predicted that the impact will affect the receptor directly. The magnitude is therefore, considered to be low.

Sensitivity of receptor

13.8.3.8 The Morgan marine archaeology study area retains a significant number of shipwrecks and the potential for more discoveries arises with the installation works proposed. Shipwrecks are vulnerable sites that can be exposed by disturbance activities. Each known shipwreck site is regarded as being of importance.

13.8.3.9 The marine archaeology receptor is deemed to be of high vulnerability, low recoverability and of varying value. The sensitivity of the receptor is therefore considered to be high.

Significance of effect

13.8.3.10 Overall, the magnitude of the impact is deemed to be low and the sensitivity of the receptor is considered to be high. Based on professional judgement and the proposed mitigation strategy it is considered that the effect will, therefore, be of minor adverse significance, which is not significant in EIA terms.

13.8.4 Direct damage to deeply buried marine archaeology receptors – submerged prehistoric receptors (e.g. palaeolandscapes and associated archaeological receptors)

13.8.4.1 The seabed activities required to facilitate the construction, operation and maintenance and decommissioning of the Morgan Generation Assets have the potential to impact on previously unrecorded palaeolandscape locations within the Morgan marine archaeology study area.

Construction phase

Magnitude of impact

13.8.4.2 The MDS for the construction phase is comprised of seabed installation of up to 107 wind turbines and four OSPs with pile penetration depth of up to 75m.

13.8.4.3 These activities have the potential to directly and permanently impact palaeolandscape locations that might lie deeply buried below the covering sands.

13.8.4.4 As described in section 13.7, borehole data acquired from the geotechnical surveys will be reviewed by a maritime archaeologist and the findings will be communicated to HE, as detailed in the WSI and PAD which will be prepared to also facilitate the recording and reporting of any archaeological material discovered during installation works.

13.8.4.5 The impact is predicted to be of local spatial extent, long term duration, continuous and low reversibility. It is predicted that the impact will affect the receptor directly. The magnitude is therefore considered to be low.

Sensitivity of receptor

13.8.4.6 There is limited potential for palaeolandscapes and associated submerged prehistoric archaeology to survive in the Morgan Array Area and therefore the installation of wind turbine and OSP foundations have the potential to directly impact marine archaeology receptors.

13.8.4.7 The marine archaeology receptor is deemed to be of moderate vulnerability, low recoverability and of high value. The sensitivity of the receptor is therefore considered to be moderate.

Significance of effect

13.8.4.8 Overall, the magnitude of the impact is deemed to be low and the sensitivity of the receptor is considered to be high. Based on professional judgement and the proposed mitigation strategy it is considered that the effect will, therefore, be of **minor adverse** significance, which is not significant in EIA terms.

13.8.5 Alteration of sediment transport regimes

13.8.5.1 The presence of infrastructure on the seabed can obstruct flow in the water column and lead to localised changes in the sediment transport regimes. This has the potential to impact on marine archaeology within the Morgan marine archaeology study area and the immediate vicinity.

Operation and maintenance phase

Magnitude of impact

13.8.5.2 The MDS in terms of hydrographic impacts is for up to 68 wind turbines with 4-legged suction bucket foundations for each jacket leg at 5m diameter spaced 48m apart, and each bucket with a diameter of 16m. Scour protection at each bucket foundation of 2.5m in height and extending 20m covering a total footprint of 10,816m^2.

13.8.5.3 Additionally, the MDS includes four OSP installations each with gravity base foundations each with a diameter of 14m at the surface and a slab base 52.5m diameter at the bed. Associated scour protection extends from the slab base by 18.3m at a height of 2.6m giving rise to 6,236m^2 footprint per unit. The modelled scenario presented in volume 4, annex 6.1: Physical processes technical report of the PEIR used an alternate arrangement for the inclusion of the OSPs within the modelled scenario.

13.8.5.4 The parameters in terms of seabed footprint and water column obstruction are similar between each wind turbine unit, as modelled, and each of the four OSP units. Therefore, it is appropriate to infer the impacts on sediment transport due to each of the OSPs would be of the same extent and order of magnitude as those modelled wind turbine sites and to occur at the OSP locations.

13.8.5.5 Sediment transport is driven by a combination of tidal currents and wave conditions, the magnitude of these has been individually quantified as described above. For a 1in1 year storm approaching from 210°, during the flood tide the wave climate is in concert with tidal flow reducing the tidal flow on the lee side of the structure further. However, during the ebb flow, the wave climate and tidal flow are in opposition reducing the magnitude of the littoral current. With the presence of infrastructure, wave climate causes a small reduction in the magnitude of flow whilst there is little difference between the magnitude of littoral current flow and the tidal flows. Changes in magnitude compared to baseline current flow are ±5% which would not be sufficient to disrupt sediment features.

13.8.5.6 Residual currents are effectively the driver of sediment transport and therefore any changes to residual currents would have a direct impact on sediment transport which would persist for the lifecycle of the Morgan Generation Assets. However, if the presence of the foundation structures does not have a significant influence on either tide or wave conditions (see impact assessments presented above for changes in tidal

and wave regime) they cannot therefore have a significant effect on the sediment transport regime. For completeness, the residual current and sediment transport was simulated with the foundations in place. The maximum change in residual current and sediment transport is circa ±10% which is largely sited within close proximity to the wind turbine foundation structures (i.e. as a result of the scour protection). Changes in the residual current and sediment transport reduce with increasing distance from the wind turbines towards baseline levels.

13.8.5.7 The MDS is comprised of the presence of up to 68 wind turbines installed with four-legged suction bucket foundations, each jacket leg with a diameter of 5m, spaced 48m apart, each bucket with a diameter of 16m and scour protection to a height of 2.5m. Up to four OSPs will be installed on four-legged suction bucket foundations, each jacket leg with a diameter of 3m, spaced 30m apart, each bucket with a diameter of 14m and scour protection to a height of 2.5m. Cable protection (including at cable crossings) is proposed of up to 3m in height. Changes in the sediment transport regime as a result of the presence of the Morgan Generation Assets infrastructure have the potential to bury known archaeological sites and to expose others and previously unknown sites.

13.8.5.8 Potential impacts are assessed in relation to the locations of known shipwrecks within the Morgan marine archaeology study area.

13.8.5.9 The physical processes modelling found that the presence of the foundation structures for the wind turbines and OSPs does not have a significant influence on either tide or wave conditions and therefore sediment transport modelling has predicted the maximum change in residual current and sediment transport is circa ±10% which is largely sited within close proximity to the turbine foundation structures (i.e. as a result of the scour protection). Changes in the residual current and sediment transport reduce with increasing distance from the wind turbines towards baseline levels.

13.8.5.10 The impact is predicted to be of local spatial extent, long term duration, continuous and high reversibility. It is predicted that the impact will affect the receptor indirectly. The magnitude is therefore considered to be negligible.

Sensitivity of the Receptor

13.8.5.11 The Morgan marine archaeology study area lies in a wider area that retains a significant number of shipwrecks. Shipwrecks are vulnerable sites that can be exposed or buried by significant alteration of the sediment transport regimes.

13.8.5.12 The marine archaeology receptor is deemed to be of medium vulnerability, low recoverability and of national value. The sensitivity of the receptor is therefore considered to be medium.

Significance of effect

13.8.5.13 Overall, the magnitude of the impact is deemed to be negligible and the sensitivity of the receptor is considered to be medium. Based on professional judgement it is considered that the effect will, therefore, be of **negligible adverse** significance, which is not significant in EIA terms.

13.9 Cumulative effect assessment methodology

13.9.1 Methodology

13.9.1.1 The Cumulative Effects Assessment (CEA) takes into account the impact associated with the Morgan Generation Assets together with other projects and plans. The projects and plans selected as relevant to the CEA presented within this chapter are based upon the results of a screening exercise (see volume 3, annex 5.1: CEA screening matrix). Each project has been considered on a case by case basis for screening in or out of this chapter's assessment based upon data confidence, effect-receptor pathways and the spatial/temporal scales involved.

13.9.1.2 The marine archaeology CEA methodology has followed the methodology set out in volume 1, chapter 5: EIA methodology of the PEIR. As part of the assessment, all projects and plans considered alongside the Morgan Generation Assets have been allocated into 'tiers' reflecting their current stage within the planning and development process, these are listed below.

13.9.1.3 A tiered approach to the assessment has been adopted, as follows:

13.9.1.4 The tiered approach uses the following categorisations:

- Tier 1
  - Under construction
  - Permitted application
  - Submitted application
  - Those currently operational that were not operational when baseline data were collected, and/or those that are operational but have an ongoing impact
- Tier 2
  - Scoping report has been submitted and is in the public domain
- Tier 3
  - Scoping report has not been submitted and is not in the public domain
  - Identified in a relevant development plan
  - Identified in other plans and programmes.

13.9.1.5 This tiered approach is adopted to provide a clear assessment of the Morgan Generation Assets alongside other projects, plans and activities.

13.9.1.6 The specific projects, plans and activities scoped into the CEA, are outline in Table 13.16.

Table 13.16: List of other projects, plans and activities considered within the CEA.

Project/Plan	Status	Distance from the Morgan array area (km)	Description of project/plan	Dates of construction (if applicable)	Dates of operation (if applicable)	Overlap with the Mona Offshore Wind Project
Tier 1						
None						
Tier 2						
Morgan and Morecambe Offshore Wind Farms Transmission Assets	Pre-application	0.0	Morgan and Morecambe Offshore Wind Farms Transmission Assets	1 January 2026 to 31 December 2029	1 January 2030 to 31 December 2065	Project construction phase overlaps with the Morgan Generation Assets proposed construction phase. Project operational phase overlaps with the Morgan Generation Assets proposed operations and maintenance phase.
Tier 3						
None						

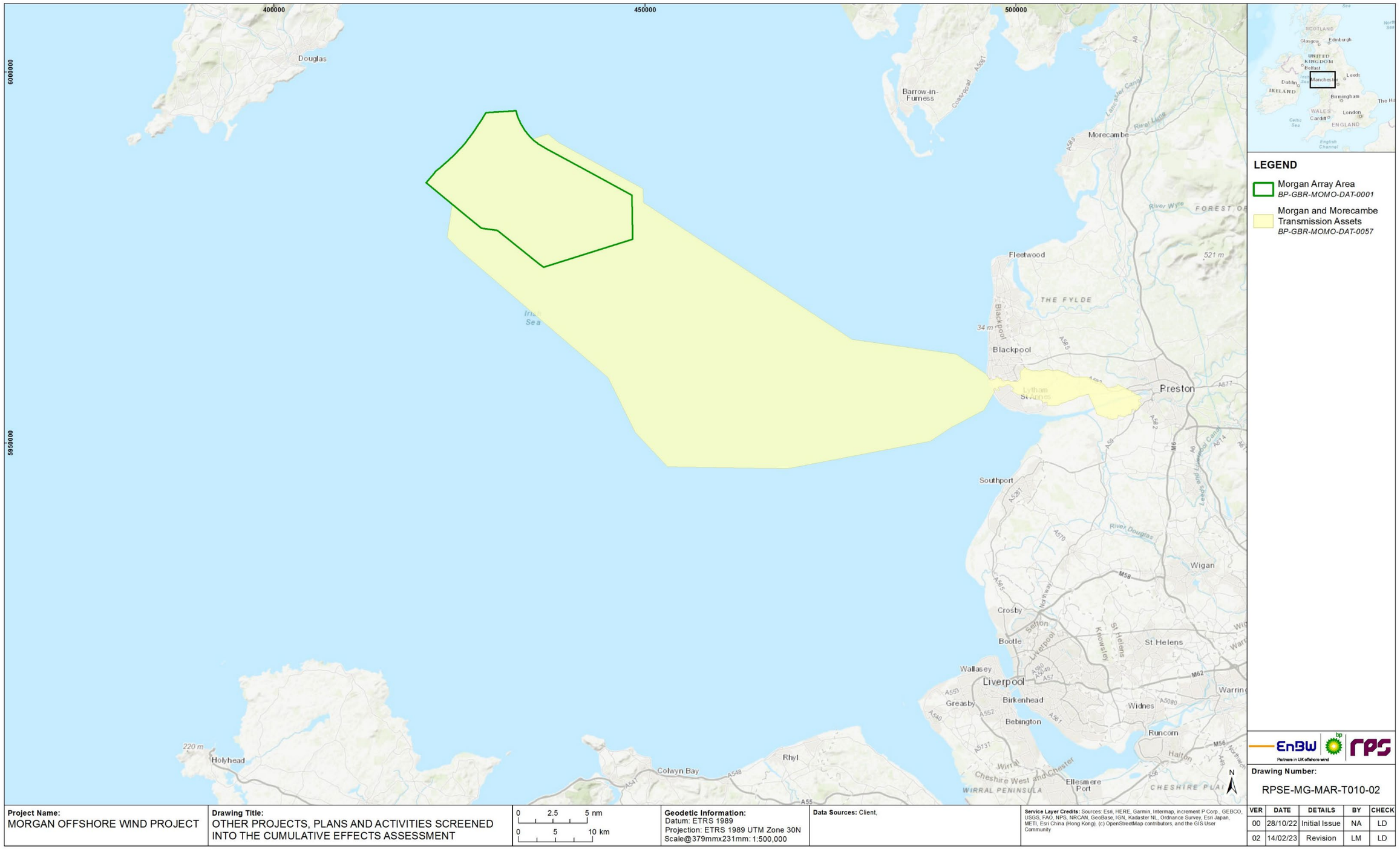

Figure 13.5: Other projects, plans and activities screened into the cumulative effects assessment.

13.9.2 Maximum design scenario

13.9.2.1 The MDSs identified in Table 13.17 have been selected as those having the potential to result in the greatest effect on an identified receptor or receptor group. The cumulative effects presented and assessed in this section have been selected from the Project Design Envelope provided in volume 1, chapter 3: Project description of the PEIR as well as the information available on other projects and plans, in order to inform a 'MDS'. Effects of greater adverse significance are not predicted to arise should any other development scenario, based on details within the Project Design Envelope (e.g. different turbine layout), to that assessed here, be taken forward in the final design scheme is within the Project Design Envelope.

13.9.2.2 The range of potential cumulative impacts identified in Table 13.17 below is a subset of those considered for the Morgan Generation Assets alone assessment (Table 13.13). This is for one of two reasons:

- The potential impacts identified and assessed for the Morgan Generation Assets alone are relatively localised and have limited, or no, potential to interact with similar impacts associated with other projects
- The potential significance of impact has been assessed as negligible for the Morgan Generation Assets alone and therefore has limited or no potential to interact with similar impacts associated with other projects.

13.9.2.3 Of the impacts set out in Table 13.13, the following have not been included in the CEA:

- Direct damage to deeply buried marine archaeology receptors – submerged prehistoric receptors (palaeolandscapes and associated archaeological receptors).

Table 13.17: Maximum design scenario considered for the assessment of potential cumulative effects on marine archaeology.

[a] C=construction, O=operation and maintenance, D=decommissioning

Potential cumulative effect	Phase[a]			Maximum Design Scenario	Justification
	C	O	D		
Sediment disturbance and deposition leading to indirect impacts on marine archaeology receptors.	✓	✓	✓	MDS as described for the Morgan Generation Assets (Table 13.13) assessed cumulatively with the following other projects/plans: **Tier 2** • Morgan and Morecambe Offshore Wind Farms Transmission Assets	Maximum potential for culminative effects of sediment disturbance and deposition leading to indirect effects on marine archaeology receptors.
Alteration of sediment transport regimes.	×	✓	×	MDS as described for the Morgan Generation Assets (Table 13.13) assessed cumulatively with the following other projects/plans: **Tier 2** • Morgan and Morecambe Offshore Wind Farms Transmission Assets	Maximum potential for culminative effects of alteration of transport regimes to have indirect impacts on marine archaeology receptors.

13.10 Cumulative effects assessment

13.10.1 Overview

13.10.1.1 A description of the significance of cumulative effects upon marine archaeology receptors arising from each identified impact is given below.

13.10.2 Sediment disturbance and deposition leading to indirect impacts on marine archaeology receptors

13.10.2.1 The Morgan Generation Assets, together with the projects and plans identified in Table 13.16, may result in sediment disturbance and deposition leading to indirect effects on marine archaeology receptors. Other projects and plans screened into the assessment include the construction, operation and maintenance and decommissioning phases of Morgan Generation Assets.

Tier 2

Construction phase

Magnitude of impact

13.10.2.2 The construction phase of Morgan Generation Assets is due to overlap with the construction phase of Morgan and Morecambe Offshore Wind Farms Transmission Assets and therefore activities such as site preparation/sandwave clearance, foundation and cable installation have the potential to increase sediment disturbance and deposition leading to a cumulative indirect impact on marine archaeology receptors. Construction activities may result in increased suspended sediment concentration, and therefore increased disturbance or deposition of sediment, however, these activities would be of limited spatial extent and frequency and unlikely to interact with sediment plumes from the Morgan Generation Assets.

13.10.2.3 Modelling from Chapter 6: Physical processes indicates that construction activities may result in increased suspended sediment concentration; however, these activities would be of limited spatial extent and frequency.

13.10.2.4 As described in section 13.7, an Outline WSI and PAD will be developed to inform the construction works and to facilitate the recording and reporting of any archaeological material discovered as a result of increased sediment disturbance.

13.10.2.5 The cumulative effect is predicted to be of local spatial extent, short term duration, intermittent and high reversibility. It is predicted that the impact will affect the receptor indirectly. The magnitude is therefore, considered to be negligible.

Sensitivity of the receptor

13.10.2.6 The east Irish Sea has historically been an area of high maritime activity and the number of shipwrecks associated with the area highlight the potential for more discoveries to arise. The marine archaeology receptors are vulnerable sites that can be exposed further by disturbance activities.

13.10.2.7 The marine archaeology receptors are deemed to be of high vulnerability, low recoverability and of varying value. The sensitivity of the receptor is therefore, considered to be high.

Significance of effect

13.10.2.8 The measures adopted as part of the Morgan Generation Assets outlined in section 13.7 include measures to ensure that any newly exposed archaeological assets are recorded.

13.10.2.9 Overall, the magnitude of the impact is deemed to be negligible, and the sensitivity of the receptor is considered to be high. The effect will, therefore, be of **minor adverse** significance, which is not significant in EIA terms.

Operation and maintenance phase

Magnitude of impact

13.10.2.10 The operation and maintenance phase of the Morgan Generation Assets is due to overlap with the construction phase of Morgan and Morecambe Offshore Wind Farms Transmission Assets and therefore activities such as offshore export cable repair and reburial activities and any associated jack-up vessel and vessel anchoring have the potential to increase sediment disturbance and deposition leading to a cumulative indirect impact on marine archaeology receptors.

13.10.2.11 Any suspended sediments and associated deposition will be of the same magnitude as, or lower than, the construction phase. For the purposes of this assessment, the impacts of the operational and maintenance activities (i.e. cable repair and reburial) are predicted to be no greater than those for construction, as set out above.

13.10.2.12 The measures adopted as part of the Morgan Generation Assets outlined in section 13.7 include measures to ensure that any newly exposed archaeological assets are recorded. As described in section 13.7, a WSI and PAD will be implemented to facilitate the recording and reporting of any archaeological material discovered during the operational and maintenance phase.

13.10.2.13 The cumulative effect is predicted to be of local spatial extent, short term duration, intermittent and low reversibility. It is predicted that the impact will affect the receptor indirectly. The magnitude is therefore, considered to be negligible.

Sensitivity of the receptor

13.10.2.14 The east Irish Sea has historically been an area of high maritime activity and the number of shipwrecks associated with the area highlight the potential for more discoveries to arise. The marine archaeology receptors are vulnerable sites that can be exposed further by disturbance activities.

13.10.2.15 The marine archaeology receptors are deemed to be of high vulnerability, low recoverability and of varying value. The sensitivity of the receptor is therefore, considered to be high.

Significance of effect

13.10.2.16 The measures adopted as part of the Morgan Generation Assets outlined in section 13.7 include measures to ensure that any newly exposed archaeological assets are recorded.

13.10.2.17 Overall, the magnitude of the impact is deemed to be negligible and the sensitivity of the receptor is considered to be high. The effect will, therefore, be of **minor adverse** significance, which is not significant in EIA terms.

Decommissioning phase

Magnitude of impact

13.10.2.18 The decommissioning phase of Morgan Generation Assets is due to overlap with the construction phase of Morgan and Morecambe Offshore Wind Farms Transmission Assets and therefore activities such as the removal of cables have the potential to increase sediment disturbance and deposition leading to a cumulative indirect impact on marine archaeology receptors.

13.10.2.19 Any suspended sediments and associated deposition will be of the same magnitude as, or lower than, the construction phase. For the purposes of this assessment, the impacts of the decommissioning activities are predicted to be no greater than those for construction, as set out above.

13.10.2.20 The measures adopted as part of the Morgan Generation Assets outlined in section 13.7 include measures to ensure that any newly exposed archaeological assets are recorded. As described in section 13.7, a WSI and PAD will be implemented to facilitate the recording and reporting of any archaeological material discovered during the operational and maintenance phase.

13.10.2.21 The cumulative effect is predicted to be of local spatial extent, short term duration, intermittent and low reversibility. It is predicted that the impact will affect the receptor indirectly. The magnitude is therefore, considered to be negligible.

Sensitivity of the receptor

13.10.2.22 The east Irish Sea has historically been an area of high maritime activity and the number of shipwrecks associated with the area highlight the potential for more discoveries to arise. The marine archaeology receptors are vulnerable sites that can be exposed further by disturbance activities.

13.10.2.23 The marine archaeology receptors are deemed to be of high vulnerability, low recoverability and of varying value. The sensitivity of the receptor is therefore, considered to be high.

Significance of effect

13.10.2.24 The measures adopted as part of the Morgan Generation Assets outlined in section 13.7 include measures to ensure that any newly exposed archaeological assets are recorded.

13.10.2.25 Overall, the magnitude of the impact is deemed to be negligible and the sensitivity of the receptor is considered to be high. The effect will, therefore, be of **minor adverse** significance, which is not significant in EIA terms.

13.10.3 Alteration of sediment transport regimes

13.10.3.1 The Morgan Generation Assets, together with the projects and plans identified in Table 13.16, may result in alteration of transport regimes. During the operation and maintenance phase the presence of infrastructure may alter the sediment transport and sediment transport pathways leading to changes in the Morgan Offshore Wind Project area.

13.10.3.2 Other projects and plans screened into the assessment include the operation and maintenance phase of Morgan and Morecambe Offshore Wind Farms Transmission Assets.

Tier 2

Operation and maintenance phase

Magnitude of impact

13.10.3.3 The operation and maintenance phase of the Morgan and Morecambe Offshore Wind Farms Transmission Assets is due to take place during the operation and maintenance phase of the Morgan Generation Assets, therefore activities such as using jack-up vessels, inter-array, interconnector and offshore export cable repair or reburial activities, any associated vessel anchor deployments and the removal of cables have the potential to increase the likelihood of indirect damage to maritime archaeology receptors.

13.10.3.4 The Morgan and Morecambe Offshore Wind Farms Transmission Assets will be in operation during the operation and maintenance phase of the Morgan Generation Assets. The modelling carried out for Morgan Generation Assets and presented in Chapter 6: Physical Processes concluded that the impact on sediment transport and sediment transport pathways was low. Therefore, no overlap is expected to create cumulative changes in the sediment transport and sediment transport pathways between the two wind farm projects.

13.10.3.5 The cumulative effect is predicted to be of local spatial extent, long term duration, continuous and high reversibility. It is predicted that the impact may affect the receptor indirectly. The magnitude is therefore, considered to be negligible.

Sensitivity of the receptor

13.10.3.6 The marine archaeology study area retains a significant number of shipwrecks and the potential for more discoveries arises with the installation works proposed. Shipwrecks are vulnerable sites that can be exposed by disturbance activities. Each known shipwreck site is regarded as being of importance.

13.10.3.7 The marine archaeology receptor is deemed to be of high vulnerability, low recoverability and of varying value. The sensitivity of the receptor is therefore, considered to be high.

Significance of effect

13.10.3.8 Overall, the magnitude of the cumulative effect is deemed to be negligible and the sensitivity of the receptor is considered to be high. The cumulative effect will, therefore, be of **minor adverse** significance, which is not significant in EIA terms.

13.11 Transboundary effects

13.11.1.1 A screening of transboundary impacts has been carried out and has identified that there was no potential for significant transboundary effects with regard to marine archaeology from the Morgan Generation Assets upon the interests of other states.

13.12 Inter-related effects

13.12.1.1 Inter-relationships are considered to be the impacts and associated effects of different aspects of the proposal on the same receptor. These are considered to be:

- Project lifetime effects: Assessment of the scope for effects that occur throughout more than one phase of the Morgan Generation Assets (construction, operation and maintenance, and decommissioning), to interact to potentially create a more significant effect on a receptor than if just assessed in isolation in these three phases (e.g. subsea noise effects from piling, operational wind turbines, vessels and decommissioning)
- Receptor led effects: Assessment of the scope for all effects to interact, spatially and temporally, to create inter-related effects on a receptor. As an example, all effects on marine archaeology, such as sediment disturbance and deposition and direct damage to marine archaeology receptors, may interact to produce a different, or greater effect on this receptor than when the effects are considered in isolation. Receptor-led effects may be short term, temporary or transient effects, or incorporate longer term effects
- A description of the likely interactive effects arising from the Morgan Generation Assets on marine archaeology is provided in volume 2, chapter 15: Inter-related effects of the PEIR.

13.13 Summary of impacts, mitigation measures and monitoring

13.13.1.1 Information on marine archaeology within the Morgan marine archaeology study area was collected through desktop review, site surveys and consultation.

- Table 13.18 presents a summary of the potential impacts, measures adopted as part of the project and residual effects in respect to marine archaeology. The impacts assessed include: sediment disturbance and deposition leading to indirect impacts on marine archaeology receptors; direct damage to marine archaeology receptors (e.g. wrecks, debris, submerged prehistoric receptors (palaeolandscapes and associated archaeological receptors); direct damage to deeply buried marine archaeology receptors – submerged prehistoric receptors (eg. Palaeolandscapes and associated archaeological receptors); and alteration of sediment transport regimes. Overall, it is concluded that there will be no significant effects arising from the Morgan Generation Assets during the construction, operation and maintenance or decommissioning phases
- Table 13.19 presents a summary of the potential cumulative impacts, mitigation measures and residual effects. The cumulative impacts assessed include: Sediment disturbance and deposition leading to indirect impacts on marine archaeology receptors and alteration of transport regimes.
- Overall, it is concluded that there will be no significant cumulative effects from the Morgan Generation Assets alongside other projects/plans
- No potential transboundary impacts have been identified in regard to effects of the Morgan Generation Assets.

Table 13.18: Summary of potential environmental effects, mitigation and monitoring.

[a] C=construction, O=operation and maintenance, D=decommissioning

Description of impact	Phase[a] C	O	D	Measures adopted as part of the project	Magnitude of impact	Sensitivity of the receptor	Significance of effect	Further mitigation	Residual effect	Proposed monitoring
Sediment disturbance and deposition leading to indirect impacts on marine archaeology receptors	✓	✓	✓	Avoidance where possible; Archaeological Exclusion Zones; Pre-construction marine geophysical surveys and archaeological review; WSI and PAD; review and agreement of the WSI and PAD and review and agreement of the AEZs.	C: Low O: Negligible D: Negligible	C: High O: High D: High	C: Minor adverse O: Minor adverse D: Minor adverse	N/A	N/A	N/A
Direct damage to marine archaeology receptors (e.g. wrecks, debris, submerged prehistoric receptors (palaeolandscapes and associated archaeological receptors)	✓	✓	✓	Avoidance where possible; Archaeological Exclusion Zones; Pre-construction marine geophysical surveys and archaeological review; WSI and PAD; review and agreement of the WSI and PAD and review and agreement of the AEZs.	C: Low O: Low D: Low	C: High O: High D: High	C: Minor adverse O: Minor adverse D: Minor adverse	N/A	N/A	N/A
Direct damage to deeply buried marine archaeology receptors – submerged prehistoric receptors (e.g. Palaeolandscapes and associated archaeological receptors)	✓	✓	✓	Avoidance where possible; Archaeological Exclusion Zones; Pre-construction marine geophysical surveys and archaeological review; WSI and PAD; review and agreement of the WSI and PAD and review and agreement of the AEZs.	C: Low O: Negligible D: Low	C: High O: High D: High	C: Minor adverse O: Minor adverse D: Minor adverse	N/A	N/A	N/A
Alteration of sediment transport regimes	×	✓	×	Avoidance where possible; Archaeological Exclusion Zones; Pre-construction marine geophysical surveys and archaeological review; WSI and PAD; review and agreement of the WSI and PAD and review and agreement of the AEZs.	O: Negligible	O: High	O: Minor adverse	N/A	N/A	N/A

Table 13.19: Summary of potential cumulative environmental effects, mitigation and monitoring.

[a] C=construction, O=operation and maintenance, D=decommissioning

Description of effect	Phase[a] C	O	D	Measures adopted as part of the project	Magnitude of impact	Sensitivity of the receptor	Significance of effect	Further mitigation	Residual effect	Proposed monitoring
Tier 2										
Sediment disturbance and deposition leading to indirect impacts on marine archaeology receptors	✓	✓	✓	Avoidance where possible; Archaeological Exclusion Zones; Pre-construction marine geophysical surveys and archaeological review; WSI and PAD; review and agreement of the WSI and PAD and review and agreement of the AEZs.	C: Negligible O: Negligible D: Negligible	C: High O: High D: High	C: Minor adverse O: Minor adverse D: Minor adverse	N/A	N/A	N/A
Alteration of sediment transport regimes	×	✓	×	Avoidance where possible; Archaeological Exclusion Zones; Pre-construction marine geophysical surveys and archaeological review; WSI and PAD; review and agreement of the WSI and PAD and review and agreement of the AEZs.	O: Negligible	O: High	O: Minor adverse	N/A	N/A	N/A

13.14 Next steps

13.14.1.1 As discussed in section 13.4, further Morgan Generation Assets geophysical and geotechnical surveys of the Morgan Array Area were undertaken from April to September 2022. Together with the existing data, this survey will be used to refine the marine archaeology baseline and inform the Environmental Statement.

13.14.1.2 As discussed in section 13.2.3 an Archaeology and Heritage Engagement Forum has been established to allow for further pre-application consultation with the MMO, HE, and other stakeholders. This forum will cover marine archaeology throughout the EIA process and their inputs incorporated into the Environmental Statement. The first meeting of the AHEF Offshore was held in November 2022 to present the scoping responses to the identified stakeholders, further consultation will be ongoing throughout the Morgan Offshore Wind Project.

13.15 References

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