

MORGAN OFFSHORE WIND PROJECT: GENERATION ASSETS

Environmental Statement

Volume 2, Chapter 8: Marine archaeology and cultural heritage

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MORGAN OFFSHORE WIND PROJECT: GENERATION ASSETS

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Annexes

Annex number	Annex title
8.1	Marine archaeology technical report
8.2	Cultural heritage technical report

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Glossary

Term	Meaning
1 in 20 year storm	A weather event expected to occur every 20 years. Depending on scale of observation, one such event is expected five times over the course of 100 years, or alternatively, each year the chance to occur is 5%.
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.
Morgan Array Area	The area within which the wind turbines, foundations, inter-array cables, interconnector cables, scour protection, cable protection and offshore substation platforms (OSPs) forming part of the Morgan Offshore Wind Project: Generation Assets will be located.
Morgan Offshore Wind Project: Generation Assets	This is the name given to the Morgan Generation Assets project as a whole (includes all infrastructure and activities associated with the project construction, operations and maintenance, and decommissioning).
Palaeoenvironmental	An environment of a past geological age.
Palaeolandscape	Terrestrial landscape features of a past geological age.

Acronyms

Acronym	Description
AEZ	Archaeological Exclusion Zone
AHEF	Archaeology and Heritage Engagement Forum
AD	<i>Anno Domini</i>
BC	Before Christ
BP	Before Present
BULSI	Burial, use, loss, survival and investigation
CEA	Cumulative effects assessment
DCO	Development Consent Order
EIA	Environmental Impact Assessment
EWG	Expert Working Group
HE	Historic England
HER	Historic Environment Record
HSC	Historic Seascape Character
JNAPC	Joint Nautical Archaeology Policy Committee
MBES	Multibeam Bathymetry

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Acronym	Description
MDS	Maximum Design Scenario
MLWS	Mean Low Water Springs
MNH	Manx National Heritage
MPS	Marine Policy Statement
NMRW	National Monuments Record Wales
NPS	National Policy Statement
NRHE	National Record of the Historic Environment
NSIPs	Nationally Significant Infrastructure Projects
OSP	Offshore Substation Platform
PAD	Protocol for Archaeological Discoveries
PDE	Project Design Envelope
PEIR	Preliminary Environmental Information Report
RCAHMW	Royal Commission on the Ancient and Historical Monuments of Wales
SBP	Sub-bottom Profiler
SSC	Suspended Sediment Concentration
SSS	Sidescan Sonar
TAEZ	Temporary Archaeological Exclusion Zone
UKHO	United Kingdom Hydrographic Office
UXO	Unexploded Ordnance
WSI	Written Scheme of Investigation

Units

Unit	Description
°	Degree
%	Percentage
kg	Kilogram
km	Kilometres
km ²	Square kilometres
m	Metres
m ²	Square metres
m ³	Cubic metres
m/h	Miles per hour
mg/l	Milligrams per litre
mm	Millimetres

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Unit	Description
nm	Nautical miles (distance; 1nm = 1.852 km)

8 Marine archaeology and cultural heritage

8.1 Introduction

8.1.1 Overview

8.1.1.1 This chapter of the Environmental Statement presents the assessment of the potential impact of the Morgan Generation Assets on marine archaeology and cultural heritage. Specifically, this chapter considers the potential impact of the Morgan Generation Assets seaward of Mean Low Water Springs (MLWS) during the construction, operations and maintenance, and decommissioning phases. Those impacts of the Morgan Generation Assets landward/seaward of Mean High Water Springs (MHWS)/Mean Low Water Springs (MLWS) are addressed in Volume 4, Annex 8.2: Cultural heritage technical report of the Environmental Statement.

8.1.1.1 The assessment presented is informed by the following technical chapters:

- Volume 2, Chapter 1: Physical processes of the Environmental Statement.

8.1.1.2 This chapter also draws upon information contained within:

- Volume 4, Annex 1.1: Physical processes technical report of the Environmental Statement
- Volume 4, Annex 8.1: Marine archaeology technical report of the Environmental Statement.
- Volume 4, Annex 8.2: Cultural heritage technical report of the Environmental Statement.

8.1.1.2 In particular, this Environmental Statement chapter:

- Presents the existing marine archaeology baseline established from desk studies, site-specific surveys and consultation
- Identifies any assumptions and limitations encountered in compiling the marine archaeology information
- Presents the potential effects on marine archaeology arising from the Morgan Generation Assets, based on the information gathered and the analysis and assessments undertaken
- Presents the potential effects on onshore designated heritage assets arising from the Morgan Generation Assets based on the results of a separate assessment (Volume 4, Annex 8.2: Cultural heritage technical report)
- 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 and cultural heritage.

8.1.2 Study area

8.1.2.1 The Morgan marine archaeology study area consists of the Morgan Array Area with an additional 2 km buffer. This is shown in Figure 8.1. This study area was used as the search area for obtaining records from relevant archive databases. The Morgan marine archaeology study area allows for a greater understanding of the 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.

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- 8.1.2.2 Physical processes modelling carried out for the Morgan Generation Assets (Volume 2, Chapter 1: Physical processes of the Environmental Statement) has shown that changes to the tidal regime are limited to the immediate Morgan Array Area. Therefore, changes in marine physical process beyond the 2 km Morgan marine archaeology study area are so minimal as to be negligible and thus a 2 km buffer is considered adequate in which to assess potential impacts upon marine archaeology.
- 8.1.2.3 The study area for this assessment of impacts on terrestrial designated assets comprises a 50 km buffer around the Morgan Array Area (shown in Volume 4, Annex 8.2: Cultural heritage technical report of the Environmental Statement, Figure 1.1.)

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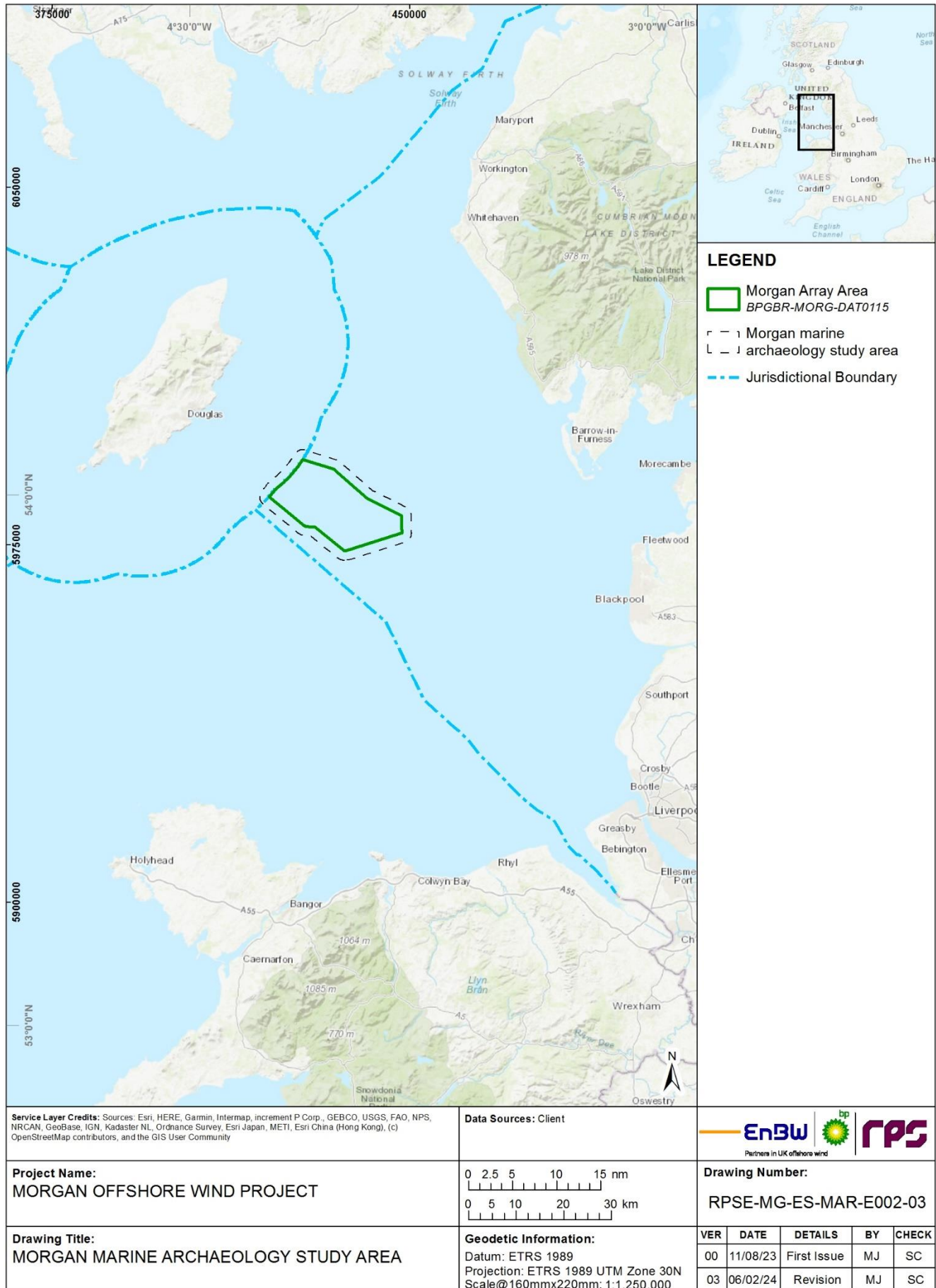


Figure 8.1: Morgan marine archaeology study area.

8.2 Planning policy context

8.2.1.1 The Morgan Generation Assets are located in English offshore waters (beyond 12 nautical miles (nm) from the English coast). As set out in Volume 1, Chapter 1: Introduction of this Environmental Statement, as the Morgan Generation Assets is an offshore generating station with a capacity of greater than 100 MW located, it is a Nationally Significant Infrastructure Project (NSIP) as defined by Section 15(3) of the Planning Act 2008. As such, there is a requirement to submit an application for a DCO to the Planning Inspectorate to be decided by the Secretary of State for the Department for Energy Security and Net Zero (DESNZ).

8.2.1 National Policy Statements

8.2.1.1 Planning policy on renewable energy infrastructure is presented in Volume 1, Chapter 2: Policy and legislation of the Environmental Statement. There are currently six energy National Policy Statements (NPSs), two of which contain policy relevant to offshore wind development and the Morgan Generation Assets, specifically:

- Overarching NPS for Energy (NPS EN-1) which sets out the UK Government’s policy for the delivery of major energy infrastructure (Department for Energy Security & Net Zero, 2023a).
- NPS for Renewable Energy Infrastructure (NPS EN-3) (Department for Energy Security & Net Zero, 2023b).

8.2.1.2 NPS EN-3 includes guidance on what matters are to be considered in the assessment. These are summarised in Table 8.1. NPS EN-3 also highlights a number of factors relating to the determination of an application and in relation to mitigation. These are summarised in Table 8.2.

Table 8.1: Summary of the NPS EN-3 provisions relevant to marine archaeology and cultural heritage.

Summary of NPS EN-3 provision	How and where considered in the Environmental Statement
<p>Consultation with all relevant statutory consultees is to be carried out at an early stage. [Paragraph 2.8.94]</p>	<p>Consultation with relevant statutory and non-statutory stakeholders has been carried out from the early stages of the Morgan Generation Assets and through the Archaeology and Heritage Engagement Forum (AHEF). See section 8.3 and Table 8.4 for further details.</p>
<p>Assessments should include a desk-based assessment that takes into account any geotechnical or geophysical surveys that have been undertaken to inform the wind farm design. [Paragraph 2.8.160-161]</p>	<p>A marine archaeology desk-based assessment and technical report has been produced which informs the archaeological assessment (see Volume 4, Annex 8.1: Marine archaeology technical report of the Environmental Statement). The archaeological review of site investigation data is included in section 8.4 below and in Volume 4, Annex 8.1: Marine archaeology technical report of the Environmental Statement.</p>
<p>Assessment should include any beneficial effects on the historic environment, for example through improved access or new knowledge. [Paragraph 2.8.166].</p>	<p>The methodology for determining whether an effect may be adverse or beneficial is described in Table 8.13. This methodology has been applied in the assessment of significant effects (section 8.8).</p>

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Summary of NPS EN-3 provision	How and where considered in the Environmental Statement
<p>Assessment of potential impacts upon the historic environment should be considered as part of the Environmental Impact Assessment process undertaken to inform any application for consent. [Paragraph 2.8.169]</p>	<p>The methodology for determining whether an effect may be adverse or beneficial to heritage assets is described in Volume 4, Annex 8.2: Cultural heritage technical report of the Environmental Statement. The methodology provides for the inclusion of Listed Buildings.</p>
<p>Applicants are required to determine how any known heritage assets might best be avoided. [Paragraph 2.8.173]</p>	<p>Any potential for avoidance is described in Volume 4, Annex 8.2: Cultural heritage technical report of the Environmental Statement.</p>
<p>Where elements of a proposed project (whether offshore or onshore) may interact with historic environment features that are located onshore, applicants should assess the effects in accordance with Section 5.9 in EN-1. [Paragraph 2.8.177]</p>	<p>The methodology for determining whether an effect may be adverse or beneficial to heritage assets is described in Volume 4, Annex 8.2: Cultural heritage technical report of the Environmental Statement. This methodology has been applied in the assessment of significant effects (section 8.8.7).</p>

Table 8.2: Summary of NPS EN-3 policy on decision making relevant to marine archaeology.

Summary of EN-3 provision	How and where considered in the Environmental Statement
<p>Decision-making is based on being satisfied that the proposed development has appropriately considered and mitigated for any impacts to the historic environment including both known heritage assets, and discoveries that may be made during the course of development. [Paragraph 2.8.315]</p>	<p>Mitigation is primarily by avoidance and Morgan Generation Assets has been designed to avoid known sensitive receptors through provision of Archaeological Exclusion Zones (AEZs) and Temporary Archaeological Exclusion Zones (TAEZs) (section 8.7). The measures adopted as part of the project include the development of and adherence to a Protocol for Archaeological Discoveries (PAD) for the reporting of any discoveries that may be made during the course of Morgan Generation Assets.</p>
<p>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 2.8.243]</p>	<p>Morgan Generation Assets incorporates AEZs, where appropriate, as stated in the measures adopted as part of Morgan Generation Assets (section 8.7). AEZs are discussed further in the Outline Offshore Written Scheme of Investigation (WSI) and Protocol for Archaeological Discoveries (PAD) (Document Reference J.14).</p>

8.2.1.3 In addition to NPS EN-3, planning policy relevant to marine archaeology within the Morgan Generation Assets is contained within a national Marine Policy Statement (MPS) (HM Government, 2011). Planning policy within the MPS relevant to marine archaeology is summarised in Table 8.3.

8.2.1.4 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 8.2.3 and Table 8.5) and the Preliminary Environmental Impact Report (PEIR) (Morgan Offshore Wind Ltd, 2023a).

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Table 8.3: Summary of the MPS.

Summary of key points in MPS relevant to marine archaeology	How and where considered in the Environmental Statement
<p>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’</p> <p>[Paragraph 2.6.6.3]</p>	<p>This Environmental Statement has considered the significance of all known and potential heritage assets within the Morgan marine archaeology study area. This is discussed further in section 8.8 below.</p> <p>The 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. The results of these investigations will ultimately be made publicly available. This is discussed further in section 8.7 below.</p>
<p>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.</p> <p>[Paragraph 2.6.6.5]</p>	<p>Planning policy principles have been applied to all known and potential heritage assets within the Morgan marine archaeology study area, including non-designated assets. This is discussed further in section 8.8 below.</p> <p>Consultation to date with the relevant regulator and advisors is set out in Table 8.5.</p>
<p>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.</p> <p>[Paragraph 2.6.6.9]</p>	<p>The 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. The results of these investigations will ultimately be made publicly available. This is discussed further in section 8.7 below. An Outline Offshore WSI (Document Reference J.14) has been prepared to support the EIA which sets out the high level mitigation strategy for approval by the regulator and advisors.</p>

8.2.2 North West Inshore and North West Offshore Coast Marine Plans

8.2.2.1 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 8.4 along with details as to how these have been addressed within the assessment.

Table 8.4: North West Inshore and North West Offshore Marine Plan policies relevant to marine archaeology.

Policy	Key provisions	How and where considered in the Environmental Statement
NW-HER-1	<p>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.</p>	<p>The potential for harm to the significance of marine heritage assets by the Morgan Generation Assets has been assessed in section 8.8, 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 development of Morgan Generation Assets in the Outline Offshore WSI and PAD (Document Reference J.14).</p>

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8.2.3 Legislation

8.2.3.1 This chapter of the Environmental Statement has considered the legislative framework as defined by:

- Protection of Wrecks Act 1973
- Ancient Monuments and Archaeological Areas Act 1979 (as amended)
- The Planning (Listed Buildings and Conservation Areas) Act 1990
- Protection of Military Remains Act 1986
- The Merchant Shipping Act 1995.

8.2.3.2 Full details of the legislation, policy and guidance considered in the development of this marine archaeology chapter are presented in Volume 4, Annex 8.1: Marine archaeology technical report of the Environmental Statement.

8.2.4 Guidance

8.2.4.1 This chapter of the Environmental Statement has been developed in accordance with the following guidelines:

- 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, 2022)
- Standard and Guidance for Historic Environment Desk Based Assessment (Chartered Institute for Archaeologists, 2020)
- 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).
- Principles of Cultural Heritage Impact Assessment in the UK (IEMA, IHBC and Cifa, 2021)
- Conservation Principles, Policies and Guidance for the Sustainable Management of the Historic Environment (English Heritage (now Historic England), 2008)
- Environmental Archaeology, A Guide to the Theory and Practice of Methods, from Sampling and Recovery to Post-excavation (second edition) (Campbell et al., 2011)
- Marine Geophysical Data Acquisition, Processing and Interpretation – guidance notes (Historic England, 2013)
- Guidance for Assessment of Cumulative Impacts on the Historic Environment from Offshore Renewable Energy (Oxford Archaeology, 2008)
- Deposit Modelling and Archaeology – Guidance for Mapping Buried Deposits (Historic England, 2020)

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- The Setting of Heritage Assets. Historic Environment Good Practice Advice in Planning: 3 (2nd Edition) (Historic England, 2017)
- Guidelines for Landscape and Visual Assessment in the UK (Landscape Institute, 2013).

8.3 Consultation

8.3.1.1 A summary of the key topics raised during consultation activities undertaken to date specific to marine archaeology is presented in Table 8.5 below, together with how these topics have been considered in the production of this Environmental Statement chapter.

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Table 8.5: Summary of key consultation topics raised during consultation activities undertaken for the Morgan Generation Assets relevant to marine archaeology.

Date	Consultee and type of response	Topic raised	Response to issue raised and/or where considered in this chapter
June 2022	The Planning Inspectorate. Scoping response.	<p>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.</p> <p>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 Maximum Design Scenario (MDS) assessed.</p>	Full details of proposed seabed preparation activities are provided in Volume 1, Chapter 3: Project description of the Environmental Statement. The maximum design scenario in relation to seabed disturbance and impacts to marine archaeology is provided in section 8.6.1 of this chapter with justification.
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 8.16 of this chapter. Cumulative impacts for operation and maintenance activities are assessed as part of the Cumulative Effects Assessment (CEA) in section 8.9 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.	The cumulative impacts are detailed and assessed as part of the CEA in section 8.9 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 heritage matters in relation to the Morgan Generation Assets. Historic England have been key participants to the AHEF. Topics raised and responses are captured in this table.

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Date	Consultee and type of response	Topic raised	Response to issue raised and/or where considered in this chapter
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.	If damaged, marine archaeology receptors lack the ability to recover, therefore there is no 'reasonable timescale' or 'short time period' within which recovery could occur so that an impact would be reversible/not permanent. The methodology for the assessment of significant effects on marine archaeology is presented in section 8.5.
July 2022	Historic England. Scoping response.	In section 5.3.4 (Baseline environment) (of the Morgan Offshore Wind Project Generation Assets 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.	Measures have been adopted as part of the Morgan Generation Assets and are presented in section 8.7. These include the provision of an Outline Offshore WSI and PAD (Document Reference J.14) in order to establish measures and procedures should the project encounter presently unknown archaeological material/assets.
July 2022	Historic England. Scoping response.	Regarding the statement made in paragraph 5.3.4.12 (of the Morgan Offshore Wind Project Generation Assets 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 8.8 of this chapter. Measures have been adopted as part of Morgan Generation Assets and are presented in section 8.7. These include the provision of an Outline Offshore WSI and PAD (Document Reference J14) 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 records from the Isle of Man marine historic environment record (HER).	Manx National Heritage (MNH) have been contacted with a request to purchase the shipwreck data on 07 July 2023, July 2023, 22 August 2023, and 30 October 2023. A list of records was supplied by MNH and cross-checked with the other datasets (see Table 8.6).

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Date	Consultee and type of response	Topic raised	Response to issue raised and/or where considered in this chapter
July 2022	Historic England. Scoping response.	<p>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 Environmental Statement and Environmental Statement prepared for "Array Area". 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:</p> <ul style="list-style-type: none"> • https://historicengland.org.uk/research/methods/characterisation/historic-seascapes/ • https://archaeologydataservice.ac.uk/archives/view/hscirish_eh_2011/. 	<p>Cumulative impacts and inter related effects have been assessed in this chapter in sections 8.10 and 8.12.</p> <p>This document and data source have been reviewed and applied in the development of the approach to assessment of effects to Historic Seascape Character (HSC), along with advice from HE received through the AHEF, as presented in section 8.8.6.</p>
November 2022	Historic England. AHEF meeting.	The Isle of Man territorial waters run right up to the Morgan Array Area boundary, is there adequate collaboration and coordination with the IoM.	<p>Manx National Heritage (MNH) have been contacted with a request to purchase the shipwreck data on 7 July 2023, 19 July 2023, and 30 October 2023. A list of records was supplied by MNH and cross-checked with the other datasets (see Table 8.6).</p> <p>The potential to find archaeological receptors near the boundary with the Isle of Man territorial waters is noted and are addressed in the Outline Offshore WSI (Document Reference J.14).</p>
May 2023	Historic England. Preliminary Environmental Information Report (PEIR) response	The PEIR explains that an Outline archaeological Written Scheme of Investigation (WSI) is to be produced and we encourage the applicant to discuss the scope of the WSI prior to DCO application.	The Outline Offshore WSI and PAD (Document Reference J.14) and preliminary results of ongoing surveys have now been discussed with stakeholders including Historic England through the AHEF.

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Date	Consultee and type of response	Topic raised	Response to issue raised and/or where considered in this chapter
May 2023	Historic England. PEIR response	<p>We appreciate the explanation that ‘pre-construction site investigation surveys’ are likely to include geophysical and geotechnical surveys as relevant to the (proposed) development area for wind turbines, Offshore Substation Platforms (OSPs) and electricity cable routes. We also appreciate the relevance of geophysical survey to support UXO investigations and for mapping dynamic bedforms and boulders and sub-seabed sedimentary conditions, and that such mapping requires corroboration with geotechnical surveys. However, the selection of “specific locations within the Morgan Array Area” (section 3.6.2) should be discussed with Historic England so that palaeoenvironmental objectives are effectively included within an Outline Offshore WSI.</p> <p>Paragraph 3.6.2.2 describes the geophysical site investigations to be inclusive of:</p> <ul style="list-style-type: none"> • Multi-Beam Echo-Sounder (MBES) • Side Scan Sonar (SSS) • Single Beam Echosounder (SBES) • Sub-Bottom Profilers (SBP) • Ultra High Resolution Seismic (UHRS) • Magnetometer. <p>Paragraph 3.6.2.3 describes geotechnical site investigations to be inclusive of:</p> <ul style="list-style-type: none"> • Boreholes • Vibrocores. 	<p>The approach to the Outline Offshore WSI and PAD (Document Reference J.14) and preliminary results of ongoing surveys have now been discussed with stakeholders including Historic England through the Offshore AHEF. Any requirements for pre-construction survey are fully covered within the Outline Offshore WSI and PAD.</p>
May 2023	Historic England. PEIR response.	<p>Section 3.6.4 (Site preparation activities) describes removal of boulders and out of service cables. It is therefore important that we highlight the role of an accredited, professional and experienced archaeological consultant in assessing the risk that archaeological materials might be encountered and that such material is not treated as (contemporary) debris. Regarding sand wave clearance for either cable or wind turbine/OSP foundation installation, it is relevant that pre-construction site investigation surveys are informed by archaeological advice to address the risk of encountering presently buried and unknown archaeological materials.</p>	<p>All pre-construction site investigation surveys are to be designed with advice from suitably qualified archaeologists. This provision is part of the measures adopted as part of the Morgan Generation Assets as detailed in section 8.7 of this chapter of the Environmental Statement and the Outline Offshore WSI (Document Reference J.14).</p>

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Date	Consultee and type of response	Topic raised	Response to issue raised and/or where considered in this chapter
May 2023	Historic England. PEIR response.	The seabed depth across the Morgan Generation Assets is described as between 32 m and 54 m below Mean Sea Level with a depression across the array area running from southwest to northeast. Quaternary sediment thickness in the central Irish Sea can be more than 20 m or considerably deeper where former glacial valleys are present. Regarding dynamic seafloor conditions we note the description that array area includes sand waves, and mega-ripples. Table 6.11 (Maximum Design Scenario) describes sand wave clearance for installation of intra-array and interconnector cables to an average depth of 5.1 m. This provides useful information to determine what impacts there could be for presently unknown and buried archaeological materials.	The assessment of significant effects (section 8.8) has assessed the potential for impacts to expose currently buried archaeological material that may be present within the Morgan marine archaeology study area. This assessment has been informed by the results of physical processes modelling (Volume 2, Chapter 1: Physical processes of the Environmental Statement).
May 2023	Historic England. PEIR response.	We are aware that survey data analysis is ongoing of geophysical and geotechnical survey data acquired in 2022 and that further archaeological and geoarchaeological interpretation should be included within the Environmental Statement.	Geophysical and Geotechnical surveys were undertaken between July 2021 and March 2022 and in 2022 and 2023. The results of those surveys and the subsequent Stage 1 geoarchaeological assessment are summarised in section 8.4.3 of this chapter and presented in full in Volume 4, Annex 8.1: Marine archaeology technical report of the Environmental Statement.
May 2023	Historic England. PEIR response.	We note that physical processes modelling conducted for this project has indicated that changes to the tidal regime are limited to the immediate development area. It is therefore anticipated that marine physical process beyond the 2 km marine archaeology study area are “minimal” (i.e. ‘negligible’). Regarding section 13.2.4 (Guidance) we also offer the following: <ul style="list-style-type: none"> • Historic England Advisory Note (No 15) Commercial Renewable Energy • Development and the Historic Environment (2021) • Deposit Modelling and Archaeology; and Radiocarbon Dating and Chronological Modelling 	The guidance documents have now been consulted and have been used in the production of this chapter and specifically referenced in section 8.2.4 below. Full details of physical processes modelling can be found in Volume 2, Chapter 2: Physical processes of the Environmental Statement.
May 2023	Historic England. PEIR response.	Paragraph 13.4.4.23 highlights a potential aircraft crash site record held by the United Kingdom Hydrographic Office (UKHO) (Ref: 5418) and National Record of the Historic Environment (NRHE) (Ref: 909495) within the Morgan marine archaeology study area and considered ‘live’ by the UKHO. If a crashed military aircraft is present and identified as being British, then it will be automatically afforded ‘protected place’ status under the Protection of Military Remains Act 1986.	There is no indication that the aircraft crash site was of a military aircraft and the geophysical survey has not identified any existing material on the seabed. However, given the ephemeral nature of aviation material, a TAEZ is proposed as a precautionary approach. All AEZs and TAEZs are presented in section 8.7.2 and shown in Figure 8.5 of this chapter.

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Date	Consultee and type of response	Topic raised	Response to issue raised and/or where considered in this chapter
May 2023	Historic England, PEIR response.	Paragraph 13.4.5.2 acknowledges that dynamic seabed conditions means that there is potential for archaeological sites to be exposed or buried including 'new marine archaeology sites and wrecks...' and this matter is expanded upon in section 13.4.6 (data limitations). It therefore continues to be our advice that professional archaeological analysis is commissioned for any further geophysical and geotechnical survey data acquired for the Morgan Generation Area with the results included within any Environmental Statement subsequently produced.	Updates on the site investigation have been provided to stakeholders through the Offshore AHEF. The results of these have been incorporated into and are presented in full in Volume 4, Annex 8.1: Marine archaeology technical report of the Environmental Statement.
May 2023	Historic England. PEIR response.	Section 13.5 (Impact assessment methodology) we concur with paragraph 13.5.2.4 which states that " <i>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.</i> " However, section 13.6 (key parameters for assessment) states that one of the effects to determine a maximum design scenario is " <i>the greatest penetration depth of foundations</i> ". We suggest that it is not greatest penetration per se, but greatest area cleared to facilitate foundation placement. We therefore welcome further discussion regarding the content of Table 13.13 and whether gravity base foundations should be included (as described in Table 3.10) within the Environmental Statement.	In order to assess the MDS for direct impacts to marine archaeology receptors the total area of impact for both near surface sediments and deeply buried deposits have been calculated. Please see MDS Table 8.16 for full details. This is in order to assess both impacts to near-surface archaeological material and deeply buried deposits that may contain palaeoenvironmental evidence or associated prehistoric material. Gravity-based foundations have been assessed as part of the MDS (section 8.6.1).
May 2023	Historic England. PEIR response.	Section 13.7.3 (preservation by record) describes the use of the Offshore Renewables Protocol for Archaeological Discoveries, as was originally supported by The Crown Estate. We therefore recommend that the Applicant checks procedures for the use of a protocol system with The Crown Estate to clarify what system continues to be supported. Subject to this clarification the appropriate reference should be included within the Environmental Statement plus in other related documentation.	The most up to date guidance from The Crown Estate has been consulted in the production of the Outline Offshore WSI and PAD (Document Reference J.14) which clarifies the approach to the protocol and system adopted. The Outline Offshore WSI and PAD (Document Reference J.14).
May 2023	Historic England. PEIR response.	Section 13.9 (Cumulative effect assessment methodology) requires further attention in any Environmental Statement to explain why Morecambe Offshore Windfarm Generation Assets is not included in Table 13.16.	Morecambe Offshore Windfarm Generation has been assessed as part of the Culminative Effects Assessment (CEA) which is presented in section 8.10.

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Date	Consultee and type of response	Topic raised	Response to issue raised and/or where considered in this chapter
May 2023	Historic England. PEIR response.	Section 13.14 (Next steps) explains that geophysical and geotechnical surveys were undertaken between April and September 2022 and that these data, as described in section 13.4.3, are to be used to refine the marine archaeology baseline and inform the Environmental Statement. We therefore encourage the applicant to maximise the use of the Archaeology and Heritage Engagement Forum during the rest of the pre-application stage to engage with Historic England.	Updates on the site investigation have been provided to stakeholders through the Offshore AHEF. The results of these have been incorporated into and are presented in section 8.4.3 of this chapter.
May 2023	Historic England. PEIR response.	In our Scoping Response (July 2022) we made the comment that the Applicant should contact the national curator for the historic environment in the Isle of Man to support preparation of the PEIR. However, we note the comment made in Table 13.4 that no data appears to be held as relevant to the Morgan marine archaeology study area.	<p>MNH have been contacted with a request to purchase their newly acquired shipwreck data on 07 July 2023, 19 July 2023, 22 August 2023, and 30 October 2023. A list of records was supplied by MNH and cross-checked with the other datasets.</p> <p>The potential to find archaeological receptors near the boundary with the Isle of Man territorial waters is noted and are addressed in the Outline Offshore WSI and PAD (Document Reference J.14).</p>
May 2023	Historic England. PEIR response.	We note that Historic seascape and the setting of historic assets are considered in Volume 2, Chapter 13 (Marine archaeology) which in turn explains that further consideration features in Annex 13.1 (Marine archaeology technical report) of the PEIR (Morgan Offshore Wind Ltd., 2023b). However, Chapter 13, in paragraph 13.6.1.3 mentions that impacts to HSC are addressed within Volume 2, Chapter 25; this is taken to be a typo. We therefore request that the Environmental Statement prepared for this proposed project given adequate and sufficient inclusion of HSC in a clearly and consistently referenced chapter.	An assessment of effects on HSC has been undertaken and is presented in section 8.8.6.
May 2023	Historic England. PEIR response.	Section 1.2.2 (Legislation) includes Protection of Wrecks Act 1973 and Ancient Monuments and Archaeological Areas Act 1979 (as amended) although it is not explained why these acts are included in consideration that the entire proposed Morgan Generation Assets is within the North West Offshore Marine Plan Area. Furthermore, in Section 1.2.3 (Policy) the explanation in paragraph 1.2.3.3 requires further clarification that 'Designated archaeological assets' can only occur within the English Inshore Marine Planning Area. In section 1.2.4 (Guidance) we offer the additional reference Historic England Advisory Note Commercial Renewable Energy Development and the Historic Environment, as referenced above.	The North West Marine Plan is discussed in section 8.2.2, and the Historic England Advisory Note is referenced in section 8.2.4 of this chapter. However, there is no policy or guidance that suggest that designated archaeological assets can only occur within the English Inshore Marine Planning Area.

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Date	Consultee and type of response	Topic raised	Response to issue raised and/or where considered in this chapter
May 2023	Historic England. PEIR response.	Section 1.5.2 (Historic Seascape Characterisation) while we note the use of HSC to provide context for the archaeology study and the identification of historic character as "...predominantly related to fishing and navigation activity" and that there is "a high potential for maritime archaeology" it does not appear to include an assessment of how these perceptions of historic character can accommodate change as presented by this proposed development. We require this matter to be considered further within the Environmental Statement.	The HSC of Morgan Generation Assets is presented in section 8.4.3. An assessment of effects on HSC has been undertaken and is presented in section 8.8.6.
June 2023	Isle of Man Department of Infrastructure. PEIR response	The PEIR sets out the preliminary findings of the EIA undertaken to date. The TSC is satisfied from the information in these documents that all international environmental standards and best practice will be adhered to when undertaking the collection and analysis of the data obtained from within the proposed development area and will ensure appropriate mitigation measures are in place to address any concerns identified throughout the remaining Environmental Assessments process. The TSC had however expected there to be more emphasis and greater detail provided on proposed mitigation measures for the impacts identified to date as part of the PEIR, particularly as set out in the Statement of Community Consultation whereby 'It (the PEIR) also sets out measures that could prevent, reduce or offset any environmental effects, identified as part of early assessments and consultation'.	The measures adopted as part of the project to reduce impacts to marine archaeology receptors are fully detailed in section 8.7 and accompanying Outline Offshore WSI and PAD (Document Reference J.14).
June 2023	Isle of Man Department of Infrastructure. PEIR response.	<p>MNH would expect that the forthcoming EIA would consider the following issues:</p> <p>Visual impact of proposals on the setting of protected monuments on the east side of the watershed of the Island, given the proximity of the west edge of the study area, this could involve approximately 25 monuments. The impact could be considered limited, but there are some flagship sites such as Castle Rushen and Laxey Wheel which are major tourist assets of national and economic significance to the Island where the impact should be considered more holistically.</p>	The assessment of potential impacts to the setting of onshore heritage receptors is included within Volume 4, annex 8.2: Cultural heritage technical report of the Environmental Statement and summarised in section 8.8.7.

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Date	Consultee and type of response	Topic raised	Response to issue raised and/or where considered in this chapter
June 2023	Isle of Man Department of Infrastructure. PEIR response.	The potential direct impact on historical shipwrecks would also need to be assessed. MNH has recently acquired some shipwreck data and whilst this is still being evaluated and integrating it into MNH data system, it is already clear that there are several sites in the area. None of them are formally protected so as to cause a significant problem, but nevertheless MNH would expect an EIA to exercise due diligence in this respect.	Data from the MNH Shipwreck Index was reviewed and they hold no additional records within the Morgan marine archaeology study area (see Table 8.6). The potential to find archaeological receptors near the boundary with the Isle of Man territorial waters is noted and is addressed in the Outline Offshore WSI and PAD (Document Reference J.14).
01 June 2023	Manx National Heritage (MNH) response to Preliminary Environmental Information Report (PEIR)	MNH would expect that the forthcoming Environmental Impact Assessment (EIA) would consider the following issues: Visual impact of proposals on the setting of protected monuments on the east side of the watershed of the Island, given the proximity of the western edge of the study area, this could involve approximately 25 monuments. The impact could be considered limited, but there are some flagship sites such as Castle Rushen and Laxey Wheel which are major tourist assets of national and economic significance to the Island where the impact should be considered more holistically.	Offshore settings are considered in detail in Volume 4, Annex 8.2: Cultural Heritage Technical Report of the Environmental Statement and summarised in section 8.8.7.
July 2023	Historic England. AHEF meeting.	Key element of HSC is that it can't be equated to sensitivity and therefore assessed as a receptor. It is more of a narrative approach, acknowledging perception of historical character, what exists and what more is being introduced by the proposed development. I.e., Industrial seascape (e.g. oil and gas) is then able to accommodate further iteration of industrial development (e.g. offshore wind), contrary to 'pristine' seascapes which were, historically, less industrialised and therefore less able to accommodate industrial development.	The HSC of Morgan Generation Assets is presented in section 8.4.3. An assessment of effects on HSC has been undertaken and is presented in section 8.8.6.
October 2023	Royal Commission on the Ancient and Historic Monuments of Wales (RCAHMW)	In reference to the PEIR document, what is happening regarding the longer-term monitoring of the archaeological resource? The surveys that have been done have turned up new material, potentially. One of the things RCAHMW will be looking for is this material to be included into the National Monuments Record for Wales (NMRW) more efficiently, i.e. as much detail on assets coming from geophysical surveys as possible – perhaps within the WSI or Environmental Statement. A lot of the material goes into reporting but no further.	Document ReferenceThe ongoing monitoring of all known marine archaeology receptors identified as having a high or medium potential is proposed within the measures adopted as part of the project (section 8.7).

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Date	Consultee and type of response	Topic raised	Response to issue raised and/or where considered in this chapter
November 2023	MNH. PEIR response.	<p>I have now been able to query the finished database, which can be found at https://isleofmanher.im . With the caveat that, because the IoMHER is not yet GIS-enabled, I am not able to directly layer a shapefile of the development site into our database, to the best of my estimation, the following wreck sites may lie within the area: 1009; 1077; 1200; 1312; 1385; 1497; 1520; 1533; 1655; 1678; 1803; 2262; 2845; 2982; 3116; 3237; 3386</p> <p>Please note that a significant proportion of these wreck sites are only generally located, and you may decide, on studying the individual records through the database, to discard several of them. In relation to the PEIR we have no other comments to raise from a cultural heritage perspective.</p>	<p>Data from the MNH Shipwreck Index was reviewed and cross-checked with the other desktop datasets (see Table 8.6), no additional records were identified.</p> <p>The potential to find archaeological receptors near the boundary with the Isle of Man territorial waters is noted and is addressed in the Outline Offshore WSI and PAD (Document Reference J.14).</p>
March 22 2024	Historic England response to Assessment Methodology (Appendix A)	<p>Are there any nationally significant non-designated assets within the study area?</p>	<p>Undesignated assets were considered in the screening for this assessment. No undesignated assets considered to be of national significance were identified which have a meaningful visual or historic relationship with the seascape that contributes substantially to its heritage significance.</p>
March 22 2024	Historic England response to Assessment Methodology (Appendix A)	<p>Any assessment of impact to WHSs needs to be undertaken with reference to the document <i>Guidance and Toolkit for Impact Assessment in a World Heritage context</i></p> <p>Impacts to a WHS must be articulated in terms of impact to the WHS's OUV, citing the relevant attributes/themes affected.</p> <p>This is as per the last sentence of NPPF paragraph 2: <i>Planning policies and decisions must also reflect relevant international obligations and statutory requirements.</i></p>	<p>The methodology document (Appendix A) has been modified to include the guidance on impact assessment within a World Heritage Site context.</p> <p>Initial scoping of the two World Heritage Sites potentially affected identified that one (the Frontiers of the Roman Empire (Hadrian's Wall) World Heritage Site) had no meaningful relationship with the seascape, and therefore views in the direction of the Morgan Array did not contribute to the Outstanding Universal Values of the World Heritage Site. it was therefore not taken forward for further assessment.</p> <p>Initial screening identified that whilst there was a potential that long views from the English Lake District would encompass the turbines of the Morgan Array Area, they were unlikely to contribute to its Outstanding Universal Values. Site visits were undertaken to consider these views further, and it was concluded that they did not contribute to the Outstanding Universal Values of the Lake District, and therefore it was not taken forward for further assessment.</p>

8.4 Methodology to inform baseline environment

8.4.1.1 Data used to compile this report consists of primary site investigation survey data (Table 8.8) and secondary information derived from a variety of sources (Table 8.6).

8.4.1 Desktop study

Marine archaeology

8.4.1.1 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 8.6 below.

8.4.1.2 The principal archaeological archives relating to the Morgan marine archaeology study area are the National Record of the Historic Environment (NRHE) as held by HE. Data from the UKHO is a further resource, which RPS holds in house, and is utilised to corroborate positional information of known wrecks and obstructions on the seabed. Additional sources consulted include the National Monuments Record Wales (NMRW) as held by RCAHMW, historic Ordnance Survey maps and Admiralty Charts. MNH provided additional shipwreck data from within the Morgan marine archaeology study area.

Table 8.6: Summary of key marine archaeology desktop data.

Title	Source	Year	Author
UKHO Wreck and Obstructions Data	UKHO	2024	UKHO
HER Data	NRHE	2021	Historic England (HE)
HER Data	NMRW	2021	Royal Commission on the Ancient and Historical Monuments of Wales (RCAHMW)
HER Shipwreck Data	MNH	2023	MNH
HSC: The Irish Sea (English Sector)	Archaeology Data Service (ADS)	2011	HE
Submerged Landscapes Data	EMODnet Geology	2024	British Geological Survey

Cultural heritage

8.4.1.3 Information on cultural heritage within the Morgan settings study area was collected through a detailed desktop review of existing studies and datasets. These are summarised at Table 8.7 below.

Table 8.7: Summary of key cultural heritage desktop data.

Title	Source	Year	Author
World Heritage Site	Historic England	2023	n/a
Listed Buildings	Historic England	2023	n/a
Isle of Man Ancient Monuments	Manx National Heritage	2024	n/a

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Title	Source	Year	Author
Isle of Man Registered Buildings	Manx National Heritage	2024	n/a
Isle of Man Conservation Areas	Manx National Heritage	2024	n/a
World Heritage Site	Historic England	2023	n/a
Registered Parks and Gardens	Historic England	2023	n/a
Scheduled Monuments	Historic England	2023	n/a

8.4.2 Site specific surveys

8.4.2.1 In order to inform this Environmental Statement, site-specific surveys were undertaken. A summary of the surveys undertaken to inform the marine archaeology and cultural heritage impact assessment is outlined in Table 8.8 below.

Marine archaeology

8.4.2.2 A comprehensive marine geophysical survey was carried out for the Morgan Generation Assets. The survey comprised MBES, SSS and SBP 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 8.1: Marine archaeology technical report of the Environmental Statement. Additional 3d UHR seismic surveys were conducted in 2023.

8.4.2.3 Geotechnical site investigations were conducted in 2022 and 2023 by Fugro Marine Limited and Gardline, including within the Morgan Array Area. These investigations were in the form of vibrocore and borehole sampling. All data were collected to a specification that fulfils the requirements of Section 3 of Archaeological Written Schemes of Investigation for Offshore Wind Farm Projects (Wessex Archaeology, 2021).

Cultural heritage

8.4.2.4 Site visits were undertaken in February 2024 to confirm visibility towards the Morgan Array Area and gain a fuller understanding of the current settings of these assets and the contribution of the setting to their heritage significance. Where site visits were not possible due to location (such as assets on small islands with no regular access) the understanding of the current settings of these assets and the contribution of the setting to their heritage significance was based on review of available information.

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Table 8.8: 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 Generation Assets.	Gardline	July 2021 to September 2021	Volume 4, Annex 8.1: Marine archaeology technical report of the Environmental Statement.
Multibeam Bathymetry (MBES)	Morgan Array Area	Geophysical survey to characterise the marine archaeology of the Morgan Generation Assets.	XOCEAN	June 2021 to March 2022	Volume 4, Annex 8.1: Marine archaeology technical report of the Environmental Statement.
Sub-bottom Profiler (SBP)	Morgan Array Area	Geophysical survey to characterise the marine archaeology of the Morgan Generation Assets.	Gardline	July 2021 to September 2021	Volume 4, Annex 8.1: Marine archaeology technical report of the Environmental Statement.
Geotechnical	Morgan Array Area	Geotechnical survey to characterise the marine archaeology of the Morgan Generation Assets	Fugro and Gardline	2022 and 2023	Volume 4, Annex 8.1: Marine archaeology technical report of the Environmental Statement
Setting assessment site visits	Sites within setting assessment study area	Site visits in to confirm potential intervisibility and gather baseline setting data	RPS	February 2024	Volume 4, Annex 8.2: Cultural heritage technical report of the Environmental Statement

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8.4.3 Baseline environment

8.4.3.1 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
- Historic Seascape Character (HSC): characterisation of the historic and present physical, environmental and human made changes and activities that have formed the seascape as it is today.

8.4.3.2 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 8.9.

Table 8.9: 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
19 th century	AD 1800 to 1899
Modern	AD 1900 to present day

Submerged prehistoric archaeology

8.4.3.3 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

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archaeology study area is summarised below, and further information is presented in Volume 4, Annex 8.1: Marine archaeology technical report of the Environmental Statement.

8.4.3.4 Geological periods referred to in this section are defined by the date ranges presented in Table 8.10.

Table 8.10: 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 (<i>Homo sapiens</i>).
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 to 45,000 BP, 184,000 to 43,000 BC)

8.4.3.5 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 and geotechnical 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 to 10,000 BP, 43,000 to 8,000 BC)

8.4.3.6 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.

8.4.3.7 Sea level and landscape changes within the Morgan marine archaeology study area and its 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

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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 geophysical and geotechnical 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 that submergence of the area where the Morgan Generation Assets are proposed to be sited occurred around c. 13,000 BP and others arguing for c. 6,000 to 7,000 BP (Fitch *et al.*, 2011).

- 8.4.3.8 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 to 6,000 BP, 12,000 to 4,000 BC)

- 8.4.3.9 Evidence from the site-specific geophysical and geotechnical 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 a kettle hole lake may be situated to the north east of the Morgan Array Area.

- 8.4.3.10 Geotechnical assessment from the Morgan Array Area indicates that by between 16,000 and 13,000 BP there was an influx of glaciomarine sedimentation, suggesting the beginnings of submergence (Li, *et al.*, 2023). Although the chronology for submergence is debated academically, the data shows that 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 and therefore would lack the potential for the survival of archaeological material.

Maritime and aviation archaeology

Maritime archaeology potential

Early Prehistoric (Palaeolithic and Mesolithic)

- 8.4.3.11 There is currently no evidence in the Morgan marine archaeology study area for maritime archaeological remains pre-dating the start of the Holocene.
- 8.4.3.12 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 from the Palaeolithic and Mesolithic periods is considered low.

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Neolithic and Bronze Age

- 8.4.3.13 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.
- 8.4.3.14 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

- 8.4.3.15 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.
- 8.4.3.16 The Roman occupation of Britain was by necessity a maritime endeavour, which would have required continuous transportation of resources and people to the military forts (such as *Deva Victrix*, modern Chester and *Luguvalium*/Modern Carlisle on Hadrians wall) and civilian towns (such as Wilderspool) established by the Romans (University of Gothenburg, 2023). Sites such as these can be found along the coast of the eastern Irish sea and Liverpool Bay, such as Chester 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

- 8.4.3.17 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.
- 8.4.3.18 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.
- 8.4.3.19 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

- 8.4.3.20 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.
- 8.4.3.21 Only one recorded loss has been identified within the NMRW data for the Morgan marine archaeology study area. A further 11 recorded losses are contained within the HER data supplied by MNH. The full details of all recorded losses are presented in

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Volume 4, Annex 8.1 Marine archaeology technical report of the Environmental Statement. The position of these records, however, have not been identified through the site-specific surveys but the possibility that material could survive within the Morgan marine archaeology study area remains.

8.4.3.22 The increased volume of losses from this period is consistent with the 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.

8.4.3.23 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. All of the recorded losses are Post Medieval and predominantly lost to weather rather than enemy action. None of the recorded losses were in active service with the Royal Navy and thus do not qualify for designation under the Protection of Military Remains Act 1986.

Aviation archaeology

8.4.3.24 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 and 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.

8.4.3.25 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 8.2) 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. Due to the potential value of this receptor and as a precautionary approach, a TAEZ with a 100 m radius has been established around the coordinates of the UKHO record. Full details of AEZs and TAEZs are given in section 8.7.2.

Results of the desktop study

8.4.3.26 No designated sites have been identified within the datasets for the Morgan marine archaeology study area.

8.4.3.27 Within the UKHO data there are 11 entries that relate to wreck sites within the Morgan marine archaeology study area and one that corresponds to the aircraft. Of these, six are considered 'live'; the further five are all listed as 'dead' indicating that no remains of these wrecks are currently visible on the seabed.

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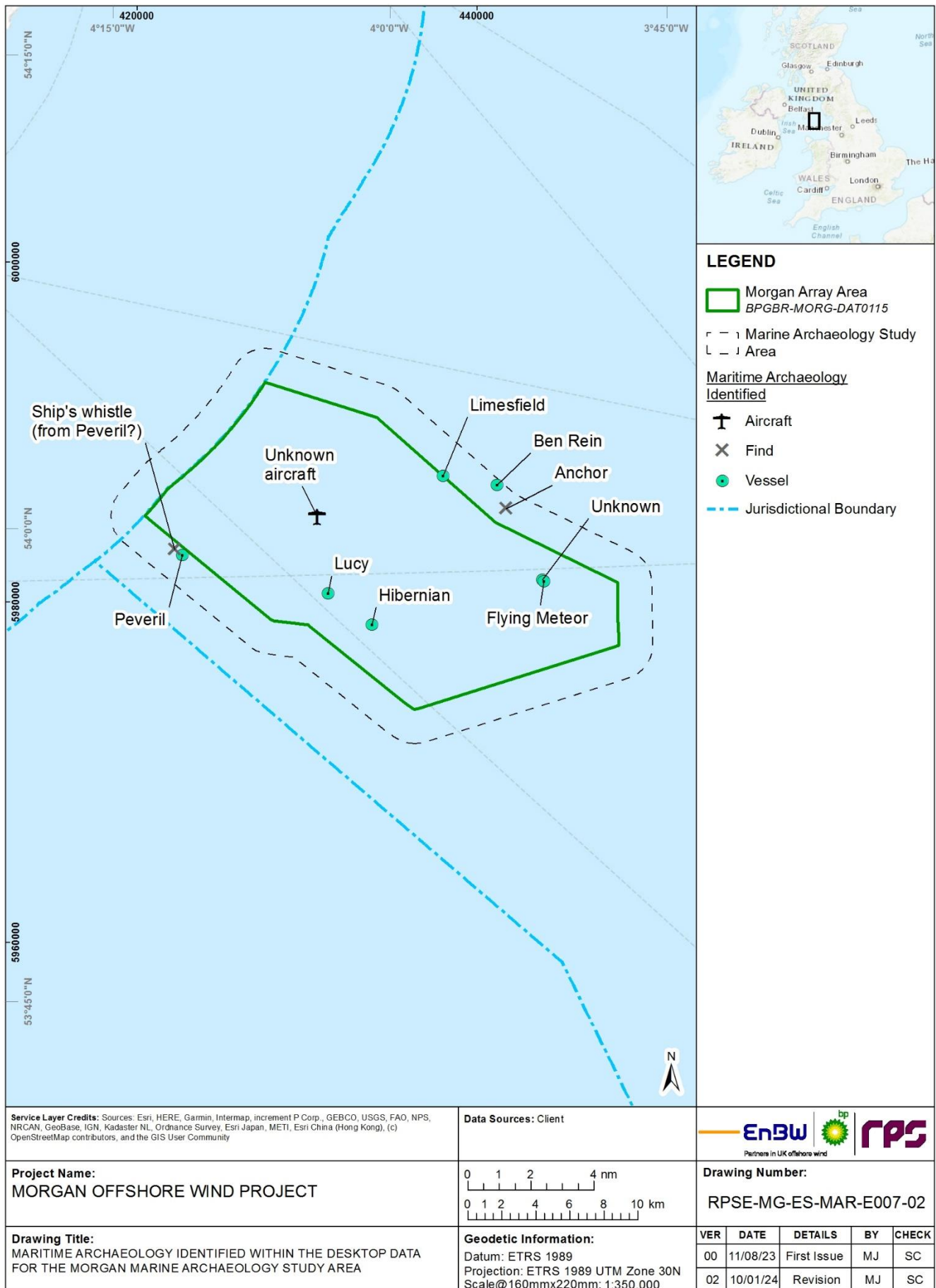


Figure 8.2: Maritime and aviation archaeology identified within the desktop data for the Morgan marine archaeology study area.

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Geophysical seabed features assessment results

- 8.4.3.28 Geophysical data collected for the Morgan Generation Assets recorded 51 anomalies of potential archaeological interest. Of these, five are considered to be high potential anomalies, five are of medium potential and 41 have been classed as low potential anomalies. There were previously 42 low potential anomalies identified during the archaeological assessment of geophysical data but, as the Morgan Array Area was reduced following PEIR, one anomaly of low potential now lies outside the Morgan marine archaeology study area. This anomaly is not included in the anomaly total in this report.
- 8.4.3.29 The distribution of anomalies with medium potential is shown in Figure 8.3 and those with high potential are shown in Figure 8.4. The 41 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. Full details of the low potential anomalies can be found in Volume 4, Annex 8.1: Marine archaeology technical report of the Environmental Statement.
- 8.4.3.30 The five medium potential anomalies could represent marine archaeology sites from potential debris to wreck. These are presented in Table 8.11. Full details of the medium potential anomalies can be found in Volume 4, Annex 8.1: Marine archaeology technical report of the Environmental Statement.

Table 8.11: Medium potential anomalies.

ID	Category
Morgan_0005	Seabed disturbance
Morgan_0015	Unidentified debris
Morgan_0025	Potential wreck
Morgan_0030	Potential debris
Morgan_0116	Potential debris

- 8.4.3.31 Of the six wrecks identified within the desktop data, five were located during the archaeological assessment of geophysical data and have been classified as high potential anomalies. All correspond to UKHO recorded positions of ‘live’ wrecks, these are shown in Figure 8.4 and presented in Table 8.12 below.

Table 8.12: High potential anomalies.

ID	Name	Location	Description
Morgan_0008 UKHO: 5463 NRHE: 909403	<i>Limesfield</i>	Morgan marine archaeology study area (close proximity to northern boundary of the Array Area)	Morgan_0008 is visible in both the SSS and MBES data and corresponds with records of the wreck of <i>Limesfield</i> , a British steamship sunk by submarine UB57 on 7 February 1918 whilst on passage from Belfast to Preston with a cargo of cotton waste.

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ID	Name	Location	Description
Morgan_0017 UKHO: 8250 NRHE: 909493	<i>Flying Meteor</i>	Array Area	Morgan_0017 is visible in the SSS and MBES data and corresponds with records of <i>Flying Meteor</i> , a British paddle steamer tug built in 1864 and sank on 13 March 1874 whilst towing the barque <i>Ravenbourne</i> from Liverpool to Troon.
Morgan_0096 UKHO: 5462 NRHE: 909472	<i>Ben Rein</i>	Morgan marine archaeology study area	Morgan_0096 is visible in the SSS and MBES data and corresponds with records of <i>Ben Rein</i> , a British carrier built in 1905 and sunk by submarine UB57 on 07 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.
Morgan_0097 UKHO: 7458 NRHE: 909402 NMRW: 506875	<i>Hibernian</i>	Array Area	Morgan_0097 is visible in the SSS and MBES data and corresponds with records of <i>Hibernian</i> , 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.
Morgan_0098 UKHO: 7459 NMRW: 506874	<i>Lucy</i>	Array Area	Morgan_0098 is visible in the SSS and MBES data and corresponds with records of <i>Lucy</i> , 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.

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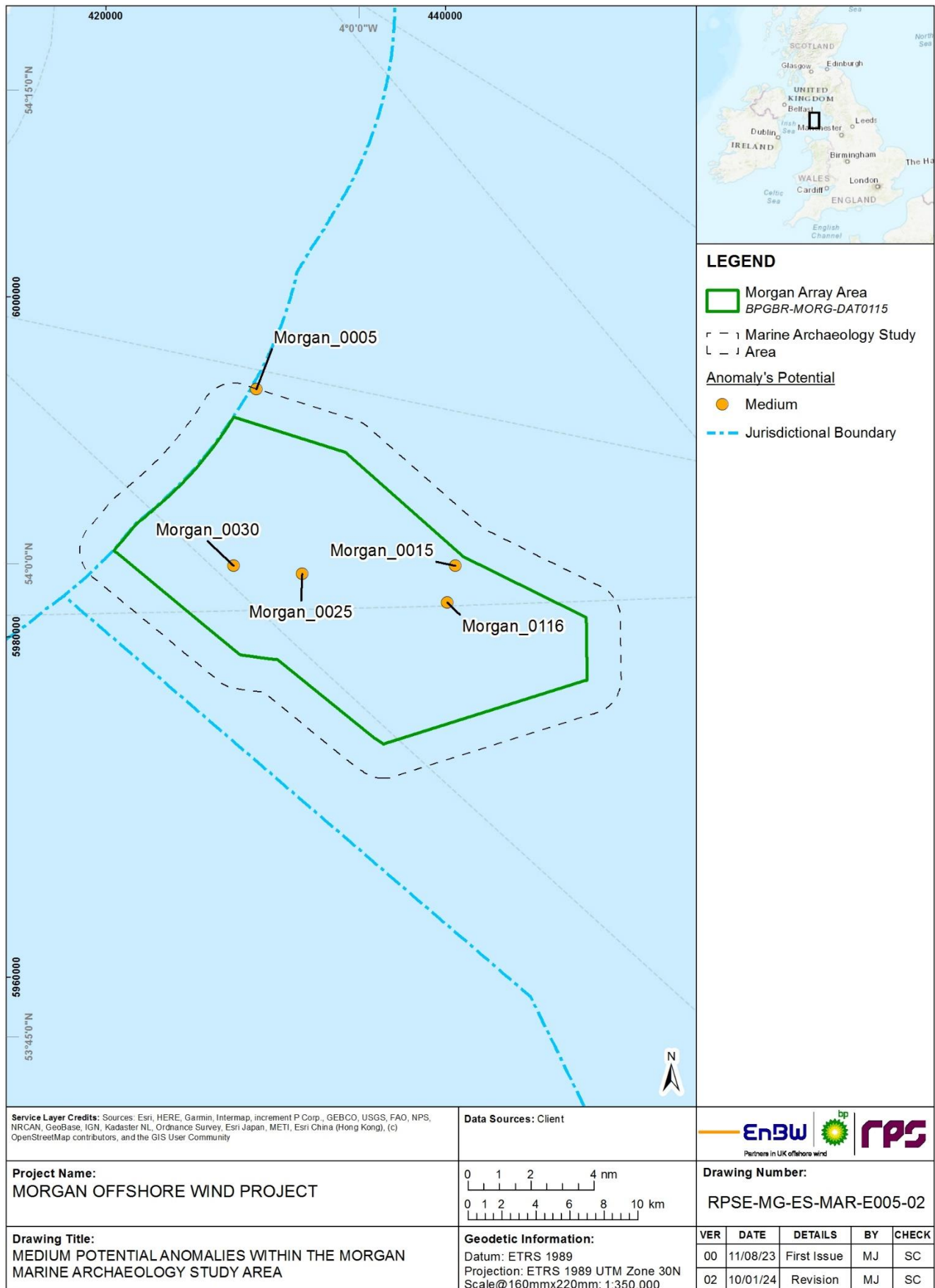


Figure 8.3: Geophysical Anomalies with medium archaeological potential within the Morgan Generation Assets marine archaeology study area.

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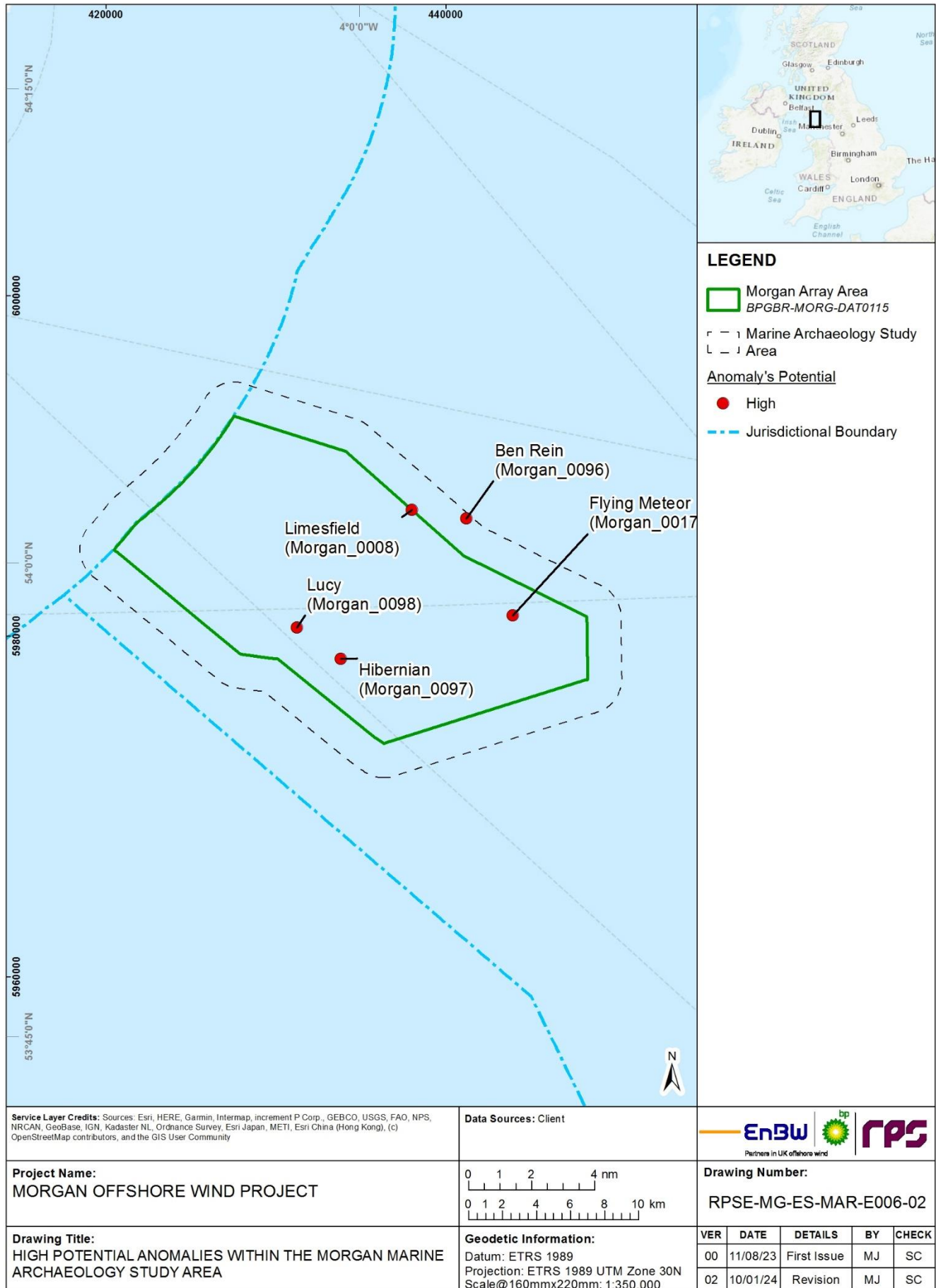


Figure 8.4: Geophysical Anomalies with high archaeological potential within the Morgan Generation Assets marine archaeology study area.

Historic Seascape Character

- 8.4.3.32 The HSC method characterises historic trends and process that have shaped the marine archaeological environment to provide information for the sustainable management of English marine and coastal environments. The marine environment is considered in four 'levels': the sea surface, the water column, the sea floor and the sub-sea floor. The results are available in Geographical Information System compatible downloads from the Archaeology Data Service which allows key characteristics within the Morgan marine archaeology study area to be identified.
- 8.1.1.3 The HSC was categorised based on the data, the full results of which are presented in Volume 4, Annex 8.1: Marine archaeology technical report of the Environmental Statement. The sub-character types can be broken down into the following categories:
- Fishing activities such as bottom trawling, potting, and shellfish dredging in the modern period
 - Modern installations and activities such as submarine cables
 - Modern maritime debris
 - Modern navigation routes
 - Seabed types and characteristics of find and course sediment plains.
- 8.4.3.33 Historical cultural processes which have shaped the character of the Morgan marine archaeology study area are predominantly related to fishing and navigation activity. Infrastructure for the modern energy industry dominates the current seascape character.

Cultural heritage

- 8.4.3.34 The baseline for the assessment of impacts upon designated historic assets derives from the application of the methodology for assessment (set out in Appendix A of Volume 4, Annex 8.2: Cultural heritage technical report of the Environmental Statement) to datasets of historic assets in England and the Isle of Man, consisting of datasets held by Historic England (for designated assets), by local authorities in England (for undesignated assets) and by Manx National Heritage (designated and undesignated assets on the Isle of Man). Initial scoping of undesignated assets within the Zone of Theoretical Visibility (ZTV) generated for the project determined that there were no undesignated assets considered to be of equal significance to designated assets which had a meaningful visual or historic relationship with the seascape which contributes substantively to their heritage significance. Accordingly, the only assets taken forward to assessment were terrestrial designated assets.
- 8.4.3.35 Following this initial scoping, a number of designated assets were identified which lay within the ZTV and were considered to potentially have a meaningful visual or clear historic relationship with the sea that contributes substantively to their cultural significance. These were then visited in order to determine whether there was indeed likely intervisibility with the turbines of the Morgan array, and whether the assets had a relationship with the seascape which contributed meaningfully to their historic significance. As a result assets were either included for further assessment, or scoped out. The assets that were taken forward for further assessment can be seen in Table 1.8 of Volume 4, Annex 8.2: Cultural heritage technical report of the Environmental Statement. these do not form a coherent group of assets, rather they comprise a mixture of lighthouses, a foghorn, seaside hotels, coastal fortifications, prehistoric promontory forts and war memorials. The only unifying factor to the group is the

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intervisibility they have with the Morgan Array, and the contribution that the seascape makes to their heritage significance.

8.4.4 Future baseline scenario

8.4.4.1 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.

8.4.4.2 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.

8.4.4.3 The only potential impacts on terrestrial historic assets as a result of the proposed Morgan Array Area comprise negative impacts to their historic significance, arising from alterations to their settings. The specific group of historic assets which form the baseline assessed are therefore selected purely on the basis of the specific impacts likely as a result of the Morgan Offshore Wind Project. These impacts would not occur were the Morgan Offshore Wind Project not to proceed. However, there are already a number of offshore wind farms in the waters between England and the Isle of Man, and others are planned. Should those proceed, it is likely that there would be negative impacts on some or all of these historic assets, potentially as well as other historic assets not impacted by the Morgan Offshore Wind Project. There are numerous other changes which could occur which could also impact on the historic assets which form the current baseline for the Morgan Offshore Wind Project, including changes to the seascape as a result of climate change or additional land based developments or events which could impact on one or more of these assets adversely.

8.4.4.4 As a result, it is not possible to predict the future baseline with any degree of confidence. The current baseline results from impacts specific to the Morgan Offshore Wind Project, and whilst there are numerous potential future changes which could impact those historic assets, they are highly unlikely to impact only this specific group of historic assets, nor is it possible to predict with any degree of confidence what the effects of such changes would be.

8.4.5 Data limitations

8.4.5.1 The records held by the UKHO, NRHE, MNH, 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. This particularly relates to buried archaeological features.

8.4.5.2 The interpretation of geophysical 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

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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 Generation Assets.

8.5 Impact assessment methodology

8.5.1 Overview

- 8.5.1.1 The marine archaeology impact assessment has followed the methodology set out in Volume 1, Chapter 5: EIA methodology of the Environmental Statement.
- 8.5.1.2 This assessment has been undertaken in accordance with Principles of Cultural Heritage Impact Assessment in the UK (IEMA, IHBC and CifA, 2021).
- 8.5.1.3 Details of the methodology used to assess potential effects of the Morgan Generation Assets on terrestrial designated assets are set out in detail in Volume 4, Annex 8.2: Cultural heritage technical report of the Environmental Statement.

8.5.2 Impact assessment criteria

- 8.5.2.1 The significance of an effect is determined based on the sensitivity of a receptor and the magnitude of an impact. This section describes the criteria applied in this chapter to characterise the sensitivity of receptors and magnitude of potential impacts. The terms used to define magnitude and sensitivity are based on and have been adapted from those used in the Design Manual for Roads and Bridges methodology (Highways England et al., 2020).

Magnitude of impact

- 8.5.2.2 The criteria for defining magnitude in this chapter are outlined in Table 8.13 below.

Table 8.13: Definition of terms relating to the magnitude of an impact.

Magnitude of impact		Definition
High	Adverse	Loss of resource and/or quality and integrity of resource; severe damage to key characteristics, composition, or attributes
	Beneficial	Large scale or major improvement of resource quality; extensive restoration or enhancement; major improvement of attribute quality
Medium	Adverse	Loss of resource, but not adversely affecting the integrity; partial loss of/damage to key characteristics, composition or attributes
	Beneficial	Benefit to, or addition of, key characteristics, composition or attributes improvement of attribute quality
Low	Adverse	Some measurable change in attributes, quality or vulnerability, minor loss or alteration to, one (maybe more key characteristics, composition or attributes)

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Magnitude of impact		Definition
	Beneficial	Minor benefit to, or addition of, one (maybe more key characteristics, composition or attributes; some beneficial impact on an attribute or a reduced risk of negative impact occurring
Negligible	Adverse	Very minor loss or detrimental alteration to one or more characteristics, composition or attributes
	Beneficial	Very minor benefit to, or positive addition of one or more characteristics, composition or attributes

Receptor sensitivity/value

8.5.2.3 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.

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

8.5.2.5 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.

8.5.2.6 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

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

8.5.2.7 The criteria for defining value, and therefore sensitivity, in this chapter are outlined in Table 8.14 below.

Table 8.14: Definition of terms relating to the value (and therefore sensitivity) of the receptor.

Value	Definition
Very High	<p>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.</p> <p>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.</p> <p>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.</p>
High	<p>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).</p> <p>Prehistoric deposits with high potential to contribute to an understanding of the palaeoenvironment.</p>
Medium	<p>Average example and/or moderate potential to contribute to knowledge and understanding and/or outreach.</p> <p>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.</p> <p>Prehistoric deposits with moderate potential to contribute to an understanding of the palaeoenvironment.</p>
Low	<p>Below average example and/or low potential to contribute to knowledge and understanding and/or outreach.</p> <p>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.</p> <p>Prehistoric deposits with low potential to contribute to an understanding of the palaeoenvironment.</p>
Negligible	<p>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.</p>

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Significance of effect

- 8.5.2.8 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 used for this assessment is presented in Table 8.15. Where a range of significance of effect is presented the final assessment for each effect is based upon expert judgement. Indirect impacts to marine archaeology receptors may produce adverse or beneficial effects (see also Table 8.13).
- 8.5.2.9 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. Where the magnitude of impact is ‘no change’, no effect would arise.

Table 8.15: Matrix used for the assessment of the significance of the effect.

Sensitivity of Receptor	Magnitude of Impact			
	Negligible	Low	Medium	High
Negligible	Negligible	Negligible or Minor	Negligible or Minor	Minor
Low	Negligible or Minor	Negligible or Minor	Minor	Minor or Moderate
Medium	Negligible or Minor	Minor	Moderate	Moderate or Major
High	Minor	Minor or Moderate	Moderate or Major	Major
Very High	Minor	Moderate or Major	Major	Major

Approach to the assessment of HSC

- 8.5.2.10 The assessment of effects on HSC has been undertaken in accordance with An Approach to Seascape Character Assessment (Natural England, 2012) and the methodology developed through consultation with HE and the AHEF meeting held on 13 July 2023. The assessment is presented in section 8.8.6.
- 8.5.2.11 As the assessment of HSC considers the character of the development and how that character may alter or change the HSC the methodology is necessarily unique and as such does not follow the methodology detailed for other marine archaeology receptors. An MDS cannot be defined for character and assessment considers the historic, present and near future character of the seascape in order to assess change holistically, therefore HSC is not included in the CEA.
- 8.5.2.12 HSC is not something that can be physically impacted, but something that can be changed; therefore, the assessment has defined the characteristics of the historic seascape and assesses whether or not these characteristics have the ability to accommodate change, whilst considering the context of the seascape’s present and near future character also. A key element of HSC is that it can’t be equated to sensitivity and therefore assessed as a receptor, therefore the HSC assessment will consider the magnitude of impact only.

Approach to the assessment of cultural heritage

- 8.5.2.13 Full details of the methodology used to assess potential effects of the Morgan Generation Assets on terrestrial designated assets are set out in detail in Volume 4, Annex 8.2: Cultural heritage technical report of the Environmental Statement.

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- 8.1.1.4 Due to the location of the Morgan Array Area, the terrestrial historic assets which have been assessed are located on the Isle of Man and in England. Although the methodology utilised in this assessment allowed for the inclusion and assessment of undesignated assets considered to be of equal significance to designated assets, the initial screening exercise failed to identify any undesignated monuments which met this criterion and which had a meaningful visual or historic relationship with the seascape which contributes substantively to their heritage significance. Accordingly, the only assets taken forward to assessment were terrestrial designated assets.
- 8.1.1.5 In the absence of a formal definition of the setting of a historic asset on the Isle of Man, the definition used for this assessment is the one defined in the National Planning Policy Framework (NPPF):
- ‘The surroundings in which a heritage asset is experienced. Its extent is not fixed and may change as the asset and its surroundings evolve. Elements of a setting may make a positive or negative contribution to the significance of an asset, may affect the ability to appreciate that significance or may be neutral’.* (NPPF, Annex 2 Glossary)
- 8.1.1.6 In the absence of specific guidance regarding the setting of historic assets or an adopted definition of setting on the Isle of Man, the definition of setting in the NPPF above has been adopted for the assessment regarding historic assets located in both England and the Isle of Man. This approach has previously been used with the approval of MNH on other projects on the Isle of Man.
- 8.1.1.7 Whilst development in general may affect the setting of heritage assets in a range of ways, including factors such as noise and odour, this assessment considers impacts resulting from visual change only. At its closest points, the Morgan Array Area is located approximately 22.2 km from the Isle of Man and 37.13 km from the nearest point on the English coast. Consequently, there is no potential for the wind turbines and OSPs within the Morgan Array Area to affect the setting of onshore historic assets other than visually.
- 8.1.1.8 The settings assessment has considered only terrestrial designated historic assets. This reflects the importance attached to their settings by statute and policy, and hence the greater likelihood of significant effects as a result of change within their settings. Designated historic assets types considered within the assessment comprise:
- World Heritage Sites (England)
 - Registered Parks and Gardens (England)
 - Scheduled Monuments (England)
 - Ancient Monuments (Isle of Man)
 - Listed Buildings (England)
 - Registered Buildings (Isle of Man)
 - Conservation Areas (Isle of Man and England)
 - Registered Battlefields (England).
- 8.5.2.14 The settings assessment has examined data from a number of sources, principally the Historic England and Manx National Heritage datasets which cover England and the Isle of Man (<https://historicengland.org.uk/listing/the-list> and <https://isleofmanher.im>).

8.6 Key parameters for assessment

8.6.1 Maximum design scenario

- 8.6.1.1 The MDSs identified in Table 8.16 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 (PDE) provided in Volume 1, Chapter 3: Project description of the Environmental Statement. Effects of greater adverse significance are not predicted to arise should any other design scenario to that assessed here, be taken forward in the final design scheme.
- 8.6.1.2 The assessment of potential impacts on marine archaeology and cultural heritage is based on the MDS as identified from a design envelope and is specific to the potential impacts identified in this chapter. The key parameters for the MDS include the greatest area of near-surface sediments disturbed and the greatest penetration depth of foundations.
- 8.6.1.3 There are therefore three MDSs for impacts on marine archaeology and cultural heritage. The first of which assumes that the Morgan Array Area will consist of 68 wind turbines, 45 on three legged jacket foundations and 23 on conical gravity base foundations, one large OSP on 6 legs with three piles per leg, 390 km of inter array cables and 60 km of interconnector cable. This infrastructure, along with associated construction, operations and maintenance and decommissioning activities represents the largest footprint of impact to near surface sediments and the greatest volume of sediment disturbed that may result in either direct or indirect impact to near surface marine archaeology receptors.
- 8.6.1.4 The second MDS for impacts on marine archaeology assumes that the Morgan Array Area will consist of 57 wind turbines on four-legged jacket foundations requiring a total of 229 piles reaching a pile penetration depth of 75 m, two OSPs on jacket foundations reaching a pile penetration depth of 75 m and associated infrastructure. This MDS represents the greatest depth of penetration of infrastructure and therefore has the greatest potential to directly impact deeply buried deposits that may contain paleoenvironmental or associated archaeological evidence.
- 8.6.1.5 The third MDS for impacts on cultural heritage assumes that the Morgan Array Area will consist of 68 wind turbines Maximum blade tip height (above Lowest Astronomical Tide) of 364 m, a maximum rotor diameter of 320 m and a maximum hub height (above Lowest Astronomical Tide) of 204 m. This MDS represents the scenario with the turbines being visible from greatest distances.
- 8.6.1.6 Five potential impacts on marine archaeology and cultural heritage receptors have been identified:
- Sediment disturbance and deposition leading to indirect impacts on marine archaeology receptors (the exposure or burial of 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 (palaeolandscapes and associated archaeological receptors)
 - Alteration of sediment transport regimes

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- Potential for visual change leading to indirect impacts on cultural heritage receptors.

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Table 8.16: MDS considered for assessment of potential impacts on marine archaeology.

*C=construction, O=operation and maintenance, D=decommissioning

Potential Impact	Phase			MDS	Justification
	C	O	D		
Sediment disturbance and deposition leading to indirect impacts on marine archaeology receptors (the exposure or burial of receptors).	✓	✓	✓	<p>Construction phase</p> <p><u>Site preparation:</u></p> <p>Sandwave clearance:</p> <ul style="list-style-type: none"> • Sandwave clearance activities undertaken over a 9 month duration within the wider four year construction programme producing a total sandwave clearance volume of 18,870,961 m³ • Wind turbines and OSP foundations: sandwave clearance has been calculated on the basis of wind turbine generator and OSP foundations and an assumption of clearance at up to 60% of locations. Sandwave clearance 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 205 m and an average depth of 7.5 m. This equates to a total sandwave clearance volume of 10,149,455 m³ and a volume of 247,548 m³ per location. • Inter-array cables: sandwave clearance along 40% of total length, equalling up to 156 km , with a width of 80 m, to an average depth of 3 m. Total clearance volume of 5,026,651 m³ • Interconnector cables: sandwave clearance along 60% of total length, equalling up to 36 km of cable length, with a width of 104 m, to an average depth of 3 m. Total sandwave clearance volume of 3,060,814 m³ • Removal of up to 46 km of disused cables. <p><u>Foundation installation:</u></p> <ul style="list-style-type: none"> • Undertaken over an approximate 12 month duration • Wind turbines: installation of 45 with three-legged jacket piles of 5.5 m diameter (per leg), drilled to a depth of 75 m at a rate of up to 1.45 m/h. Spoil volume of 2,107 m³ per pile • Wind turbines: installation of 23 conical gravity base foundations with a structural diameter at seabed (base slab) of 49 m, a caisson diameter of 37 m and a sea surface diameter of 15 m. Installation requires dredging of a maximum area of 32,761 m² to a maximum depth of 10 m 	<p>Construction phase</p> <p><u>Site preparation:</u></p> <p>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 have a mean height of 8 m.</p> <p>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.</p> <p>Boulder clearance activities will result in minimal increases in Suspended Sediment Concentrations (SSCs) and have therefore not been considered in the assessment.</p> <p>UXO is addressed in the Volume 1, Chapter 3: Project description of the Environmental Statement.</p> <p><u>Foundation installation:</u></p> <p>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</p>

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Potential Impact	Phase	MDS	C O D	Justification
			<ul style="list-style-type: none"> • OSPs: installation of one OSP with six legs with three piles per leg, each 5.5 m pile diameter drilled to a depth of 75 m at a rate of up to 1.45 m/h. Spoil volume of 2,107 m³ per pile • OSPs: Two drilled piles installed concurrently at adjacent sites. <p><u>Cable installation:</u></p> <ul style="list-style-type: none"> • Inter-array cables: Up to Installation via trenching of up to 390 km of cable, with a trench width of up to 3 m and a depth of up to 3 m with a V-shaped cross-section. Total maximum clearance volume of 1,755,000 m³ Installed over a period of approximately 12 months • Interconnector cables: Installation via trenching of up to 60 km of cable, with a trench width of up to 3 m and a depth of up to 3 m with a V-shaped cross-section. Total clearance volume of 270,000 m³. Installed over a period of approximately four-months. <p>Operations and maintenance phase</p> <ul style="list-style-type: none"> • Inter-array cables: repair of up 8 km of cable in one event every three years. Reburial of up to 20 km of cable in one event every five years • Interconnector cables: repair of up to 4 km of cable in each of three events every 10 years. Reburial of up to 3 km of cable in one event every five years. <p>Decommissioning phase</p> <ul style="list-style-type: none"> • Scour and cable protection will remain in situ. If suction caissons are removed using the overpressure to release them, then suspended sediment concentrations (SSCs) will be temporarily increased • Inter-array and interconnector cables will be removed and disposed of onshore 	<p>scenario represents the greatest volume of sediment to be released for a drilling event.</p> <p>The greatest drilling rate represents the maximum level of increase in SSC.</p> <p><u>Cable installation:</u></p> <p>MDS assumes 100% of cables are buried. 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.</p> <p>Cables may be buried by ploughing, trenching or jetting with jetting mobilising the greatest volume of material to increase SSCs.</p> <p>Operations and maintenance phase:</p> <p>The greatest foreseeable number of cable reburial and repair events is considered to the MDS for sediment dispersion.</p> <p>Decommissioning Phase</p> <p>The removal of cables may be undertaken using similar techniques to those employed during installation, therefore the potential increases in SSC and deposition would be in line with the construction phase.</p>
Direct damage to marine archaeology receptors (e.g. wrecks, debris, submerged prehistoric receptors (palaeolandscapes and associated	✓	✓	<p>Construction phase</p> <p>Up to 61,729,657 m² of seabed loss during the construction phase of the Morgan Generation Assets associated with the following:</p> <ul style="list-style-type: none"> • Jack-up events: up to 825,600 m² of disturbance from the use of jack-up vessels during foundation installation, with up to four jack-up events at each of 96 wind turbines (two jack-up events for wind turbines and two jack-up events for the foundations) and two jack-up events at each of four OSPs 	<p>Construction phase</p> <p>Maximum footprint which would be affected during the construction, operations and maintenance and decommissioning phases.</p> <p>The MDS assumes 100% of all cables are buried.</p> <p>The MDS assumes that the width of disturbance for sandwave and pre-lay</p>

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Potential Impact	Phase	MDS	Justification
	C O D		
archaeological receptors)		<ul style="list-style-type: none"> • Sandwave clearance for WTG and OSP foundations: up to 818,960 m² of seabed disturbance comprising <ul style="list-style-type: none"> – 721,561 m² of sandwave clearance associated with seabed preparation for wind turbine foundations – 97,399 m² of sandwave clearance associated with seabed preparation for OSP foundations • Cable installation (including sandwave clearance and pre-lay preparation): up to 21,384,000 m² of disturbance comprising: <ul style="list-style-type: none"> – Inter-array cables: up to 17,160,000 m² impact from installation of up to 390 km of inter-array cables (assumes 80% requires boulder clearance with a 20 m width of disturbance and 40% requires sandwave clearance with a 80 m width of disturbance) – Interconnector cables: up to 3,804,000 m² impact from installation of up to 60 km of interconnector cables (assumes 50% requires boulder clearance with a 20 m width of disturbance and 60% requires sandwave clearance with a 104 m width of disturbance) • Sandwave clearance material deposition: Up to 36,473,840 m² of seabed impact associated with the deposition of sandwave clearance material comprising: <ul style="list-style-type: none"> – 20,298,910 m² from deposition of 10,149,455 m³ of sandwave clearance material associated with seabed preparation for wind turbine and OSP foundations – 10,053,302 m² from deposition of 5,026,651 m³ of sandwave clearance material associated with seabed preparation for inter-array cables – 6,121,628 m² from deposition of 3,060,814 m³ of sandwave clearance material associated with seabed preparation for interconnector cables • Cable removal: Up to 920,000 m² from the removal of 46 km of disused cables • UXO removal: clearance of up to 13 UXOs within the Morgan array area ranging from 25 kg to 907 kg with 130 kg the most likely (common) maximum • installation of foundations and scour protection: up to 758,457 m² of seabed loss comprising: <ul style="list-style-type: none"> – Wind turbines: up to 735,488 m² from the installation of up to 68 wind turbine foundations on 4-legged suction bucket jacket foundations with associated scour protection – OSPs: up to 24,964 m² from four OSPs on suction bucket four-legged jacket foundations with associated scour protection 	<p>preparation (boulder and debris clearance) also includes subsequent burial.</p> <p>For the purposes of the MDS, and to avoid double counting of the total footprint with sandwave clearance activities, the MDS assumes up to 60% of inter-array and 40% of interconnector will be subject to pre-lay preparation (boulder and debris clearance) only. The MDS assumes that the remainder of the cables will be subject to sandwave clearance.</p> <p>The area of seabed affected by the placement of sandwave clearance material has been calculated based on the maximum volume of sediment to be placed on the seabed, assuming all this sediment is coarse material (i.e. is not dispersed through tidal currents; see "Increased suspended sediment concentrations" impact assessment below). The total footprint of seabed affected has been calculated, for the purposes of the MDS, assuming a mound of uniform thickness of 0.5 m height.</p> <p>The disturbance width is driven by the need to survey for UXO over the cable route. The actual disturbance width for cable installation is likely to be considerably less.</p> <p>Maximum number and maximum size of UXOs encountered in the Morgan Array Area. Due to uncertainties in number and size of UXOs the assessment presents a range, highlighting the most likely size (common) to be encountered.</p> <p>Operations and maintenance phase</p>

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Potential Impact	Phase	MDS	Justification
	C O D		
		<ul style="list-style-type: none"> Installation of cable protection: up to 510,000 m² of seabed loss comprising: <ul style="list-style-type: none"> Inter-array cable protection: 390,000 m² associated with up to 39 km of inter-array cables (10 m width of cable protection). Interconnector cable protection: 120,000 m² for up to 20% of 60 km of interconnector cables (10 m width of cable protection). Installation of cable crossing protection: up to 38,800 m² of seabed loss comprising: <ul style="list-style-type: none"> Cable protection for cable crossings for inter-array cables: 28,800 m² from 10 cable crossings (each up to 80 m in length and 36 m in width) Cable protection for cable crossings for interconnector cables: 10,000 m² from 10 cable crossings (each up to 50 m in length and 20 m in width) Maximum duration of the offshore construction phase is up to four years. <p>Operation and maintenance phase</p> <p>Up to 12,078,500 m² of seabed loss/disturbance due to:</p> <ul style="list-style-type: none"> Up to 2,068,500 m² of seabed loss/disturbance due to jack-ups at wind turbines and OSPs over the lifetime of the Morgan Generation Assets for the following: <ul style="list-style-type: none"> 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 10,010,000 m² of seabed loss/disturbance due to inter-array and interconnector cables <ul style="list-style-type: none"> Inter-array cables: up to 20 km for reburial events every five years and up to 8 km for cable repair events every three years (assuming 20 m width seabed disturbance for repair and remedial burial) Interconnector cables: up to 3 km for reburial events with one event every five years and up to 60 km of cable in three events every 10 years for repair events (assuming 20 m width seabed disturbance for repair and remedial burial). <p>Decommissioning phase</p> <ul style="list-style-type: none"> Seabed impact due to: 	<p>The MDS for seabed impact associated with export cable maintenance includes repairs/reburial of subtidal cables.</p> <p>Decommissioning phase</p> <p>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 <i>in situ</i> after decommissioning.</p>

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Potential Impact	Phase			MDS	Justification
	C	O	D		
				<ul style="list-style-type: none"> – Cable removal: disturbance from the removal of up to 390 km of inter-array cables and 60 km of interconnector cables – Anchor placements: seabed impact from anchor placements during cable removal. 	
Direct damage to deeply buried marine archaeology receptors – submerged prehistoric receptors (palaeolandscapes and associated archaeological receptors)	✓	x	x	<p>Construction phase</p> <ul style="list-style-type: none"> • As above for ‘Direct damage to buried archaeological receptors’ • Wind turbines: 57 four-legged jacket foundations requiring a total of 229 piles reaching a pile penetration depth of 75 m • OSPs: Two jacket foundations reaching a pile penetration depth of 75 m and seabed disturbance of 10,622 m². 	Maximum depth of seabed disturbance of foundation installation represents the maximum impact to submerged prehistoric archaeological receptors. This is calculated by the most number of WTGs requiring piles to 75 m depth.
Alteration of sediment transport regimes.	x	✓	x	<p>Operations and maintenance phase</p> <ul style="list-style-type: none"> • Wind turbines: 68 installations with four-legged suction bucket foundations, each jacket leg with a diameter of 5 m, spaced 48 m apart, and each bucket with a diameter of 16 m. Scour protection to a height of 2.5 m and extending 20 m from the bucket. Total footprint of 10,816 m² per wind turbine • OSPs: one installation with a rectangular gravity base foundation, with an 80 m by 60 m dimension at the surface, a slab base dimension of 100 m by 80 m and with scour protection to a height of 2.6 m and extending 25 m from the base. Total footprint of 19,500 m² • Inter-array cables: cable protection along 39 km of the cable, with a height of up to 3 m and up to 10 m width. Up to 10 cable crossings, each crossing has a height of up to 4 m, a width of up to 36 m and a length of up to 80 m • Interconnector cables: cable protection along 12 km of the cable, with a height of up to 3 m and up to 10 m width. Up to ten cable crossings, each crossing has a height of up to 3 m, a width of up to 20 m and a length of up to 50 m. 	This provides the largest obstruction to flow in the water column. See Volume 2, Chapter 1: Physical processes of the Environmental Statement.
Potential for visual change leading to indirect impacts on cultural heritage receptors.	✓	✓	✓	<p>Morgan Generation Assets</p> <p>Morgan Offshore Wind Project comprises the Morgan Generation Assets as set out in Volume 1, Chapter 3: Project description of the Environmental Statement. The offshore and onshore transmission elements of Morgan Offshore Wind Project are being considered as part of a separate conjoined application with Morecambe Offshore Windfarm for a single (coordinated) grid connection location at Penwortham in Lancashire. The construction, operations and maintenance and decommissioning phases of Morgan Generation Assets are summarised below.</p>	Of the possible design scenarios the one with the maximum turbine rotor diameter and maximum tip height has been identified as resulting in the Maximum Design Scenario (MDS) for this assessment, as the tallest turbines would be seen from greater distances.

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Potential Impact	Phase	MDS	Justification
	C O D	<p>Construction phase</p> <p>The offshore components and activities relating to construction of Morgan Generation Assets considered in the SLVIA are described below.</p> <p><u>Construction works/activities</u></p> <p>Generally, wind turbines are installed using the following process:</p> <ul style="list-style-type: none"> • Wind turbine components (blades, nacelles, towers, foundation and transition pieces) are transported to Morgan Array Area by dedicated vessels for 68 wind turbines (dimensions below) • Wind turbine components will be assembled on site and erected on to foundations by an installation vessel (e.g. Jack-Up Vessel (JUV), Dynamic Positioning Vessel (DPV) or heavy lift vessel). The process is assisted by smaller support vessels (e.g. tugs, guard vessels and anchor handling vessels), which tend to shadow the installation vessels. The maximum number of wind turbine installation and support vessels on site at any one time during construction of the array area is 69 vessels and 7 helicopters. The number of return trips to the Morgan Array Area from port required throughout installation is up to 1,929 installation vessel movements (return trips) during construction (521 main installation/support vessels, 74 tug/anchor handlers, 56 cable lay installation and support vessels, 50 guard vessels, 31 survey vessels, 19 seabed preparation vessels, 1,135 crew transfer vessels (CTVs), 41 scour protection installation vessels and two cable protection installation vessels and 1095 helicopter movements). <p><u>Construction programme/duration(s)</u></p> <p>The total duration for wind turbine construction is expected to be a maximum of 18 months.</p> <p>Operations and maintenance phase</p> <p>The Maximum Design Scenario for this assessment during the operations and maintenance phase, comprising the following key project components and equipment:</p> <ul style="list-style-type: none"> • 68 wind turbines (dimensions below) • Up to four OSPs • Service vessels/helicopters. <p>The above components are also a consideration during the construction and decommissioning phases.</p>	

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Potential Impact	Phase	MDS	Justification
	C O D		
		<p>The wind turbines and offshore substation platforms will be attached to the seabed by gravity based and/or jacket foundation structures (the type to be deployed is subject to further investigations). The wind turbine towers may be connected to the foundation via a transition piece which is visible above sea level.</p> <p><u>Wind turbines</u></p> <p>The wind turbines will be the standard horizontal axis design with three blades connected to the nacelle housing the turbine. An illustration of this design can be seen in Volume 1, Chapter 3: Project description of the Environmental Statement.</p> <p>The maximum wind turbine dimensions are:</p> <ul style="list-style-type: none"> • Maximum blade tip height (above Lowest Astronomical Tide) – 364 m • Maximum rotor diameter – 320 m • Maximum hub height (above Lowest Astronomical Tide) – 204 m. <p><u>Aids to navigation, colour, marking and lighting</u></p> <p>Appropriate marking, lighting and aids to navigation will be employed during the operations and maintenance phase (also during construction and decommissioning phases) of the Morgan Generation Assets.</p> <p>The nacelles, blades and towers will be painted light grey (colour code RAL 7035) and the foundation structures will be painted yellow (colour code RAL 1023).</p> <p>Appropriate lighting at night-time will ensure the offshore structures are visible for search and rescue and emergency response procedures. In addition, lighting will conform to the following:</p> <ul style="list-style-type: none"> • Red, medium intensity aviation warning lights (of variable brightness between 200 to 2000 candelas (cd)) will be located on either side of the nacelle of significant peripheral wind turbines. These lights will flash simultaneously with a Morse W flash pattern (and will also include an infra-red component) • All aviation warning lights will flash synchronously throughout the Morgan Array Area • Aviation warning lights will allow for reduction in lighting intensity at and below the horizon when visibility from every wind turbine is more than 5 km (to a minimum of 10% of the maximum (i.e. 200 cd) • Search and rescue lighting of each of the non-periphery turbines will be combi infra-red (IR)/200 cd steady red aviation hazard lights 	

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Potential Impact	Phase C O D	MDS	Justification
		<ul style="list-style-type: none"> All wind turbines will be fitted with a low intensity light for the purpose of helicopter winching (green hoist lamp). All wind turbines will also be fitted with suitable illumination (minimum one 5 cd light) for ID signs. <p>Marine navigational lights will be fitted at the platform level on significant peripheral structures (SPS). These lights will be synchronized to display simultaneously an IALA 'special mark' characteristic, flashing yellow, with a range of not less than 5 nm.</p> <p>Decommissioning phase</p> <ul style="list-style-type: none"> Removal of up to 68 wind turbines with a minimum spacing of 1,400 m and up to four OSPs. <p>The decommissioning sequence will generally be the reverse of the construction sequence and involve similar types and numbers of vessels and equipment.</p> <p>The duration for infrastructure removal is expected to be a maximum of 24 months.</p>	

8.6.2 Impacts scoped out of the assessment

8.6.2.1 On the basis of the baseline environment and the description of development outlined in Volume 1, Chapter 3: Project description of the Environmental Statement, no impacts have been scoped out of the assessment for marine archaeology.

8.7 Measures adopted as part of the Morgan Generation Assets

8.7.1 Overview

8.7.1.1 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 Generation Assets 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 licence (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 licence (referred to as tertiary mitigation in IEMA, (2016).

8.7.1.2 A number of measures (primary and tertiary) have been adopted as part of the Morgan Generation Assets to reduce the potential for impacts on marine archaeology. These are outlined in Table 8.17 below. As there is commitment to implementing these measures, they are considered inherently part of the design of the Morgan Generation Assets and have therefore been considered in the assessment presented in section 8.8 below (i.e. the determination of magnitude and therefore significance assumes implementation of these measures). The measures adopted as part of the Morgan Generation Assets are captured in the Outline Offshore WSI and PAD (document ref J14).

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Table 8.17: 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		
<p>Development of, and adherence to AEZs around those sites identified as having high and medium archaeological potential (Table 8.20), as presented in the Offshore Historic Environment Plan (Document Reference B.7) and the Outline Offshore WSI and PAD (Document Reference J.14).</p> <p>The Design Plan will include final wind turbine locations to avoid any AEZs identified in pre-construction site investigation surveys or micrositing requirements as set out in the Offshore WSI and PAD.</p>	<p>To avoid any potential direct impacts on sites of identified archaeological significance.</p> <p>An Outline WSI and PAD has been submitted as part of the Application (Document Reference J.14).</p>	<p>Outline WSI and PAD and the need for a Design Plan to be approved is secured within the deemed marine licence(s) of the draft DCO.</p>
<p>Development of, and adherence to TAEZs based on all available information including the stated positional accuracy, the recorded size of the target and the potential archaeological significance (Table 8.18), as presented in the Offshore Historic Environment Plan (Document Reference B.7) and the Outline Offshore WSI and PAD (Document Reference J.14).</p>	<p>To avoid any potential impacts on sites of archaeological importance.</p> <p>An Outline WSI and PAD has been submitted as part of the Application (Document Reference J.14).</p>	<p>Outline WSI and PAD is secured within the deemed marine licence(s) of the draft DCO.</p>
Tertiary measures: Measures required to meet legislative requirements, or adopted standard industry practice		
<p>Development of, and adherence to, an Outline Offshore WSI including the establishment of PAD, prior to any post-consent works within the Morgan Array Area.</p>	<p>The Outline Offshore WSI and PAD (Document Reference J.14) is 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.</p>	<p>Outline Offshore WSI and PAD is secured within the deemed marine licence(s) of the draft DCO.</p>
<p>Development of, and adherence to, an Outline Offshore WSI including the establishment of a PAD, which details the methodology for further site investigation, including archaeological input into specifications for, and archaeological analysis of, any post-consent, site investigation. The responsibilities of the Morgan Generation Assets Retained Archaeologist includes being consulted in the preparation of any pre-construction surveys where relevant, including</p>	<p>To identify any sites of potential archaeological importance that may require further investigation, avoidance or engagement with the Statutory Historic Body.</p> <p>To offset any potential impacts of the Morgan Generation Assets through preservation by record on sediments of geoarchaeological/ palaeoenvironmental importance and enhance knowledge of the offshore marine archaeological resource.</p> <p>An Outline Offshore WSI and PAD has been submitted as part of the Application (Document Reference J.14).</p>	<p>Outline Offshore WSI and PAD is secured within the deemed marine licence(s) of the draft DCO.</p>

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Measures adopted as part of the Morgan Generation Assets	Justification	How the measure will be secured
geophysical, geotechnical and ROV/diver survey and, if appropriate, in monitoring/checking of data.		
Development of, and adherence to, an Outline Offshore WSI including the establishment of PAD, which ensures operational awareness and avoidance, where possible, of the location of archaeological anomalies identified as having a low potential.	To identify any sites of archaeological importance that may require further investigation, avoidance or engagement with the Statutory Historic Body. An Outline Offshore WSI and PAD has been submitted as part of the Application (Document Reference J.14).	Outline Offshore WSI and PAD is secured within the deemed marine licence(s) of the draft DCO.
Development of, and adherence to, an Outline Offshore WSI including the establishment of PAD, which details that archaeologists are to be consulted in the preparation of pre-construction cable route clearance or other pre-construction clearance operation, where relevant, and, if appropriate, to carry out archaeological monitoring of such work.	To record archaeological remains that may be affected by pre-construction clearance operation. An Outline Offshore WSI and PAD has been submitted as part of the Application (Document Reference J.14).	Outline Offshore WSI and PAD is secured within the deemed marine licence(s) of the draft DCO.
Development of, and adherence to, an Outline Offshore WSI including the establishment of PAD, which details the delivery of any mitigation including, where necessary, identification and modification of AEZs and TAEZs.	To offset the effects of disturbance/destruction of irreplaceable archaeological remains. An Outline Offshore WSI and PAD has been submitted as part of the Application (Document Reference J.14).	Outline Offshore WSI and PAD is secured within the deemed marine licence(s) of the draft DCO.
Development of, and adherence to, an Outline Offshore WSI including the establishment of PAD, which through the acquisition of relevant spatial survey data, includes monitoring of AEZs. This monitoring will include the appropriateness of, and adjustments that need to be made to, AEZs during the lifetime of Morgan Generation Assets, where required.	Changes to marine archaeology receptors during the lifetime of offshore wind projects are not well known. Industry guidance (Wessex Archaeology, 2007) suggests that monitoring methods, set out in the Outline Offshore WSI and PAD, may include periodic reporting on adherence to exclusion zones and the results of watching briefs. Periodic reporting will provide a potential beneficial effect through regional mapping of accessible data and provision of publicly accessible data post-consent (described but currently not quantifiable). An Outline Offshore WSI and PAD has been submitted as part of the Application (Document Reference J.14).	Outline Offshore WSI and PAD is secured within the deemed marine licence(s) of the draft DCO.

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Measures adopted as part of the Morgan Generation Assets	Justification	How the measure will be secured
Development of, and adherence to, an Outline Offshore WSI including the establishment of PAD, which details that any agreed archaeological report is deposited with the National Record of the Historic Environment, by submitting an OASIS (Online Access to the Index of archaeological investigations) form with a digital copy of the report within six months of completion of construction of the Morgan Generation Assets.	To publicly share archaeological information of the area. An Outline Offshore WSI and PAD has been submitted as part of the Application (Document Reference J.14).	Outline Offshore WSI and PAD is secured within the deemed marine licence(s) of the draft DCO.
The nacelles, blades and towers will be painted light grey.	Light grey is considered the optimum colour for offshore wind turbines to minimise adverse effects on seascape, landscape, and visual resources.	Paint colour is secured as a condition of the deemed marine licence(s) (dML) within the Draft DCO (Document Reference C1).
The lights will be operated at the lowest permissible intensity level. The aviation lighting will be kept to 200 candelas in good visibility conditions. However, in poor visibility (e.g. foggy conditions, the lighting levels may rise to 2,000 candelas).	To keep night time visual impacts to a minimum.	Lighting levels are secured as a Requirement of the Draft DCO (Document Reference C1).

8.7.2 Archaeological exclusion zones

- 8.7.2.1 Best practice favours the preservation in situ of archaeological remains, therefore the preferred mitigation for archaeological remains is avoidance (Wessex Archaeology for The Crown Estate, 2021). For the Morgan Generation Assets, AEZs have been proposed around significant archaeological receptors and anomalies of higher archaeological potential. These AEZs 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 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.
- 8.7.2.2 All AEZs agreed with the HE and the MMO, through the Offshore WSI and PAD, will be marked on the Design Plan. The Offshore WSI and PAD is a live document and further AEZs may be required, or existing AEZs may be removed, as more information on site conditions becomes available through pre-construction/construction surveys. If impacts cannot be avoided, measures to reduce, remedy or offset disturbance will be agreed with HE and the MMO.
- 8.7.2.3 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. 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.
- 8.7.2.4 The proposed AEZs are listed in Table 8.18 and shown in Figure 8.5. Scope is allowed for their amendment in light of further evidence and with the involvement of HE and the MMO. Further details of AEZs and archaeological monitoring will be provided in the Outline Offshore WSI and PAD (Document Reference J.14). The TAEZ for UKHO 5418 is retained due to its location within the Morgan Array Area and its potential to be military aviation wreckage and thus automatic protection under the Protection of Military Remains Act 1986. Details of this record is presented in section 1.8.6 of Volume 4, Annex 8.1: marine archaeology technical report of the Environmental Statement.
- 8.7.2.5 Additional TAEZs have been assigned to Morgan_0096, the wreck of the *Ben Rein*, and Morgan_0005 as a precautionary measure, both of which are outside of the Morgan Array Area, but within the 2 km buffer. This as a precautionary approach due to the potential impact-receptor pathway identified for the Morgan and Morecambe Offshore Wind Farms Transmission Assets. The Morgan and Morecambe Offshore Windfarms Transmission Assets boundaries PEIR stage has now passed, so the TAEZs are available for update following that project's application submission. All TAEZs are presented in Table 8.19.
- 8.7.2.6 The appropriateness and effectiveness of the AEZs and condition of the archaeological assets will be monitored, where required, through the acquisition of survey data during the lifetime of Morgan Generation Assets. Data relating to the marine archaeology assets will be archived with HE through OASIS at the outset of Morgan Generation Assets and as it is collected through its lifetime. Document Reference

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Table 8.18: Proposed AEZs within the Morgan marine archaeology study area.

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

Table 8.19: Proposed TAEZs within the Morgan marine archaeology study area.

ID	Description	Potential	Eastings	Northings	AEZ (m)
UKHO 5418	Unknown aircraft	N/A	430634.9	5985017	100 radius
Morgan_0005	Seabed disturbance	Medium	428856.55	5994556.41	50 radius
Morgan_0096	Wreck	High	441193.65	5986904.68	50 extents

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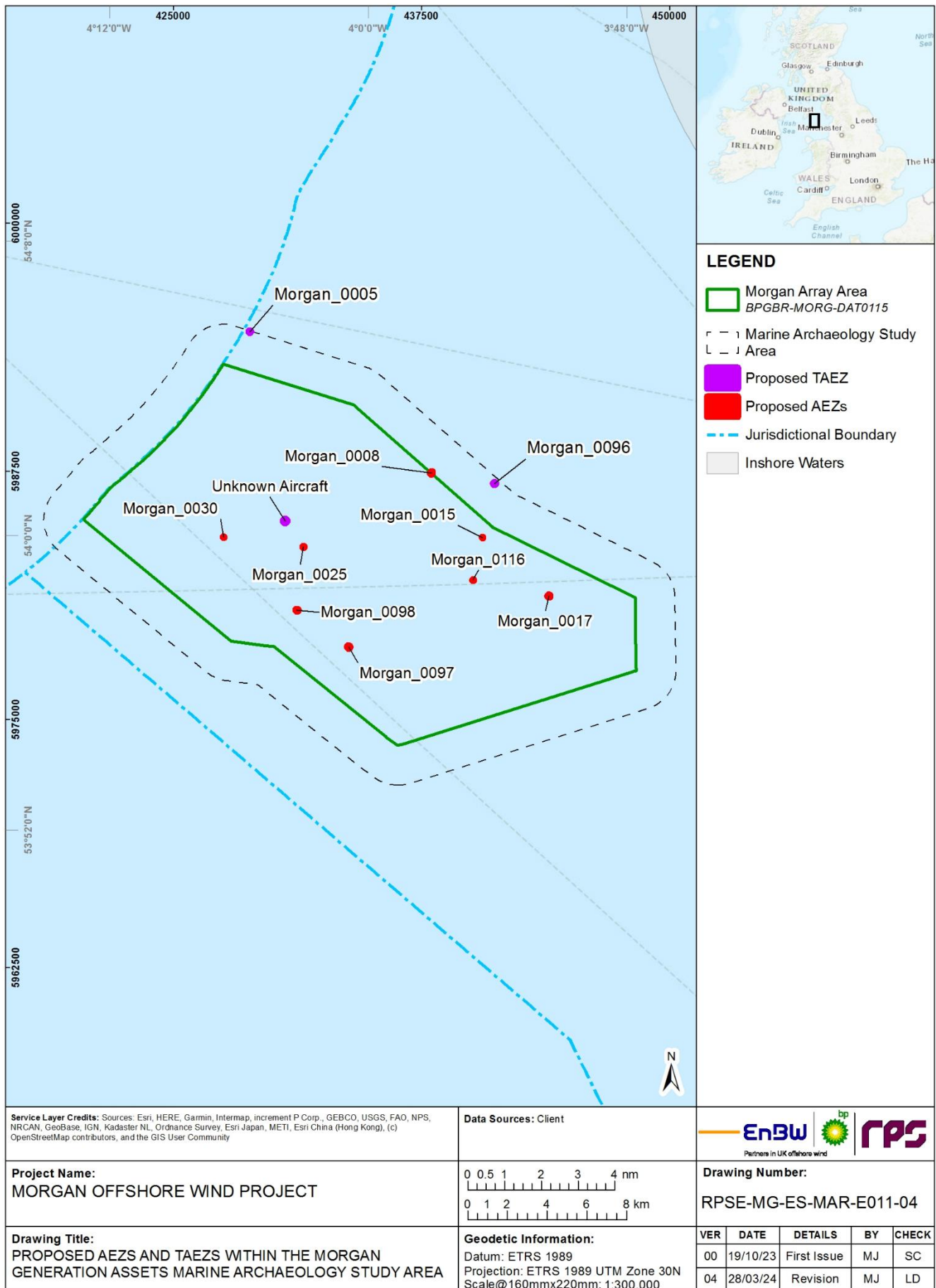


Figure 8.5: Proposed AEZs within the Morgan marine archaeology study area.

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8.7.3 Preservation by record

- 8.7.3.1 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 survey, recording and excavation where required prior to the impact occurring (Wessex Archaeology, 2021). Approaches to additional archaeological mitigation measures are set out in the Outline Offshore WSI and PAD (Document Reference J14).
- 8.7.3.2 A PAD has been developed (Document Reference J14) based on the Offshore Renewables Protocol for Archaeological Discoveries (The Crown Estate, 2014). This PAD will be implemented and adhered to and 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).
- 8.7.3.3 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 site investigation.

8.8 Assessment of significant effects

8.8.1 Overview

- 8.8.1.1 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 8.16, along with the MDS against which each impact has been assessed. These are:
- Sediment disturbance and deposition leading to indirect impacts on marine archaeology receptors.
 - Direct damage to maritime 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 (e.g. palaeolandscapes and associated archaeological receptors)
 - Alteration of sediment transport regimes.
- 8.8.1.2 Additionally, effects on HSC (section 8.8.6) have also been assessed.

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8.8.1.3 The assessment of impacts and effects arising from the construction, operations and maintenance, and decommissioning of the structures within the Morgan Array Area as a result of changes within the settings of designated historic assets is presented in Volume 4, Annex 8.2: Cultural heritage technical report of the Environmental Statement and summarised below.

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

8.8.2.1 Increases of SSCs and associated deposition are predicted to occur during the construction and decommissioning phases as a result of the installation/removal of foundations, sandwave clearance activities and the installation of inter-array and interconnector cables. Increases in suspended sediments and associated sediment deposition are also predicted to occur during the operations and maintenance phase due to inter-array and OSP interconnector cable repair and reburial events. Volume 4, Annex 1.1: Physical processes technical report of the Environmental Statement provides a full description of the physical assessment, including numerical modelling used to inform the predictions made with respect to increases in suspended sediment and subsequent deposition.

8.8.2.2 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 potentially beneficial impact of the burial or reburial of known archaeological receptors.

Construction, operation and maintenance and decommissioning phases

Magnitude of impact

8.8.2.3 The installation of Morgan Generation Assets infrastructure may lead to increased SSC and associated deposition. The project design includes the provision of site preparation/sandwave clearance activities which have the potential to increase SSC in the construction phase with associated deposition. The MDS for sandwave clearance was calculated for 60% of the wind turbine and OSP foundations at a radius of 102.5 m and a depth of 7.5 m. The MDS for inter-array sandwave clearance is based on 156 km of cable length with a width of 80 m, to an average depth of 3 m. The MDS for sandwave clearance for interconnector cables is based on 36 km of cable length, with a width of 104 m, to an average depth of 3 m.

8.8.2.4 As outlined in Table 8.16, the MDS for inter-array and interconnector cable seabed preparation activities may be undertaken using a range of techniques, but 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. 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 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 inter-array and interconnector cable corridors as it progressed along the route, resulting in higher quantification of sedimentation compared to the plough dredging.

8.8.2.5 The dredging phase plumes, during sandwave clearance, are predicted to be smaller than the plumes generated during the dumping phase (<50 mg/l). The deposition plume is expected to be most extensive when the deposited material is redistributed

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on the successive tides, with average SSC levels of <500 mg/l above background levels, extending a tidal excursion circa 20 km from the site. During the dumping phase the plume is slightly larger with concentrations reaching 3,000 mg/l above background levels at the release site for the inter-array and interconnector cables, with the plume extending 5 km northeast of the dump site.

- 8.8.2.6 Average sedimentation associated with the sandwave clearance for inter-array and interconnector cables is expected to be up to 0.5 mm, with sedimentation extending to the furthest west and east of the site by approximately 10 km. One day following cessation of activities deposited material at the site of release is modelled to be 0.3 mm deep reducing to <0/01 mm at distances of 100 m from the release site. The dispersion of the released material is predicted to continue on successive tides.
- 8.8.2.7 As outlined in Table 8.16, the MDS for foundation installation assumes: the installation of 45 wind turbines with three-legged jacket piles drilled to a depth of 75 m at a rate of up to 1.45 m/h.; the installation of 23 wind turbines with conical gravity base foundations; the installation of one OSP with six legs and three piles per leg. A sample of three representative pile installation scenarios were simulated to cover the range of conditions in terms of water depth, tidal currents and sediment grading. At each location modelling assessed two piles being installed simultaneously. Modelling of suspended sediments (Volume 2, Chapter 1: Physical processes of the Environmental Statement) associated with drilling for foundation installation in the northwest of the Morgan Array Area predicted average concentrations of <30 mg/l at the modelled site with the concentration reducing rapidly with distance from the two discharge locations. During drilling for foundation installation the sediment plume envelope in the northwest of the site are predicted to extend to a distance of approximately 6 km (i.e. 6 km to the southwest and 6 km to the northeast of the foundation installation site). Where the plumes converge concentrations of suspended sediment are <1 mg/l above background levels. In the northeast of the site the stronger currents and finer material means that a greater proportion of the material will be suspended. The peak concentrations for the installation and up to three days following installation in the northeast of the Morgan Array Area are approximately 50 mg/l and average values are typically less than one fifth of this magnitude. In the northeast, the maximum extent of the plume envelope is approximately 22 km (12 km to the southwest to 10 km to the northeast). In the southeast of the site average sediment concentrations are 50 mg/l where the plumes coalesce. The total maximum extent of this plume envelope is approximately 13 km (southwest to northeast). This is similar to the unmerged values as the plumes are travelling in concert with the tide (and not towards one another) and at the point that the plume reaches the adjacent discharge it is highly dispersed.
- 8.8.2.8 Within the Morgan Array Area, following foundation installation, sediment was expected to be deposited on the slack tide and then subsequently re-suspended into the water column. The plume concentration associated with this resuspension was <50 mg/l and reduces with the distance from the site as the sediment is dispersed. In the northeast of the Morgan Array Area material is also predicted to settle out on the slack tide and be re-suspended with increasing current speed. In the southeast of the Morgan Array Area at the centre of the plume envelope peak values are circa 50 mg/l. Three days after the cessation of foundation installation, sediment concentrations are reduced with decreased current speeds on slack tides and mobilise settled material as speed increase through the tidal cycle. Under these circumstances peak concentrations are 50 mg/l and average values are typically one tenth of this value, with the peaks centred on areas of remobilised material.
- 8.8.2.9 Following drilling in the northwest of the Morgan Array Area sedimentation depths are particularly low with sedimentation values of <0.1 mm during all phases of drilling at

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all the modelled sites. This corresponds with the immediate settlement of coarser material fractions, the lower neap current speed and also for the portion of work undertaken on slack tide. This settlement would be imperceptible from the background sediment transport activity.

- 8.8.2.10 For the inter-array cable installation, peak plume concentrations are 300 to 500 mg/l (at the release site) with the sediment settling during slack water becoming resuspended in the form of an amalgamated plume. Sedimentation of up to 50 mm is predicted at the trench site, with sediment depths reducing with increasing distance from the trench to <0.5 mm with the maximum extent of the plume from the cable installation site being 13 km. Plume envelopes of increased SSCs of between 0.13 to 300 mg/l are predicted to extend over a plume envelope of 33 km width in total, extending from the southwest to the northeast of the modelled installation pathway, and are associated with remobilisation of the deposited material on subsequent tides. Following the completion of the inter-array cable installation the turbidity levels will return to baseline within a couple of tidal cycles. Sedimentation depths of <30 mm arise beyond the immediate vicinity of the trench one day following the cessation of drilling and therefore would be indiscernible from the existing seabed.
- 8.8.2.11 The result of the modelling for the interconnector cables were similar to those for the inter-array cable. The plume is predicted to extend east and west on the tide as the release progresses along the route perpendicular to the tidal flow. This gives rise to average SSCs of <50 mg/l offshore. SSCs along the modelled installation route however range between 50 and 1,000 mg/l where the greatest levels are located at the source of the sediment release. The sedimentation level is small typically <0.5 mm and the greatest levels of deposition occur along the trenching route as coarser material settles. The re-mobilisation of deposited material on subsequent tides is predicted to result in plumes of increased sediment concentration extending 11 km northwest to southeast along the corridor of installation and 3.5 km on either side of the installation corridor.
- 8.8.2.12 The MDS for the operations and maintenance phase is represented by repair of up to 8 km of inter-array cable in one event every three years, reburial of up to 20 km of inter-array cable in one event every five years, repair of up to 4 km of interconnector cable in each of three events every 10 years and reburial of up to 3 km of interconnector cable in one event every five years. For the purposes of this assessment, the impacts of operations and maintenance activities are therefore predicted to be no greater than those for construction, as set out above.
- 8.8.2.13 The MDS for the decommissioning phase is represented by the removal of inter-array and interconnector cables in which increases in SSC would be similar to those experienced during the construction phase, as retrieval would be undertaken using similar techniques to installation. In the case of piled foundations, there is no significant disturbance of the seabed during decommissioning as piles are cut off. SSC would increase temporarily if suction caissons were removed. Decommissioning of gravity bases would involve the removal of ballast, including sand sequestered during construction. This material, which may include rock, will be disposed of off-site and therefore a small proportion of sediment may be released during the removal/dredging operations. Decommissioning of the foundations is assumed to result in increases in suspended sediments and associated deposition that are no greater than those predicted for the construction phase. For the purposes of this assessment, the impacts of decommissioning activities are therefore predicted to be no greater than those for construction, as set out above.
- 8.8.2.14 The measures adopted as part of the Morgan Generation Assets such as the implementation of and adherence to the Offshore WSI and PAD as described in

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section 8.7 will ensure that the exposure of any as yet unknown marine archaeology receptors through sediment disturbance and deposition will be properly mitigated and reported. The burial of marine archaeology receptors could also occur and would have a beneficial impact as this would afford them more protection.

- 8.8.2.15 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 will result in some measurable changes in attributes quality or vulnerability, minor loss of, or alteration to, one or possibly more key characteristics, composition or attributes. It is predicted that the impact will affect marine archaeology indirectly. The magnitude is therefore considered to be **low**.

Sensitivity of the receptor

- 8.8.2.16 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.

- 8.8.2.17 There is potential for palaeolandscapes and associated submerged prehistoric archaeology to survive in the Morgan marine archaeology study area. Therefore, activities associated with Morgan Generation Assets have the potential to indirectly impact marine archaeology receptors through exposure or burial. Material of this nature is rare therefore any discoveries would be considered important.

- 8.8.2.18 As there is a high potential for the discovery of currently unknown archaeological receptors, and any prehistoric deposits have a high potential to contribute to an understanding of the palaeoenvironment the value and therefore sensitivity of the marine archaeology within the Morgan marine archaeology study area is deemed to be **high**.

Significance of the effect

- 8.8.2.19 The measures adopted as part of the Morgan Generation Assets outlined in section 8.7 include measures to ensure that any newly exposed archaeological assets are recorded through the implementation of and adherence to the PAD (Document Reference J14).

- 8.8.2.20 Overall, the magnitude of the impact is deemed to be low and the sensitivity of the receptor is considered to be high. Due to the implementation of the measures adopted as part of the project, the effect will be of **minor adverse** significance, which is not significant in EIA terms.

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

- 8.8.3.1 The seabed activities to facilitate the construction, operations 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. Direct damage to marine archaeology receptors may result from activities including the installation of wind turbine and OSP foundations, use of jack-up vessels during the installation of foundations for wind turbines and OSPs, sandwave clearance, pre-lay preparation (e.g. boulder and debris clearance), cable installation and repair as well as anchor placements associated with these activities. Direct damage may also arise as a result of the removal of disused/out

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of service cables. The MDS for direct damage to marine archaeology receptors is summarised in Table 8.16.

Construction, operation and maintenance and decommissioning phases

Magnitude of impact

- 8.8.3.2 The MDS for the construction phase comprises seabed preparation activities for foundations and cables installation of up to 68 wind turbines on suction bucket foundations and four OSPs four OSPs on suction bucket four-legged jacket foundations with associated scour protection. The MDS also specifies parameters for the installation of inter-array and interconnector cables and associated cable protection; and any associated jack-up vessel and vessel anchoring activities.
- 8.8.3.3 The MDS for the operations 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.
- 8.8.3.4 Decommissioning of the Morgan Generation Assets infrastructure will involve cable removal and vessel anchoring activities during cable removal.
- 8.8.3.5 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. For the purposes of this assessment, the impacts of operations and maintenance and decommissioning activities are predicted to be no greater than those for construction, as set out above.
- 8.8.3.6 As described in section 8.7, measures adopted as part of the Morgan Generation Assets account for preservation by record of submerged prehistoric archaeology through data acquired from geotechnical surveys which will be reviewed by a marine archaeologist and the findings will be communicated to Historic England. This, along with the implementation and adherence to the PAD for any archaeological discoveries ensures preservation by record, reducing the magnitude of the impact on submerged prehistoric archaeology to low.
- 8.8.3.7 AEZs will be established around each medium and high potential anomaly, within which no installation activities will take place unless permitted by HE. This will reduce the magnitude of the impact on known marine archaeology receptors to no change.
- 8.8.3.8 Low potential anomalies will be avoided where possible and pre-construction site investigation surveys will be reviewed by a marine archaeologist prior to impact at these locations. Provision will also be made for the recording of any new discoveries via the PAD. These measures will ensure preservation by record and reduce the magnitude of the impact on as yet unknown marine archaeology receptors to low.
- 8.8.3.9 Due to the measures adopted as part of the project there will be no pathway for direct impact to all known maritime archaeology receptors of medium or high potential and preservation by record will be adopted for all unavoidable direct impact, such as to near surface prehistoric deposits. This will result in either no change to receptors or minor benefit through the acquisition of data to enhance archaeological understanding. The magnitude is therefore, considered to be **low**.

Sensitivity of receptor

- 8.8.3.10 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

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known shipwreck site is regarded as being of importance, as they add to our understanding of ship construction, maritime routes and movements of their period.

8.8.3.11 There is potential for palaeolandscapes and associated submerged prehistoric archaeology to survive in the Morgan marine archaeology study area. Activities associated with Morgan Generation Assets, such as the installation of wind turbine and OSP foundations therefore have the potential to directly impact marine archaeology receptors. Material of this nature is rare therefore any discoveries would be considered important.

8.8.3.12 As there is a high potential for the discovery of currently unknown archaeological receptors, and any prehistoric deposits have a high potential to contribute to an understanding of the palaeoenvironment the value and therefore sensitivity of the marine archaeology within the Morgan marine archaeology study area is deemed to be **high**.

Significance of effect

8.8.3.13 Overall, the magnitude of the impact is deemed to be low and the sensitivity of the receptor is considered to be high. Due to the measures adopted as part of the project it is considered that the effect will, therefore, be of **minor adverse** significance, which is not significant in EIA terms.

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

8.8.4.1 The seabed activities required to facilitate the construction 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

8.8.4.2 The MDS for the construction phase for potential impacts to deeply buried marine archaeology receptors is comprised of seabed installation option of up to 57 wind turbines on four-legged jacket foundations and two OSPs on jacket foundations with pile penetration depth of up to 75 m. These activities have the potential to directly and permanently impact palaeolandscape locations and associated archaeological material that may be deeply buried.

8.8.4.3 The measures adopted as part of the Morgan Generation Assets, as described in section 8.4 account for preservation by record of submerged prehistoric archaeology through data acquired from geotechnical surveys which will be reviewed by a marine archaeologist and the findings communicated to HE. This, along with the implementation and adherence to the PAD will reduce the magnitude of the impact on submerged prehistoric archaeology to low.

8.8.4.4 Direct damage to deeply buried marine archaeology receptors will result in minor loss of resource but this will not adversely affect the integrity of the resource and . Due to the measures as adopted as part of the Project, there will be a beneficial effect through the acquisition of data that will contribute to the archaeological understanding of the area. Therefore, the magnitude is considered to be **low**.

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Sensitivity of receptor

- 8.8.4.5 There is potential for palaeolandscapes and associated submerged prehistoric archaeology to survive in the Morgan marine archaeology study area. Activities associated with Morgan Generation Assets, such as the installation of wind turbines and OSP foundations therefore have the potential to directly impact marine deeply buried archaeology receptors. Material of this nature is rare therefore any discoveries would be considered important.
- 8.8.4.6 As any prehistoric deposits have a high potential to contribute to an understanding of the palaeoenvironment the value and therefore sensitivity of the submerged prehistoric archaeology within the Morgan marine archaeology study area is deemed to be high.

Significance of effect

- 8.8.4.7 Overall, the magnitude of the impact is deemed to be low and the sensitivity of the receptor is considered to be high. Due to the measures adopted as part of the project it is considered that the effect will, therefore, be of **minor adverse** significance, which is not significant in EIA terms.

8.8.5 Alteration of sediment transport regimes

- 8.8.5.1 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 by either exposing them thus causing sites to become vulnerable, or by burying them, which may have a beneficial impact.

Operation and maintenance phase

Magnitude of impact

- 8.8.5.2 The MDS in terms of hydrographic impacts is for a scenario of up to 68 wind turbines with four-legged suction bucket foundations for each jacket leg at 5 m diameter spaced 48 m apart, and each bucket with a diameter of 16 m. Scour protection at each bucket foundation of 2.5 m in height and extending 20 m covering a total footprint of 10,816 m² resulting in a total seabed footprint (including scour protection of 735,488 m²).
- 8.8.5.3 Additionally, the MDS includes one installation with a rectangular gravity base foundation, with an 80 m by 60 m dimension at the surface, a slab base dimension of 100 m by 80 m and with scour protection to a height of 2.6 m and extending 25 m from the base. Total footprint of 19,500 m².
- 8.8.5.4 Additionally, cable protection along 39 km of inter-array cables, with a height of up to 3 m and up to 10 m width. Up to 10 cable crossings, each crossing has a height of up to 4 m, a width of up to 36 m and a length of up to 80 m and cable protection along 12 km of interconnector cables, with a height of up to 3 m and up to 10 m width.
- 8.8.5.5 The parameters in terms of seabed footprint and water column obstruction are similar between each wind turbine unit, as modelled (Volume 2, Chapter 1: Physical processes of the Environmental Statement), and the OSP unit. However, following the modelling study the Morgan Array Area has been reduced in size. The influence of each unit quantified by the modelling study remains applicable for the assessment.
- 8.8.5.6 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 1 in 20 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.

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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 $\pm 5\%$ which would not be sufficient to disrupt sediment features.

- 8.8.5.7 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 $\pm 10\%$ 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.
- 8.8.5.8 The physical processes modelling found that the presence of the foundation structures for the wind turbines and OSP 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 $\pm 10\%$ 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.
- 8.8.5.9 The hydrodynamic regime is highly variable through tidal cycles and responsive to meteorological conditions, with the scale of the impact being well within the natural variation. The changes to tidal currents, wave climate, littoral currents, and sediment transport are insignificant in terms of the hydrodynamic regime. Effects on tidal current and wave climate would be reversible on decommissioning (i.e. following removal of the wind turbine structures).
- 8.8.5.10 The implementation of and adherence to the WSI and PAD (Document Reference J14) as described in section 8.7 will ensure that the exposure of any as yet unknown marine archaeology receptors will be properly mitigated and reported. The burial of marine archaeology receptors would have a beneficial impact as this would afford them more protection.
- 8.8.5.11 The impact is predicted to result in very minor loss or detrimental alteration to one or more characteristics, composition or attributes. It is predicted that the impact will affect the receptor indirectly. The magnitude is therefore considered to be **negligible**.

Sensitivity of the Receptor

- 8.8.5.12 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.
- 8.8.5.13 As there is a high potential for the discovery of currently unknown archaeological receptors, and any prehistoric deposits have a high potential to contribute to an understanding of the palaeoenvironment the value and therefore sensitivity of the marine archaeology within the Morgan marine archaeology study area is deemed to be **high**.

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Significance of effect

- 8.8.5.14 Overall, the magnitude of the impact is deemed to be negligible and the sensitivity of the receptor is considered to be high. Due to the measures adopted as part of the project it is considered that the significance of effect will, therefore, be **minor adverse**, which is not significant in EIA terms.

8.8.6 Effects on Historic Seascape Character

8.8.6.1 The Morgan Generation Assets would involve the construction of new infrastructure which have the potential to alter the HSC of the wider East Irish Sea and Liverpool Bay area, therefore the effects on the HSC are assessed to determine whether this impact has the potential to create a significant adverse effect.

8.8.6.2 The HSC assessment identified a variety of seascape characteristics within the Morgan marine archaeology study area. These can be summarised as:

- Modern activities and installations such as navigation routes and submarine cables
- A range of fishing methods used in the modern period including potting, shellfish dredging, and bottom trawling
- Maritime debris (in some cases undated)
- Seabed types and characteristics including coarse and fine sediment plains.

Magnitude of impact

8.8.6.3 The Morgan Generation Assets will introduce new infrastructure, such as WTGs, OSPs and submarine cables.

8.8.6.4 These would be modern installations and are in line with the existing seascape characteristics identified, including submarine cables.

8.8.6.5 The presence of Morgan Generation Assets may alter the character of modern fishing methods and activities within the area, however Volume 2, Chapter 6: Commercial Fisheries has concluded that there will be no significant impacts to commercial fishery operations and therefore this character of the area will be retained.

8.8.6.6 Potential impacts to maritime debris (i.e. wrecks and associated material) have been mitigated through the measures adopted as part of the project for marine archaeology, for example, the implementation of AEZs, and thus no change to the character of maritime debris is anticipated.

8.8.6.7 There are also known to be a number of proposed offshore wind farms within the wider seascape, including Morecambe Offshore Windfarm Generation Assets, Mona Offshore Wind Project, and Mooir Vannin Offshore Wind Project. If all of these projects are consented, the HSC of this area of the eastern Irish Sea is one of relatively intensified electricity production, but not considered as a change to the HSC. Overall, the Morgan Generation Assets would be in line with the modern installations already present in and anticipated to be introduced to the area.

8.8.6.8 It is therefore considered the HSC can accommodate the introduction of the Morgan Generation Assets without altering the existing characteristics of the HSC, as historic elements and other activities including fishing and maritime debris would remain substantially unchanged.

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8.8.7 Potential for visual change within the setting of an asset

- 8.8.7.1 The Morgan Generation Assets would involve the construction, operation and maintenance, and decommissioning of infrastructure which have the potential to alter heritage significance as a result of changes in setting. This is assessed in Volume 4, Annex 8.2: Cultural heritage technical report of the Environmental Statement.
- 8.8.7.2 The Morgan Array Area is located within the seascape that makes a contribution to setting for some designated historic assets including World Heritage Sites, Scheduled Monuments, Ancient Monuments (Isle of Man), Listed Buildings, Registered Buildings (Isle of Man), Registered Historic Parks and Gardens and Conservation Areas. The introduction of the turbines and offshore substation platforms within the seascape has the potential to alter the setting of some heritage assets to the point that the significance of the assets is altered (may not be harmed) through changes in visual aspects of the setting. The MDS is summarised in Table 1.6 within Volume 4, Annex 8.2: Cultural heritage technical report of the Environmental Statement.
- 8.8.7.3 The Morgan Generation Assets would involve the construction, operation and maintenance, and decommissioning of infrastructure which have the potential to affect the heritage significance of above ground designated historic assets as a result of changes within their setting.
- 8.8.7.4 The Morgan Array Area lies within the setting of selected designated historic assets including World Heritage Sites, Scheduled Monuments, Ancient Monuments (Isle of Man), Listed Buildings, Registered Buildings (Isle of Man), Registered Historic Parks and Gardens and Conservation Areas. The introduction of the turbines and offshore substation platforms within the setting of heritage assets could alter the heritage significance of those assets through changes in visual aspects of their setting. The separate assessment is presented in Volume 4, Annex 8.2: Cultural heritage technical report of the Environmental Statement.
- 8.8.7.5 The settings assessment found that effects during the construction, operations and maintenance, and decommissioning of the structures within the Morgan Array Area would be of **negligible adverse** or **minor adverse** significance for a number of the assessed designated historic assets within the settings study area, which is not significant in EIA terms. No mitigation or monitoring is proposed.
- 8.8.7.6 The settings assessment found that effects during the construction, operations and maintenance, and decommissioning of the structures within the Morgan Array Area would be of **minor adverse** or **negligible adverse** significance for all designated historic assets within the settings study area, which is not significant in EIA terms. No mitigation or monitoring is proposed.

8.9 Cumulative effect assessment methodology

8.9.1 Methodology

- 8.9.1.1 The Cumulative Effects Assessment (CEA) takes into account the impact associated with the Morgan Generation Assets together with the Morgan and Morecambe Offshore Wind Farms: Transmission Assets, the Morecambe Offshore Windfarm: Generation Assets, and 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 of the Environmental Statement). 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.

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- 8.9.1.2 The marine archaeology CEA methodology has followed the methodology set out in Volume 1, Chapter 5: EIA methodology of the Environmental Statement. The cumulative assessment considers three scenarios;
- Scenario 1: Morgan Generation Assets plus Morgan and Morecambe Offshore Wind Farms: Transmission Assets
 - Scenario 2: Morgan Generation Assets plus Morgan and Morecambe Offshore Wind Farms: Transmission Assets and the Morecambe Offshore Windfarm: Generation Assets
 - Scenario 3: Morgan Generation Assets plus Morgan and Morecambe Offshore Wind Farms: Transmission Assets alongside all other project, plans and activities.
- 8.9.1.3 This assessment has been allocated into ‘tiers’ reflecting the current stage of the other projects, plans and activities within the planning and development process. This tiered approach is adopted to provide a clear assessment of the Morgan Generation Assets and Morgan and Morecambe Offshore Wind Farms: Transmission Assets alongside other projects, plans, and activities:
- Tier 1: includes projects plans and activities at the following stages:
 - 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: includes projects, plans and activities at the following stages:
 - Scoping report has been submitted and is in the public domain.
 - Tier 3 includes projects, plans and activities at the following stages:
 - Scoping report has not been submitted and is not in the public domain
 - Identified in the relevant Development Plan
 - Identified in other plans and programmes.
- 8.9.1.4 This approach to CEA has been developed to provide an assessment of the Morgan Generation Assets together with the Morgan and Morecambe Offshore Wind Farms: Transmission Assets (Scenario 1) and the Morecambe Offshore Windfarm: Generation Assets (Scenario 2) in order to identify, as far as possible, the combined effects of these three applications separately from the assessment that includes all other projects, plans and activities (Scenario 3).
- 8.9.1.5 The specific projects, plans and activities scoped into the CEA, are outlined in Table 8.20.

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Table 8.20: List of other projects, plans and activities considered within the CEA.

Project/Plan	Status	Distance from the Morgan Generation Assets (km)	Description of project/plan	Dates of construction (if applicable)	Dates of operation (if applicable)	Overlap with the Morgan Generation Assets
Morgan and Morecambe Offshore Wind Farms: Transmission Assets	Pre-application	0.0	Morgan and Morecambe Offshore Wind Farms: Transmission Assets	2028 to 2029	2030 to 2065	Project construction phase overlaps with Morgan and Morecambe Offshore Wind Farms: Transmission Assets construction phase.
Tier 1						
None						
Tier 2						
Morecambe Offshore Wind Farm Generation Assets	Pre-application	11.24	Morecambe Offshore Wind Farm Generation Assets	2026 to 2028	2029 to 2089	The construction, operations and maintenance and decommissioning phases of this project will overlap with the construction, operations and maintenance and decommissioning phases of the Morgan Generation Assets.
Tier 3						
None						

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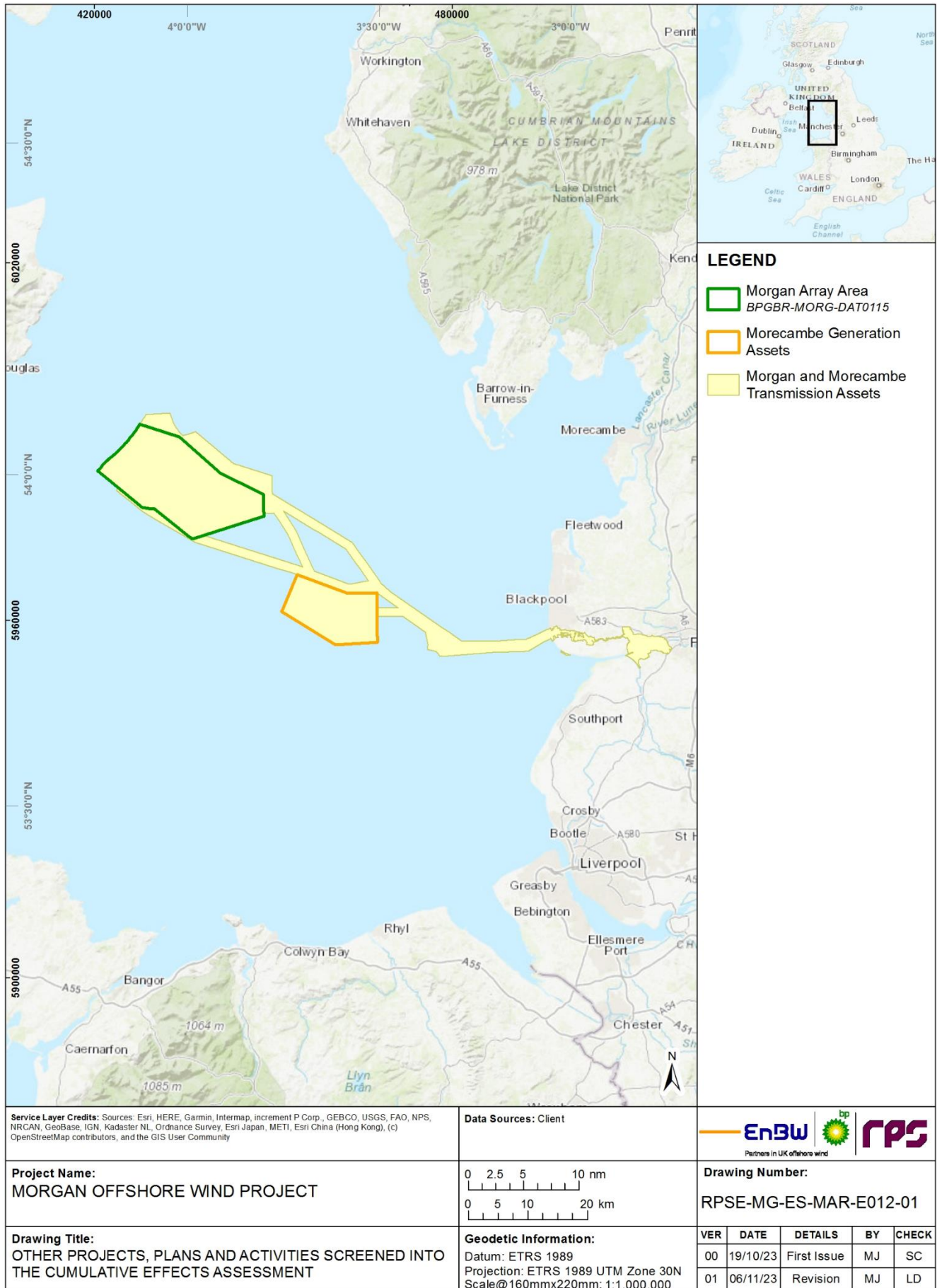


Figure 8.6: Other projects, plans and activities screened into the cumulative effects assessment.

8.9.2 Maximum design scenario

- 8.9.2.1 The MDSs identified in Table 8.21 have been selected as those having the potential to result in the greatest effect on an identified receptor or receptor group. The scenarios have been selected from the PDE provided in Volume 1, Chapter 3: Project description of the Environmental Statement 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 PDE (e.g. different turbine layout), to that assessed here, be taken forward in the final design scheme within the PDE.
- 8.9.2.2 The range of potential cumulative impacts identified in Table 8.21 below is a subset of those considered for the Morgan Generation Assets alone assessment (Table 8.16). 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.
- 8.9.2.3 Of the impacts set out in Table 8.16, the following have not been included in the CEA as the Morgan and Morecambe Transmission Assets project design does not contain infrastructure that will impact deeply buried deposits and the Morecambe Generation Assets project has no spatial overlap for culminative direct damage:
- Direct damage to deeply buried marine archaeology receptors – submerged prehistoric receptors (palaeolandscapes and associated archaeological receptors).

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Table 8.21: 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.	✓	✓	✓	<p>Scenario 1 Maximum design scenario as described for the Morgan Generation Assets (Table 8.16) assessed cumulatively with the Morgan and Morecambe Offshore Wind Farms: Transmission Assets</p> <p>Scenario 2 Maximum design scenario as described for the Morgan Generation Assets (Table 8.16) assessed cumulatively with the Morgan and Morecambe Offshore Wind Farms: Transmission Assets and the Morecambe Offshore Windfarm: Generation Assets.</p> <p>Scenario 3 Maximum design scenario as described for the Morgan Generation Assets (Table 8.16) assessed cumulatively with the Morgan and Morecambe Offshore Wind Farms: Transmission Assets and any other Tier 1, Tier 2 or Tier 3 projects identified in Table 8.20. As no other projects have been identified this scenario is not applicable to this chapter and will not be assessed further.</p>	Maximum potential for cumulative effects of sediment disturbance and deposition leading to indirect effects on marine archaeology receptors.
Direct damage to marine archaeology receptors (e.g. wrecks, debris, submerged prehistoric receptors (palaeolandscapes and associated archaeological receptors))	✓	✓	✓	<p>Scenario 1 Maximum design scenario as described for the Morgan Generation Assets (Table 8.16) assessed cumulatively with the Morgan and Morecambe Offshore Wind Farms: Transmission Assets</p> <p>Scenario 2 Maximum design scenario as described for the Morgan Generation Assets (Table 8.16) assessed cumulatively with the Morgan and Morecambe Offshore Wind Farms: Transmission Assets and the Morecambe Offshore Windfarm: Generation Assets.</p>	Maximum potential for cumulative effects of direct damage to marine archaeology receptors.

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Potential cumulative effect	Phase ^a C O D			Maximum Design Scenario	Justification
				<p>Scenario 3</p> <p>Maximum design scenario as described for the Morgan Generation Assets (Table 8.16) assessed cumulatively with the Morgan and Morecambe Offshore Wind Farms: Transmission Assets and any other Tier 1, Tier 2 or Teir 3 projects identified in Table 8.20. As no other projects have been identified this scenario is not applicable to this chapter and will not be assessed further.</p>	
Alteration of sediment transport regimes.	x	✓	x	<p>Scenario 1</p> <p>Maximum design scenario as described for the Morgan Generation Assets (Table 8.16) assessed cumulatively with the Morgan and Morecambe Offshore Wind Farms: Transmission Assets</p> <p>Scenario 2</p> <p>Maximum design scenario as described for the Morgan Generation Assets (Table 8.16) assessed cumulatively with the Morgan and Morecambe Offshore Wind Farms: Transmission Assets and the Morecambe Offshore Windfarm: Generation Assets.</p> <p>Scenario 3</p> <p>Maximum design scenario as described for the Morgan Generation Assets (Table 8.16) assessed cumulatively with the Morgan and Morecambe Offshore Wind Farms: Transmission Assets and any other Tier 1, Tier 2 or Tier 3 projects identified in Table 8.20. As no other projects have been identified this scenario is not applicable to this chapter and will not be assessed further.</p>	Maximum potential for cumulative effects of alteration of transport regimes to have indirect impacts on marine archaeology receptors.
Potential for visual change within the setting of an asset.	✓	✓	✓	<p>Scenarios 1, 2 and 3</p> <p>Maximum design scenario as described for the Morgan Generation Assets (Table 10.17 of Volume 2, Chapter 10: Seascape, landscape and visual resources of the Environmental Statement) assessed cumulatively with the following other projects/plans:</p> <p>Tier 1 Existing offshore wind farms</p> <ul style="list-style-type: none"> • North West England cluster • North Wales cluster 	Outcome of the CEA will be greatest when the greatest number of other schemes are considered.

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Potential cumulative effect	Phase ^a			Maximum Design Scenario	Justification
	C	O	D		
				<ul style="list-style-type: none"> • Robin Rigg. Tier 1 Offshore wind farms under construction, permitted and submitted for planning approval. • Awel y Môr Offshore Wind Farm • Mona Offshore Wind Farm project Tier 2 – proposed offshore wind farms • Morecambe Offshore Windfarm Generation Assets • Mooir Vannin Offshore Wind Farm • Morgan and Morecambe offshore wind farm transmission assets 	

8.10 Cumulative effects assessment

8.10.1 Marine archaeology overview

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

8.10.1.2 The CEA is presented in a series of tables (one for each potential cumulative impact), and considers the following:

- Scenario 1: Morgan Generation Assets together with the Morgan and Morecambe Offshore Wind Farms: Transmission Assets
- Scenario 2: Morgan Generation Assets together with the Morecambe Offshore Windfarm Generation Assets and the Morgan and Morecambe Offshore Wind Farms: Transmission Assets.

8.10.1.3 Scenario 3, Tier 1, Tier 2 and Tier 3: Morgan Generation Assets together with the Morgan and Morecambe Offshore Wind Farms Transmission Assets and other relevant projects and plans has not been screened into the CEA for marine archaeology as no other projects and plans have been identified.

8.10.2 Cultural heritage overview

8.10.2.1 A separate CEA has been undertaken with regard to the likely impacts of the above surface structures within the Morgan Array Area as a result of changes within the settings of designated historic assets. This is presented with Volume 4, Annex 8.2: Cultural heritage technical report of the Environmental Statement.

8.10.2.2 The CEA for the structures within the Morgan Array Area is presented in table XX and considers the following:

- Scenario 1: Morgan Generation Assets together with the Morgan and Morecambe Offshore Wind Farms: Transmission Assets
- Scenario 2: Morgan Generation Assets together with the Morgan and Morecambe Offshore Wind Farms: Transmission Assets and the Morecambe Offshore Windfarm: Generation Assets
- Scenario 3: Morgan Generation Assets together with the Morgan and Morecambe Offshore Wind Farms: Transmission Assets and other relevant Tier 1, Tier 2 and Tier 3 projects and plans.

8.10.2.3 There are no Tier 3 planned offshore and onshore wind farms of relevance to settings of terrestrial designated historic assets that may produce a culminative impact with the Morgan Generation Assets.

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

Table 8.22: Sediment disturbance and deposition leading to indirect impacts on marine archaeology receptors.

	Scenario 1 Morgan Generation Assets + Transmission Assets	Scenario 2: Morgan Generation Assets + Morecambe Offshore Windfarm Generation Assets + Transmission Assets
Construction		
Magnitude of impact	<p>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 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.</p> <p>The measures adopted as part of the Morgan Generation Assets outlined in section 8.7 and Table 8.17 include the development of and adherence to a PAD to ensure that any newly exposed archaeological assets are recorded and, where appropriate, TAEZs and AEZs can be implemented.</p> <p>The cumulative effect will result in some measurable change in attributes, quality or vulnerability, minor loss or alteration to, one (maybe more key characteristics, composition or attributes). The magnitude is therefore considered to be low.</p>	<p>The magnitude of the cumulative effect for Scenario 2 is not considered to be greater than the cumulative effect of Scenario 1 as physical processes modelling has shown that the indirect impact from sediment disturbance and deposition will be localised and will not interact with activities associated with the Morecambe Generation Assets. Therefore, the magnitude is considered to be low.</p>
Sensitivity of receptor	<p>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.</p> <p>As there is a high potential for the discovery of currently unknown archaeological receptors, and any prehistoric deposits have a high potential to contribute to an understanding of the palaeoenvironment the value and therefore sensitivity of the marine archaeology across both project areas is deemed to be high.</p>	<p>In line with the project alone assessment, the sensitivity of marine archaeology receptors within the Morgan marine archaeology study area is considered to be high.</p>
Significance of effect	<p>The measures adopted as part of the Morgan Generation Assets outlined in section 8.7 and Table 8.17 include the development of and adherence to a PAD to ensure that any newly exposed archaeological assets are recorded and, where appropriate, TAEZs can be implemented.</p>	<p>The magnitude of impact is low and the sensitivity of the receptor is high, therefore due to the measures adopted as part of the project, the significance of the culminative effect is</p>

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	<p>Scenario 1 Morgan Generation Assets + Transmission Assets</p>	<p>Scenario 2: Morgan Generation Assets + Morecambe Offshore Windfarm Generation Assets + Transmission Assets</p>
	<p>Overall, the magnitude of the cumulative impact is deemed to be low and the sensitivity of the receptor is considered to be high. Due to the measures adopted as part of the project the cumulative effect will, therefore, be of minor adverse significance, which is not significant in EIA terms.</p>	<p>minor adverse, which is not significant in EIA terms.</p>
<p>Further mitigation and residual significance</p>	<p>N/A</p>	<p>N/A</p>
<p>Operations and Maintenance</p>		
<p>Magnitude of impact</p>	<p>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.</p> <p>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 physical processes modelling carried out for Morgan Generation Assets and presented in Volume 2, Chapter 1: Physical processes of the Environmental Statement 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.</p> <p>The measures adopted as part of the Morgan Generation Assets outlined in section 8.7 and Table 8.17 include the development of and adherence to a PAD to ensure that any newly exposed archaeological assets are recorded and, where appropriate, TAEZs and AEZs can be implemented.</p> <p>The cumulative effect is predicted to result in some measurable changes in attributes quality or vulnerability, minor loss of, or alteration to, one (possibly more) key characteristics, composition or attributes. It is predicted that the impact will affect marine archaeology indirectly. The magnitude is therefore, considered to be low.</p>	<p>The magnitude of the cumulative effect for Scenario 2 is not considered to be greater than the cumulative effect of Scenario 1 as physical processes modelling has shown that the indirect impact from sediment disturbance and deposition will be localised and will not interact with activities associated with the Morecambe Generation Assets. Therefore, the magnitude is considered to be low.</p>
<p>Sensitivity of receptor</p>	<p>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</p>	<p>In line with the project alone assessment, the sensitivity of marine archaeology receptors</p>

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	<p>Scenario 1 Morgan Generation Assets + Transmission Assets</p>	<p>Scenario 2: Morgan Generation Assets + Morecambe Offshore Windfarm Generation Assets + Transmission Assets</p>
	<p>marine archaeology receptors are vulnerable sites that can be exposed further by disturbance activities.</p> <p>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.</p> <p>As there is a high potential for the discovery of currently unknown archaeological receptors, and any prehistoric deposits have a high potential to contribute to an understanding of the palaeoenvironment the value and therefore sensitivity of the marine archaeology within the both project areas is deemed to be high.</p>	<p>within the Morgan marine archaeology study area is considered to be high.</p>
<p>Significance of effect</p>	<p>The measures adopted as part of the Morgan Generation Assets outlined in section 8.7 and Table 8.17 include the development of and adherence to a PAD to ensure that any newly exposed archaeological assets are recorded and, where appropriate, TAEZs can be implemented. Overall, the magnitude of the cumulative impact of increased sediment disturbance and deposition is deemed to be low 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.</p>	<p>The magnitude of impact is low and the sensitivity of the receptor is high, therefore due to the measures adopted as part of the project, the significance of the culminative effect is minor adverse, which is not significant in EIA terms.</p>
<p>Further mitigation and residual significance</p>	<p>N/A</p>	<p>N/A</p>
<p>Decommissioning</p>		
<p>Magnitude of impact</p>	<p>This assessment for Scenario 1 considers increased sediment disturbance and deposition.</p> <p>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.</p> <p>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</p>	<p>The magnitude of the cumulative effect for Scenario 2 is not considered to be greater than the cumulative effect of Scenario 1 as physical processes modelling has shown that the indirect impact from sediment disturbance and deposition will be localised and will not interact with activities associated with the Morecambe Generation Assets. Therefore, the magnitude is considered to be low.</p>

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	<p>Scenario 1 Morgan Generation Assets + Transmission Assets</p>	<p>Scenario 2: Morgan Generation Assets + Morecambe Offshore Windfarm Generation Assets + Transmission Assets</p>
	<p>decommissioning activities are predicted to be no greater than those for construction, as set out above.</p> <p>The measures adopted as part of the Morgan Generation Assets outlined in section 8.7 and Table 8.17 include the development of and adherence to a PAD to ensure that any newly exposed archaeological assets are recorded and, where appropriate, TAEZs and AEZs can be implemented.</p> <p>The cumulative effect is predicted to result in some measurable changes in attributes quality or vulnerability, minor loss of, or alteration to, one (possibly more) key characteristics, composition or attributes. It is predicted that the impact will affect the receptors indirectly. The magnitude is therefore, considered to be low.</p>	
<p>Sensitivity of receptor</p>	<p>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.</p> <p>As there is a high potential for the discovery of currently unknown archaeological receptors, and any prehistoric deposits have a high potential to contribute to an understanding of the palaeoenvironment the value and therefore sensitivity of the marine archaeology within both project areas is deemed to be high.</p>	<p>In line with the project alone assessment, the sensitivity of marine archaeology receptors within the Morgan marine archaeology study area is considered to be high.</p>
<p>Significance of effect</p>	<p>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.</p>	<p>The magnitude of impact is low and the sensitivity of the receptor is high, therefore due to the measures adopted as part of the project, the significance of the culminative effect is minor adverse, which is not significant in EIA terms.</p>
<p>Further mitigation and residual significance</p>	<p>N/A</p>	<p>N/A</p>

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8.10.4 Direct damage to marine archaeology receptors

Table 8.23: Direct damage to marine archaeology receptors (e.g. wrecks, debris, submerged prehistoric receptors (palaeolandscapes and associated archaeological receptors)).

	Scenario 1 Morgan Generation Assets + Transmission Assets	Scenario 2: Morgan Generation Assets + Morecambe Offshore Windfarm Generation Assets + Transmission Assets
Construction		
Magnitude of impact	<p>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 may result in direct damage to marine archaeology receptors identified in section 8.4.3 and those that are as yet unknown in areas where the footprints of the projects overlap.</p> <p>The predicted cumulative seabed impact from the Morgan Generation Assets and the Morgan and Morecambe Offshore Wind Farms: Transmission Assets equates to 367.36 km². This includes all of the activities associated with the construction of the Morgan Generation Assets described in Table 8.16 together with up to 87.36 km² of seabed impact associated with the activities associated with the construction of the Morgan and Morecambe Offshore Wind Farms: Transmission Assets.</p> <p>Due to the measures adopted as part of the projects there will be no pathway for direct impact to all known maritime archaeology receptors of medium or high potential and preservation by record will be adopted for all unavoidable direct impact, such as to near surface prehistoric deposits. This will result in either no change to receptors or minor benefit through the acquisition of data to enhance archaeological understanding. The magnitude is therefore, considered to be low.</p>	<p>As there will be no spatial overlap between the Morgan Generation Assets and Morecambe Generation Assets there will be no pathway for culminative direct impact between these projects. Therefore, the magnitude of the cumulative effect for Scenario 2 is not considered to be different to the cumulative effect of Scenario 1 and is therefore low.</p>
Sensitivity of receptor	<p>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.</p> <p>As there is a high potential for the discovery of currently unknown archaeological receptors, and any prehistoric deposits have a high potential to contribute to an understanding of the palaeoenvironment the value and</p>	<p>In line with the project alone assessment, the sensitivity of marine archaeology receptors within the Morgan marine archaeology study area is considered to be high.</p>

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	<p>Scenario 1 Morgan Generation Assets + Transmission Assets</p>	<p>Scenario 2: Morgan Generation Assets + Morecambe Offshore Windfarm Generation Assets + Transmission Assets</p>
	<p>therefore sensitivity of the marine archaeology within the Morgan marine archaeology study area is deemed to be high.</p>	
<p>Significance of effect</p>	<p>Overall, the magnitude of the impact is deemed to be low 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.</p>	<p>The magnitude of impact is low and the sensitivity of the receptor is high, therefore due to the measures adopted as part of the project, the significance of the culminative effect is minor adverse, which is not significant in EIA terms.</p>
<p>Further mitigation and residual significance</p>	<p>N/A</p>	<p>N/A</p>
<p>Operations and maintenance</p>		
<p>Magnitude of impact</p>	<p>The operations and maintenance phase of Morgan Generation Assets is due to overlap with the operations and maintenance phase of Morgan and Morecambe Offshore Wind Farms: Transmission Assets and therefore may result in direct damage to marine archaeology receptors identified in section 8.4.3 and those that are as yet unknown in areas where the footprints of the projects overlap.</p> <p>The predicted cumulative seabed impact from the Morgan Generation Assets and the Morgan and Morecambe Offshore Wind Farms: Transmission Assets during the operations and maintenance phase equates to 291.57 km². This includes all of the seabed impact described in Table 8.16 together with up to 11.57 km² associated with the operations and maintenance of the Morgan and Morecambe Offshore Wind Farms: Transmission Assets.</p> <p>Due to the measures adopted as part of the projects there will be no pathway for direct impact to all known maritime archaeology receptors of medium or high potential and preservation by record will be adopted for all unavoidable direct impact, such as to near surface prehistoric deposits. This will result in either no change to receptors or minor benefit through the acquisition of data to enhance archaeological understanding. The magnitude is therefore, considered to be low.</p>	<p>As there will be no spatial overlap between the Morgan Generation Assets and Morecambe Generation Assets there will be no pathway for culminative direct impact between these projects. Therefore, the magnitude of the cumulative effect for Scenario 2 is not considered to be different to the cumulative effect of Scenario 1 and is therefore low.</p>

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	Scenario 1 Morgan Generation Assets + Transmission Assets	Scenario 2: Morgan Generation Assets + Morecambe Offshore Windfarm Generation Assets + Transmission Assets
Sensitivity of receptor	<p>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.</p> <p>As there is a high potential for the discovery of currently unknown archaeological receptors, and any prehistoric deposits have a high potential to contribute to an understanding of the palaeoenvironment the value and therefore sensitivity of the marine archaeology within both project areas is deemed to be high.</p>	<p>In line with the project alone assessment, the sensitivity of marine archaeology receptors within the Morgan marine archaeology study area is considered to be high.</p>
Significance of effect	<p>The magnitude of the cumulative impact is deemed to be low 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.</p>	<p>The magnitude of impact is low and the sensitivity of the receptor is high, therefore due to the measures adopted as part of the project, the significance of the culminative effect is minor adverse, which is not significant in EIA terms.</p>
Further mitigation and residual significance	N/A	N/A
Decommissioning		
Magnitude of impact	<p>The operations and maintenance phase of Morgan Generation Assets is due to overlap with the operations and maintenance phase of Morgan and Morecambe Offshore Wind Farms: Transmission Assets and therefore may result in direct damage to marine archaeology receptors identified in section 8.4.3 and those that are as yet unknown in areas where the footprints of the projects overlap.</p> <p>The predicted cumulative seabed impact from the Morgan Generation Assets and the Morgan and Morecambe Generation Assets during the decommissioning phases may be up to 367.36 km². This assumes that the extent of seabed impact during the decommissioning phases could be the same as in the construction phases. This is, however, highly precautionary with the actual value is likely to be much lower as activities such as sandwave clearance may not be required during decommissioning. The MDS for the decommissioning phases assumes the removal of wind turbines, OSPs, and</p>	<p>As there will be no spatial overlap between the Morgan Generation Assets and Morecambe Generation Assets there will be no pathway for culminative direct impact between these projects. Therefore, the magnitude of the cumulative effect for Scenario 2 is not considered to be different to the cumulative effect of Scenario 1 and is therefore low.</p>

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	Scenario 1 Morgan Generation Assets + Transmission Assets	Scenario 2: Morgan Generation Assets + Morecambe Offshore Windfarm Generation Assets + Transmission Assets
	<p>cable protection for the Morgan Generation Assets and the removal of cables for both projects.</p> <p>Due to the measures adopted as part of the projects there will be no pathway for direct impact to all known maritime archaeology receptors of medium or high potential and preservation by record will be adopted for all unavoidable direct impact, such as to near surface prehistoric deposits. This will result in either no change to receptors or minor benefit through the acquisition of data to enhance archaeological understanding. The magnitude is therefore, considered to be low.</p>	
Sensitivity of receptor	<p>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.</p> <p>As there is a high potential for the discovery of currently unknown archaeological receptors, and any prehistoric deposits have a high potential to contribute to an understanding of the palaeoenvironment the value and therefore sensitivity of the marine archaeology within both project areas is deemed to be high.</p>	<p>In line with the project alone assessment, the sensitivity of marine archaeology receptors within the Morgan marine archaeology study area is considered to be high.</p>
Significance of effect	<p>The magnitude of the cumulative impact of direct damage is deemed to be low 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.</p>	<p>The magnitude of impact is low and the sensitivity of the receptor is high, therefore due to the measures adopted as part of the project, the significance of the culminative effect is minor adverse, which is not significant in EIA terms.</p>
Further mitigation and residual significance	N/A	N/A

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8.10.5 Alteration of sediment transport regimes

Table 8.24: Alteration of sediment transport regimes leading to indirect impacts on marine archaeology receptors.

Scenario 1 Morgan Generation Assets + Transmission Assets		Scenario 2: Morgan Generation Assets + Morecambe Offshore Windfarm Generation Assets + Transmission Assets	
Operations and maintenance			
Magnitude of impact	<p>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.</p> <p>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 Volume 2, Chapter 6: Physical Processes of the Environmental Statement 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.</p> <p>The measures adopted as part of the Morgan Generation Assets outlined in section 8.7 and Table 8.17 include the development of and adherence to a PAD to ensure that any newly exposed archaeological assets are recorded and, where appropriate, TAEZs and AEZs can be implemented.</p> <p>The cumulative effect is predicted to result in very minor loss or detrimental alteration to one or more characteristics, composition or attributes. It is predicted that the impact will affect the receptor indirectly. The magnitude is therefore, considered to be negligible.</p>	<p>The magnitude of the cumulative effect for Scenario 2 is not considered to be greater than the cumulative effect of Scenario 1 as physical processes modelling has shown that the indirect impact from altered sediment transport regimes will be low and will not interact with activities associated with the Morecambe Generation Assets. Therefore, the magnitude is considered to be negligible.</p>	
Sensitivity of receptor	<p>The east Irish Sea 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.</p>	<p>In line with the project alone assessment, the sensitivity of marine archaeology receptors within the Morgan marine archaeology study area is considered to be high.</p>	

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	Scenario 1 Morgan Generation Assets + Transmission Assets	Scenario 2: Morgan Generation Assets + Morecambe Offshore Windfarm Generation Assets + Transmission Assets
	As there is a high potential for the discovery of currently unknown archaeological receptors, and any prehistoric deposits have a high potential to contribute to an understanding of the palaeoenvironment the value and therefore sensitivity of the marine archaeology within the both project areas is deemed to be high .	
Significance of effect	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.	The magnitude of impact is negligible and the sensitivity of the receptor is high, therefore due to the measures adopted as part of the project, the significance of the culminative effect is minor adverse , which is not significant in EIA terms.
Further mitigation and residual significance	N/A	N/A

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8.10.6 Potential for visual change within the setting of an asset.

The full cumulative assessment for visual change leading to indirect impacts on cultural heritage receptors is presented in Volume 4, Annex 8.2: Cultural heritage technical report of the Environmental Statement. Table 8.25 contains a summary of the assessments.

Table 8.25: Potential for visual change leading to indirect impacts on cultural heritage receptors.

	Scenario 1: Morgan Generation Assets + Morgan and Morecambe Offshore Wind Farms: Transmission Assets	Scenario 2: Morgan Generation Assets + Morgan and Morecambe Offshore Wind Farms: Transmission Assets + Morecambe Offshore Windfarm: Generation Assets	Scenario 3: Morgan Generation Assets + Morgan and Morecambe Offshore Wind Farms: Transmission Assets + Tier 1, Tier 2, Tier 3 projects
Construction			
Isle of Man	<p>The cumulative effects assessment for Scenario 1 considers the following:</p> <ul style="list-style-type: none"> Impacts upon the setting of designated heritage assets on the Isle of Man during the construction phase of the Morgan Generation Asset infrastructure and the Morgan and Morecambe Offshore Wind Farms: Transmission Assets. <p>It is concluded that there will therefore be no cumulative impacts on designated historic assets during the construction phase arising from Scenario 1. The potential for cumulative effects arising from Scenario 1 is not considered further.</p>	<p>The cumulative effects assessment for Scenario 2 considers the following:</p> <ul style="list-style-type: none"> Impacts on upon the setting of designated heritage assets on the Isle of Man during the construction phase of the Morgan Generation Asset infrastructure, the Morgan and Morecambe Offshore Wind Farms: Transmission Assets and the Morecambe Offshore Windfarm Generation Assets <p>It is concluded that this contemporaneous construction will have no cumulative impacts on designated assets arising from Scenario 2 during the construction phase. The potential for cumulative effects arising from Scenario 2 is not considered further.</p>	<p>Tier 1</p> <p>The Tier 1 cumulative effects assessment for Scenario 3 considers the following:</p> <ul style="list-style-type: none"> Impacts on upon the setting of designated heritage assets on the Isle of Man during the construction phase of the Morgan Generation Asset infrastructure and the the Morgan and Morecambe Offshore Wind Farms: Transmission Assets, in relation to the existing wind turbines of the Northwest England Cluster, the North Wales Cluster, the Robin Rigg Wind Farm, the proposed Mona Offshore Wind Farm, and the consented Awel y Môr Offshore Wind Farm. <p>Because of the distance between the Isle of Man and the Mona Array Area, negative impacts would be minimal. Therefore, the cumulative effects at construction would be negligible adverse.</p> <p>Tier 2</p> <p>The Tier 2 cumulative effects assessment for Scenario 3 considers the following:</p>

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	<p>Scenario 1: Morgan Generation Assets + Morgan and Morecambe Offshore Wind Farms: Transmission Assets</p>	<p>Scenario 2: Morgan Generation Assets + Morgan and Morecambe Offshore Wind Farms: Transmission Assets + Morecambe Offshore Windfarm: Generation Assets</p>	<p>Scenario 3: Morgan Generation Assets + Morgan and Morecambe Offshore Wind Farms: Transmission Assets + Tier 1, Tier 2, Tier 3 projects</p>
			<ul style="list-style-type: none"> Impacts on upon the setting of designated heritage assets on the Isle of Man during the construction phase of the Morgan Generation Asset infrastructure and the the Morgan and Morecambe Offshore Wind Farms: Transmission Assets, in relation to the proposed Mooir Vannin Offshore Wind Farm. <p>It is concluded that here will therefore be no cumulative effects beyond those assessed above.</p>
<p>England (Lake District)</p>	<p>The cumulative effects assessment for Scenario 1 considers the following:</p> <ul style="list-style-type: none"> Impacts upon the setting of designated heritage assets on the Isle of Man during the construction phase of the Morgan Generation Asset infrastructure and the Morgan and Morecambe Offshore Wind Farms: Transmission Assets. <p>It is concluded that there will therefore be no cumulative impacts on designated historic assets during the construction phase arising from Scenario 1. The potential for cumulative effects arising from Scenario 1 is not considered further.</p>	<p>The cumulative effects assessment for Scenario 2 considers the following:</p> <ul style="list-style-type: none"> Impacts upon the setting of designated heritage assets on the Lake District during the construction phase of the Morgan Generation Asset infrastructure, the Morgan and Morecambe Offshore Wind Farms Transmission Assets and the Morecambe Offshore Windfarm Generation Asses. <p>It is concluded that, negligible adverse additional, cumulative effects are likely to arise.</p>	<p>Tier 1</p> <p>The Tier 1 cumulative effects assessment for Scenario 3 considers the following:</p> <ul style="list-style-type: none"> Impacts upon the setting of designated heritage assets in the Lake District during the construction phase of the Morgan Generation Asset infrastructure and the the Morgan and Morecambe Offshore Wind Farms: Transmission Assets, in relation to the existing wind turbines of the North West England Cluster, the North Wales Cluster, the Robin Rigg Wind Farm, the proposed Mona Offshore Wind Farm, and the consented Awel y Môr Offshore Wind Farm. <p>It is concluded that the cumuative effects at construction would be negligible adverse.</p> <p>Tier 2</p> <p>The Tier 2 cumulative effects assessment for Scenario 3 considers the following:</p>

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	<p>Scenario 1: Morgan Generation Assets + Morgan and Morecambe Offshore Wind Farms: Transmission Assets</p>	<p>Scenario 2: Morgan Generation Assets + Morgan and Morecambe Offshore Wind Farms: Transmission Assets + Morecambe Offshore Windfarm: Generation Assets</p>	<p>Scenario 3: Morgan Generation Assets + Morgan and Morecambe Offshore Wind Farms: Transmission Assets + Tier 1, Tier 2, Tier 3 projects</p>
			<ul style="list-style-type: none"> Impacts on upon the setting of designated heritage assets in the Lake District during the construction phase of the Morgan Generation Asset infrastructure and the Morgan and Morecambe Offshore Wind Farms: Transmission Assets, in relation to the proposed Moir Vannin Offshore Wind Farm. <p>It is concluded that there will therefore be no cumulative effects beyond those assessed above.</p>
<p>Operations and maintenance</p>			
<p>Isle of Man</p>	<p>The cumulative effects assessment for Scenario 1 considers the following:</p> <ul style="list-style-type: none"> Impacts upon the setting of designated heritage assets on the Isle of Man during the operations and maintenance phase phase of the Morgan Generation Asset infrastructure and the Morgan and Morecambe Offshore Wind Farms: Transmission Assets. <p>It is concluded that there will therefore be no cumulative impacts on designated historic assets during the construction phase arising from Scenario 1. The potential for cumulative effects arising from Scenario 1 is not considered further.</p>	<p>The cumulative effects assessment for Scenario 2 considers the following:</p> <ul style="list-style-type: none"> Impacts upon the setting of designated heritage assets on the Isle of Man during the operations and maintenance phase of the Morgan Generation Asset infrastructure, organ and Morecambe Offshore Wind Farms Transmission Assets and the Morecambe Offshore Windfarm Generation Asses. <p>It is concluded that this contemporaneous construction will have no cumulative impacts on designated assets arising from Scenario 2 during the construction phase. The potential for cumulative effects arising from Scenario 2 is not considered further.</p>	<p>Tier 1</p> <p>The Tier 1 cumulative effects assessment for Scenario 3 considers the following:</p> <ul style="list-style-type: none"> Impacts upon the setting of designated heritage assets on the Isle of Man during the operations and maintenance phase of the Morgan Generation Asset infrastructure and the the Morgan and Morecambe Offshore Wind Farms: Transmission Assets, in relation to the existing wind turbines of the North West England Cluster, the North Wales Cluster, the Robin Rigg Wind Farm, the proposed Mona Offshore Wind Farm, and the consented Awel y Môr Offshore Wind Farm. <p>It is concluded that the cumuative effects at construction would be negligible adverse.</p> <p>Tier 2</p>

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	<p>Scenario 1: Morgan Generation Assets + Morgan and Morecambe Offshore Wind Farms: Transmission Assets</p>	<p>Scenario 2: Morgan Generation Assets + Morgan and Morecambe Offshore Wind Farms: Transmission Assets + Morecambe Offshore Windfarm: Generation Assets</p>	<p>Scenario 3: Morgan Generation Assets + Morgan and Morecambe Offshore Wind Farms: Transmission Assets + Tier 1, Tier 2, Tier 3 projects</p>
			<p>The Tier 2 cumulative effects assessment for Scenario 3 considers the following:</p> <ul style="list-style-type: none"> Impacts upon the setting of designated heritage assets on the Isle of Man during the operations and maintenance phase of the Morgan Generation Asset infrastructure and the the Morgan and Morecambe Offshore Wind Farms: Transmission Assets, in relation to the Mooir Vannin Offshore Wind Farm. <p>Construction of the Mooir Vannin Offshore Wind Farm would introduce new turbines in areas of the seascape currently containing no turbines. The turbines of the Mooir Vannin Wind Farm will be closer than those of the Morgan Array Area and would be visible from most of the derignated assets considered here, in particular they would give rise to increased impacts on the assets toward the north end of the Isle of Man. Based upon the maximum scenario contained in the Mooir Vannin Scoping Report, of up to 100 turbines up to 389m tall, the operations and maintenance phases of the Mooir Vannin Winf Farm will have minor adverse cumulative effects for the majority of the historic assets assessed. . However, there are a small number of designated assets where the cumulative effects of the Mooir Vannin turbines are likley to be moderate adverse. These comprise the Point of Ayre lighthouse (147), along with the Point of Ayre fog horn (297), the small lighthouse on the Point of Ayre Beach known as Winkie (298) and the Maughold lighthouse (300). All four of these</p>

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	<p>Scenario 1: Morgan Generation Assets + Morgan and Morecambe Offshore Wind Farms: Transmission Assets</p>	<p>Scenario 2: Morgan Generation Assets + Morgan and Morecambe Offshore Wind Farms: Transmission Assets + Morecambe Offshore Windfarm: Generation Assets</p>	<p>Scenario 3: Morgan Generation Assets + Morgan and Morecambe Offshore Wind Farms: Transmission Assets + Tier 1, Tier 2, Tier 3 projects</p>
			<p>assets have strong functional connections to the sea, and the seascape forms an important part of their setting and contributes to their significance. The proximity of the Moor Vannin array will ensure that its turbines are more prominent visible features in the seascape than is the case with the Morgan Array Area, whilst also being visible a higher percentage of the time. Furthermore, its location to the north west of the Morgan Array Area means that views of turbines will fill a greater proportion of the seascape horizon than would be the case were only the Morgan Array Area developed. As a result, the cumulative effects are greater for these assets.</p> <p>In general, the cumulative effects at the operations and maintenance stage would be minor adverse, which is not significant in EIA terms. However four assets (the Point of Ayre lighthouse (147), along with the Point of Ayre fog horn (297), the small lighthouse on the Point of Ayre Beach known as Winkie (298) and the Maughold lighthouse (300)) have been identified where the cumulative effects are considered moderate adverse, which is significant in EIA terms.</p>
<p>England (Lake District)</p>	<p>The cumulative effects assessment for Scenario 1 considers the following:</p> <ul style="list-style-type: none"> Impacts upon the setting of designated heritage assets in the Lake District during the operations and maintenance phase of the Morgan Generation Asset infrastructure and 	<p>The cumulative effects assessment for Scenario 2 considers the following:</p> <ul style="list-style-type: none"> Impacts upon the setting of designated heritage assets in the Lake District during the operations and maintenance phase of the Morgan Generation Asset infrastructure, the 	<p>Tier 1</p> <p>The Tier 1 cumulative effects assessment for Scenario 3 considers the following:</p> <ul style="list-style-type: none"> Impacts upon the setting of designated heritage assets in the Lake District during the operations and maintenance phase of the

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	<p>Scenario 1: Morgan Generation Assets + Morgan and Morecambe Offshore Wind Farms: Transmission Assets</p>	<p>Scenario 2: Morgan Generation Assets + Morgan and Morecambe Offshore Wind Farms: Transmission Assets + Morecambe Offshore Windfarm: Generation Assets</p>	<p>Scenario 3: Morgan Generation Assets + Morgan and Morecambe Offshore Wind Farms: Transmission Assets + Tier 1, Tier 2, Tier 3 projects</p>
	<p>the the Morgan and Morecambe Offshore Wind Farms: Transmission Assets.</p> <p>It is concluded that there will therefore be no cumulative impacts on designated historic assets during the construction phase arising from Scenario 1. The potential for cumulative effects arising from Scenario 1 is not considered further.</p>	<p>Morgan and Morecambe Offshore Wind Farms: Transmission Assets, and the Morecambe Offshore Windfarm Generation Asses</p> <p>It is concluded that, negligible adverse additional, cumulative effects are likely to arise.</p>	<p>Morgan Generation Asset infrastructure and the Morgan and Morecambe Offshore Wind Farms: Transmission Assets, in relation to the existing wind turbines of the North West England Cluster, the North Wales Cluster, the Robin Rigg Wind Farm, the proposed Mona Wind Farm and the consented Awel y Môr Offshore Wind Farm.</p> <p>It is concluded that the cumuative effects at construction would be negligible adverse.</p> <p>Tier 2</p> <p>The Tier 2 cumulative effects assessment for Scenario 3 considers the following:</p> <ul style="list-style-type: none"> • Impacts upon the setting of designated heritage assets in the Lake District during the operations and maintenance phase of the Morgan Generation Asset infrastructure and the Morgan and Morecambe Offshore Wind Farms: Transmission Assets, in relation to the proposed Moir Vannin Offshore Wind Farm. <p>It is concluded that the cumuative effects at construction would be minor adverse.</p>
<p>Decommissioning</p>	<p>The cumulative effects of decommissioning activities are expected to be the same or similar to the effects from construction.</p> <p>It is concluded that there will therefore be no cumulative impacts on designated historic assets during the construction phase arising from Scenario 1. The potential for cumulative</p>	<p>The cumulative effects of decommissioning activities are expected to be the same or similar to the effects from construction.</p> <p>It is concluded that there will therefore be no cumulative impacts on designated historic assets during the construction phase arising from Scenario 1. The potential for cumulative</p>	<p>The cumulative effects of decommissioning activities are expected to be the same or similar to the effects from construction.</p> <p>It is concluded that the cumuative effects at construction would be negligible adverse.</p>

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	Scenario 1: Morgan Generation Assets + Morgan and Morecambe Offshore Wind Farms: Transmission Assets	Scenario 2: Morgan Generation Assets + Morgan and Morecambe Offshore Wind Farms: Transmission Assets + Morecambe Offshore Windfarm: Generation Assets	Scenario 3: Morgan Generation Assets + Morgan and Morecambe Offshore Wind Farms: Transmission Assets + Tier 1, Tier 2, Tier 3 projects
	effects arising from Scenario 1 is not considered further.	effects arising from Scenario 1 is not considered further.	
England (Lake District)	<p>The cumulative effects of decommissioning activities are expected to be the same or similar to the effects from construction.</p> <p>It is concluded that there will therefore be no cumulative impacts on designated historic assets during the construction phase arising from Scenario 1. The potential for cumulative effects arising from Scenario 1 is not considered further.</p>	<p>The cumulative effects of decommissioning activities are expected to be the same or similar to the effects from construction.</p> <p>It is concluded that, negligible adverse additional, cumulative effects are likely to arise.</p>	<p>The cumulative effects of decommissioning activities are expected to be the same or similar to the effects from construction.</p> <p>It is concluded that the cumulative effects at construction would be negligible adverse.</p>

8.11 Transboundary effects

8.11.1.1 A screening of transboundary impacts has been carried out and has identified that due to there being no pathway for impacts beyond the Morgan marine archaeology study area or the Morgan setting assessment study area, there was no potential for significant transboundary effects with regard to marine archaeology from the Morgan Generation Assets upon the interests of other states.

8.12 Inter-related effects

8.12.1.1 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. sediment disturbance and deposition through all phases of the project)
- **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 alteration of sediment transport regimes, 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.

8.12.1.2 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 Environmental Statement. For marine archaeology, the following potential impacts have been considered within the inter-related assessment:

- Sediment disturbance and deposition leading to indirect impacts on marine archaeology receptors
- Alteration of sediment transport regimes.
- Potential impacts and effects arising from changes within the settings of terrestrial designated historic assets.

8.12.1.3 As the only impacts and effects that will affect terrestrial designated assets will occur through alteration of their settings, and considering the distance between the Morgan Generation Assets and those designated assets, only visual impacts have the potential to alter those settings. That potential has been fully explored in both this chapter and Volume 4, Annex 8.2: Cultural heritage assessment of the Environmental Statement, and all potential effects described. Consequently, no inter-related effects are predicted to arise as a consequence of the construction, operations and maintenance and decommissioning phases of the Morgan Generation Assets.

8.13 Summary of impacts, mitigation measures and monitoring

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

8.13.1.2 Table 8.26 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 (e.g. palaeolandscapes and associated archaeological receptors)
- alteration of sediment transport regimes
- effects on HSC
- potential for visual change within the setting of an asset.

8.13.1.3 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.

8.13.1.4

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- 8.13.1.6 Table 8.27 presents a summary of the potential cumulative impacts, measures adopted 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
 - direct damage to marine archaeology receptors (e.g. wrecks, debris, submerged prehistoric receptors (palaeolandscapes and associated archaeological receptors)
 - alteration of sediment transport regimes.
 - potential for visual change within the setting of an asset.
- 8.13.1.7 Overall, it is concluded that there will be no significant marine archaeology cumulative effects from the Morgan Generation Assets alongside other projects/plans.
- 8.13.1.8 In general, the cumulative potential for visual change within the setting of an asset at the operations and maintenance stage would be minor adverse, which is not significant in EIA terms. However four assets (the Point of Ayre lighthouse (147), along with the Point of Ayre fog horn (297), the small lighthouse on the Point of Ayre Beach known as Winkie (298) and the Maughold lighthouse (300)) have been identified where the cumulative effects are considered **moderate adverse**, which is significant in EIA terms. The main cause of this impact would be the proximity and scale of the turbines of the proposed Moir Vannin array.
- 8.13.1.9 No potential transboundary impacts have been identified in regard to effects of the Morgan Generation Assets.

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Table 8.26: Summary of potential environmental effects, mitigation and monitoring.

^a C=construction, O=operation and maintenance, D=decommissioning

Description of impact	Phase ^a			Measures adopted as part of the project	Magnitude of impact	Sensitivity of the receptor	Significance of effect	Further mitigation	Residual effect	Proposed monitoring
	C	O	D							
Sediment disturbance and deposition leading to indirect impacts on marine archaeology receptors	✓	✓	✓	Development of, and adherence to, an Offshore WSI and PAD, which includes the protocol for the reporting and protection of any archaeological material that may be discovered during the course of Morgan Generation Assets (Table 8.18 and Table 8.19) Document Reference.	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	Document Reference Ongoing monitoring, where appropriate, of the established AEZs and the marine archaeology receptors within them to continue to assess their condition and the appropriateness and effectiveness of the AEZs.
Direct damage to marine archaeology receptors (e.g. wrecks, debris, submerged prehistoric receptors (palaeolandscapes and associated archaeological receptors)	✓	✓	✓	Development of, and adherence to, an offshore WSI and PAD, which includes the implementation of and adherence to AEZs around those sites identified as having high and medium archaeological potential (Table 8.18 and Table 8.19), as presented in the Offshore Historic Environment Plan (Document Reference B.7).	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	Ongoing monitoring, where appropriate, of the established AEZs and the marine archaeology receptors within them to continue to assess their condition and the appropriateness and effectiveness of the AEZs. Document Reference
Direct damage to deeply buried marine archaeology receptors – submerged prehistoric receptors (e.g. Palaeolandscapes and associated archaeological receptors)	✓	✗	✗	Development of, and adherence to, an offshore WSI and PAD, which includes for archaeological input into the planning of any future geotechnical surveys (where relevant) and geoarchaeological assessment of geotechnical data in order to persevere any prehistoric	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	Ongoing monitoring, where appropriate, of the established AEZs and the marine archaeology receptors within them to continue to assess their condition and the appropriateness and effectiveness of the

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Description of impact	Phase ^a			Measures adopted as part of the project	Magnitude of impact	Sensitivity of the receptor	Significance of effect	Further mitigation	Residual effect	Proposed monitoring
	C	O	D							
				deposits through recording and the protocol for the reporting and protection of any archaeological material that may be discovered during the course of Morgan Generation Assets (Table 8.18 and Table 8.19), as presented in the Offshore Historic Environment Plan (Document Reference B.7).Document Reference						AEZs.Document Reference
Alteration of sediment transport regimes	×	✓	×	Development of, and adherence to, an Offshore WSI and PAD, which includes the protocol for the reporting and protection of any archaeological material that may be discovered during the course of Morgan Generation Assets (Table 8.18 and Table 8.19).Document Reference	O: Negligible	O: High	O: Minor adverse	N/A	N/A	Ongoing monitoring, where appropriate, of the established AEZs and the marine archaeology receptors within them to continue to assess their condition and the appropriateness and effectiveness of the AEZs.Document Reference
Effects on HSC	✓	✓	✓	It is predicted that the HSC will be able to accommodate the change of the introduction of Morgan Generation Assets infrastructure. Assessed in section 8.8.6.						
Potential for visual change within the setting of an asset	✓	✓	✓	Assessed within Volume 4, Annex 8.2: Cultural heritage technical report of the Environmental Statement. The settings assessment found that effects during the construction, operations and maintenance, and decommissioning of the structures within the Morgan Array Area would be of minor adverse or negligible adverse significance for all designated historic assets within the settings study area, which is not significant in EIA terms. No mitigation or monitoring is proposed.						

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Table 8.27: Summary of potential cumulative environmental effects, mitigation and monitoring.

^a C=construction, O=operation and maintenance, D=decommissioning

Description of effect	Phase ^a			Measures adopted as part of the project	Magnitude of impact	Sensitivity of the receptor	Significance of effect	Further mitigation	Residual effect	Proposed monitoring
	C	O	D							
Scenario 1										
Sediment disturbance and deposition leading to indirect impacts on marine archaeology receptors	✓	✓	✓	Development of, and adherence to, an Offshore WSI and PAD, which includes the protocol for the reporting and protection of any archaeological material that may be discovered during the course of Morgan Generation Assets (Table 8.18 and Table 8.19).Document Reference	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	Ongoing monitoring, where appropriate, of the established AEZs and the marine archaeology receptors within them to continue to assess their condition and the appropriateness and effectiveness of the AEZs.Document Reference
Direct damage to marine archaeology receptors (e.g. wrecks, debris, submerged prehistoric receptors (palaeolandscapes and associated archaeological receptors))	✓	✓	✓	Development of, and adherence to, an offshore WSI and PAD, which includes the implementation of and adherence to AEZs around those sites identified as having high and medium archaeological potential (Table 8.18 and Table 8.19), as presented in the Offshore Historic Environment Plan	C: Low O: Low D: Low	C: High O: High D: High	C: Minor adverse O: Minor adverse D: Minor adverse			Ongoing monitoring, where appropriate, of the established AEZs and the marine archaeology receptor within them to continue to assess their condition and the appropriateness and effectiveness of the AEZs.Document Reference

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Description of effect	Phase ^a			Measures adopted as part of the project	Magnitude of impact	Sensitivity of the receptor	Significance of effect	Further mitigation	Residual effect	Proposed monitoring
	C	O	D							
				(Document Reference B.7).Document Reference						
Alteration of sediment transport regimes	*	✓	*	Development of, and adherence to, an Offshore WSI and PAD, which includes the protocol for the reporting and protection of any archaeological material that may be discovered during the course of Morgan Generation Assets (Table 8.18 and Table 8.19).Document Reference	O: Negligible	O: High	O: minor adverse	N/A	N/A	Ongoing monitoring, where appropriate, of the established AEZs and the marine archaeology receptor within them to continue to assess their condition and the appropriateness and effectiveness of the AEZs.Document Reference
Scenario 2										
Sediment disturbance and deposition leading to indirect impacts on marine archaeology receptors	✓	✓	✓	Development of, and adherence to, an Offshore WSI and PAD, which includes the protocol for the reporting and protection of any archaeological material that may be discovered during the course of Morgan Generation Assets (Table 8.18 and Table 8.19).	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	Ongoing monitoring, where appropriate, of the established Ongoing monitoring, where appropriate, of the established AEZs and the marine archaeology receptors within them to continue to assess their condition and the appropriateness and effectiveness of the AEZs.

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Description of effect	Phase ^a			Measures adopted as part of the project	Magnitude of impact	Sensitivity of the receptor	Significance of effect	Further mitigation	Residual effect	Proposed monitoring	
	C	O	D								
Direct damage to marine archaeology receptors (e.g. wrecks, debris, submerged prehistoric receptors (palaeolandscapes and associated archaeological receptors))	✓	✓	✓	Development of, and adherence to, an offshore WSI and PAD, which includes the implementation of and adherence to AEZs around those sites identified as having high and medium archaeological potential (Table 8.18 and Table 8.19), as presented in the Offshore Historic Environment Plan (Document Reference B.7).	C: Low O: Low D: Low	C: High O: High D: High	C: Minor adverse O: Minor adverse D: Minor adverse			Ongoing monitoring, where appropriate, of the established AEZs and the marine archaeology receptors within them to continue to assess their condition and the appropriateness and effectiveness of the AEZs.	
Sediment disturbance and deposition leading to indirect impacts on marine archaeology receptors	✓	✓	✓	Development of, and adherence to, an Offshore WSI and PAD, which includes the protocol for the reporting and protection of any archaeological material that may be discovered during the course of Morgan Generation Assets (Table 8.18 and Table 8.19).	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	Ongoing monitoring, where appropriate, of the established AEZs and the marine archaeology receptors within them to continue to assess their condition and the appropriateness and effectiveness of the AEZs.	
Potential for visual change within the setting of an asset	✓	✓	✓	Assessed within Volume 4, Annex 8.2: Cultural heritage technical report of the Environmental Statement. <u>Construction and Decommissioning phases:</u>							

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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
			<p>It is concluded that the cumulative effects at construction and decommissioning phases would be negligible adverse, which is not significant in EIA terms.</p> <p>No mitigation or monitoring is proposed as there are no reasonably practicable measures which would avoid or reduce these cumulative effects.</p> <p><u>Operations and maintenance phase:</u></p> <p>Where a moderate adverse significance of effect has been identified for four designated assets on the Isle of Man, the greater contribution to the magnitude of impact is from the proposed Mooir Vannin Wind Farm, as this is closer to the historic assets and thus the turbines will appear larger than the Morgan turbines. However, both the Mooir Vannin Wind Farm and the Morgan Array Area would widen the visible extent of offshore wind farms into areas where there are no existing or consented developments of this nature.</p> <p>With regard to all other designated heritage assets considered within the CEA for all three scenarios assessed, any potential cumulative effects would be of minor adverse or negligible adverse significance, which is not significant in EIA terms.</p> <p>No mitigation or monitoring is proposed as there are no reasonably practicable measures which would avoid or reduce these cumulative effects.</p>					

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