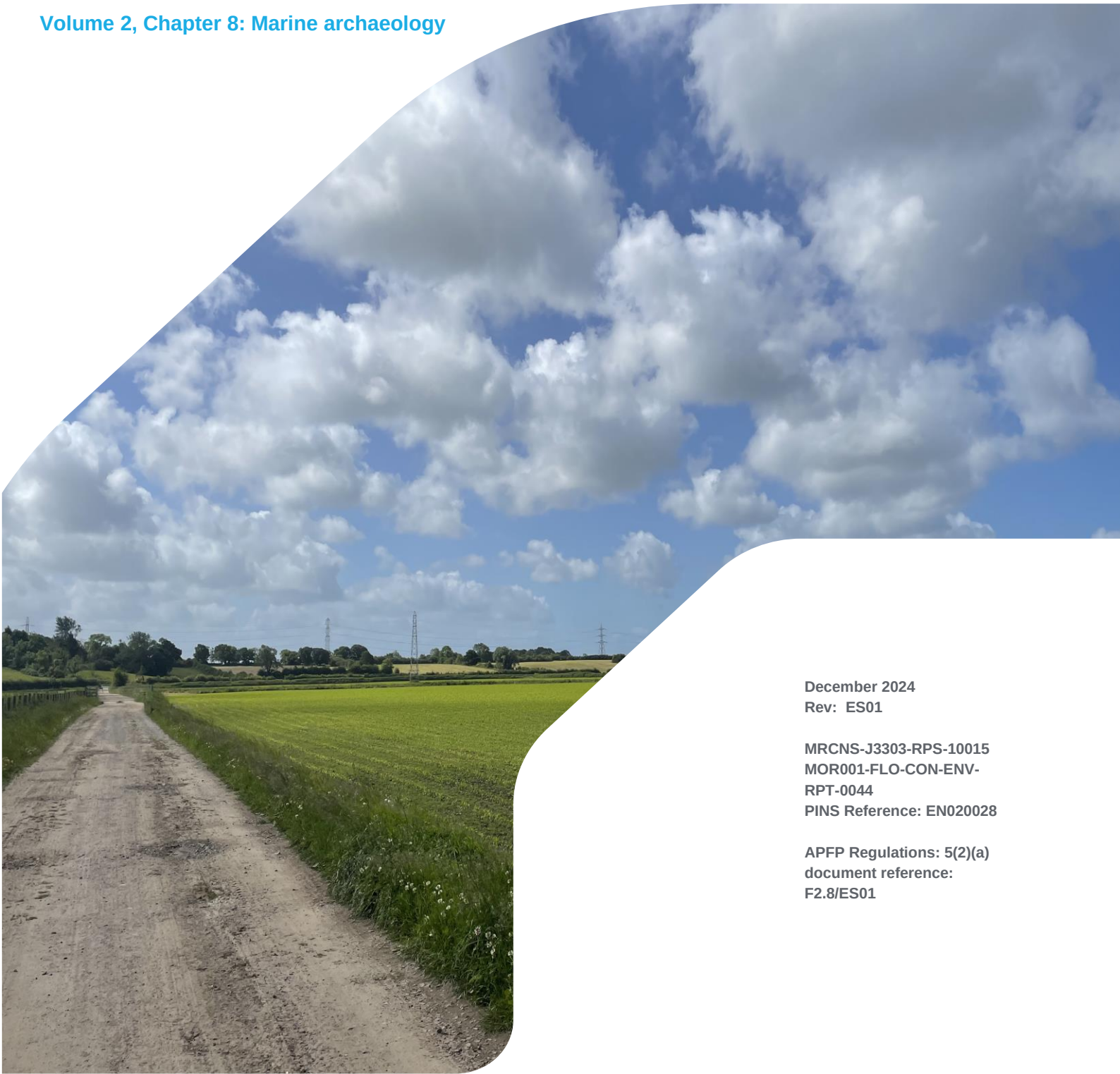
MORGAN AND MORECAMBE OFFSHORE WIND FARMS: TRANSMISSION ASSETS

Environmental Statement

Volume 2, Chapter 8: Marine archaeology



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Contents

Tables

Annexes (See Volume 2, Annexes)

Annex number	Annex title
Annex 8.1:	Marine Archaeology Technical Report.

Figures (See Volume 2, Chapter Figures)

Figure number	Figure title
8.1	Transmission Assets marine archaeology study area
8.2	Transmission Assets survey area
8.3	WCPS reconstruction of the Transmission Assets marine archaeology study area
8.4	Known and recorded wrecks within the marine archaeology study area
8.5	Geophysical anomalies within the offshore order limits and marine archaeology study area
8.6	Proposed AEZs and TAEZs within the Transmission Assets marine archaeology study area

Glossary

Term	Meaning
Applicants	Morgan Offshore Wind Limited (Morgan OWL) and Morecambe Offshore Windfarm Ltd (Morecambe OWL).
Archaeological Exclusion Zone	An area surrounding any features or geophysical anomalies of known or potential archaeological interest within which no activity may occur.
Commitment	This term is used interchangeably with mitigation and enhancement measures. The purpose of commitments is to avoid, prevent, reduce or, if possible, offset significant adverse environmental effects. Primary and tertiary commitments are taken into account and embedded within the assessment set out in the ES.
Development Consent Order	An order made under the Planning Act 2008, as amended, granting development consent.
EIA Scoping Report	A report setting out the proposed scope of the Environmental Impact Assessment process. The Transmission Assets Scoping Report was submitted to The Planning Inspectorate (on behalf of the Secretary of State) for the Morgan and Morecambe Offshore Windfarms Transmission Assets in October 2022.
Environmental Impact Assessment	The process of identifying and assessing the significant effects likely to arise from a project. This requires consideration of the likely changes to the environment, where these arise as a consequence of a project, through comparison with the existing and projected future baseline conditions.
Environmental Statement	The document presenting the results of the Environmental Impact Assessment process.
Generation Assets	The generation assets associated with the Morgan Offshore Wind Project and the Morecambe Offshore Windfarm include the offshore wind turbines, inter-array cables, offshore substation platforms and platform link (interconnector) cables to connect offshore substations.
Interconnector cables	Cables to connect the Offshore Substation Platforms to each other.
Intertidal area	The area between Mean High Water Springs and Mean Low Water Springs.
Intertidal infrastructure area	The area within which the intertidal components of the Transmission Assets will be located (i.e. between Mean Low Water Springs (MWLS) and Mean High Water Springs (MHWS)), including areas required on a temporary basis during construction and/or decommissioning.
Landfall	The area in which the offshore export cables make landfall (come on shore) and the transitional area between the offshore cabling and the onshore cabling. This term applies to the entire landfall area at Lytham St. Annes between Mean Low Water Springs and the transition joint bay inclusive of all construction works, including the offshore and onshore cable routes, intertidal working area and landfall compound(s).
Marine licence	The Marine and Coastal Access Act 2009 requires a marine licence to be obtained for licensable marine activities. Section 149A of the Planning Act 2008 allows an applicant for to apply for 'deemed marine licences' in English waters as part of the development consent process.
Maximum design scenario	The realistic worst case scenario, selected on a topic-specific and impact specific basis, from a range of potential parameters for the Transmission Assets.
Morecambe Offshore Windfarm: Generation Assets	The offshore generation assets and associated activities for the Morecambe Offshore Windfarm.

Term	Meaning
Morecambe Offshore Windfarm: Transmission Assets	The offshore export cables, landfall and onshore infrastructure required to connect the Morecambe Offshore Windfarm to the National Grid.
Morecambe OWL	Morecambe Offshore Windfarm Limited is a joint venture between Zero-E Offshore Wind S.L.U. (Spain) (a Cobra group company) and Flotation Energy Ltd.
Morgan and Morecambe Offshore Wind Farms: Transmission Assets	The offshore and onshore infrastructure connecting the Morgan Offshore Wind Project and the Morecambe Offshore Windfarm to the national grid. This includes the offshore export cables, landfall site, onshore export cables, onshore substations, 400 kV grid connection cables and associated grid connection infrastructure such as circuit breaker compounds. Also referred to in this report as the Transmission Assets, for ease of reading.
Morgan Offshore Wind Project: Generation Assets	The offshore generation assets and associated activities for the Morgan Offshore Wind Project.
Morgan Offshore Wind Project: Transmission Assets	The offshore export cables, landfall and onshore infrastructure required to connect the Morgan Offshore Wind Project to the National Grid.
Morgan OWL	Morgan Offshore Wind Limited is a joint venture between bp Alternative Energy investments Ltd. and Energie Baden-Württemberg AG (EnBW).
National Policy Statement(s)	The current national policy statements published by the Department for Energy Security and Net Zero in 2023.
Offshore export cables	The cables which would bring electricity from the Generation Assets to the landfall.
Offshore order limits	See Transmission Assets Order Limits: Offshore (below).
Offshore substation platform(s)	A fixed structure located within the wind farm sites, containing electrical equipment to aggregate the power from the wind turbine generators and convert it into a more suitable form for export to shore.
Substation	Part of an electrical transmission and distribution system. Substations transform voltage from high to low, or the reverse by means of electrical transformers.
Temporary Archaeological Exclusion Zone	An Archaeological Exclusion Zone (see above) introduced at any stage of the Transmission Assets to protect discoveries of potential archaeological interest until further investigation can ascertain the character of the discovery. This can be converted to an AEZ or the TAEZ may be removed.
Transmission Assets	See Morgan and Morecambe Offshore Wind Farms: Transmission Assets (above).
Transmission Assets Order Limits	The area within which all components of the Transmission Assets will be located, including areas required on a temporary basis during construction and/or decommissioning.
Transmission Assets Order Limits: Offshore	The area within which all components of the Transmission Assets seaward of Mean Low Water Springs will be located, including areas required on a temporary basis during construction and/or decommissioning. Also referred to in this report as the Offshore Order Limits, for ease of reading.
Transmission Assets Scoping Boundary	The term used to define the boundary used at the time the Scoping Report was submitted.

Acronyms

Acronym	Meaning
AD	Anno domini
ADS	Archaeology Data Service
AEZ	Archaeological Exclusion Zone
AHEF	Archaeology and Heritage Engagement Forum
BC	Before Christ
BEIS	The former Department for Business, Energy & Industrial Strategy
BP	Before Present
BULSI	Build, use, loss, survival and investigation
CEA	Cumulative Effects Assessment
CSIP	Cable Specification and Installation Plan
DCO	Development Consent Order
EIA	Environmental Impact Assessment
ES	Environmental Statement
HE	Historic England
HSC	Historic Seascape Character
MBES	Multibeam Echo Sounder
MDS	Maximum Design Scenario
MLWS	Mean Low Water Spring
MMO	Marine Management Organisation
MPS	Marine Policy Statement
NPS	National Policy Statement
NRHE	National Record of the Historic Environment
OSP	Offshore Substation Platform
PAD	Protocol of Archaeological Discoveries
PEIR	Preliminary Environmental Information Report
ROV	Remote Operated Vehicle
SBP	Sub-bottom Profiler
SSC	Suspended Sediment Concentration
SSS	Sidescan Sonar
TAEZ	Temporary Archaeological Exclusion Zone
UK	United Kingdom
UKHO	United Kingdom Hydrographic Office

Acronym	Meaning
WCPS	West Coast Palaeolandscape Study
WSI	Written Scheme of Investigation

Units

Unit	Description
%	Percentage
km	Kilometre
km^2	Square kilometres
km^3	Kilometres cubed
m	Metre
m^2	Metre squared
m^3	Metre cubed
nm	Nautical mile
nT	Nanotesla

8 Marine archaeology

8.1 Introduction

8.1.1.1 This chapter of the Environmental Statement (ES) presents the findings of the Environmental Impact Assessment (EIA) work undertaken to date for the Morgan and Morecambe Offshore Wind Farms: Transmission Assets. For ease of reference the Morgan and Morecambe Offshore Wind Farms Transmission Assets are referred to in this chapter as the 'Transmission Assets'. This ES accompanies the application to the Planning Inspectorate for development consent for the Transmission Assets.

8.1.1.2 The purpose of the Transmission Assets is to connect the Morgan Offshore Wind Project: Generation Assets and Morecambe Offshore Windfarm: Generation Assets (referred to collectively as the 'Generation Assets') to the National Grid. A description of the Transmission Assets can be found in Volume 1, Chapter 3: Project description of the ES.

8.1.1.3 This chapter considers the likely impacts and effects of the Transmission Assets on marine archaeology during the construction, operation and maintenance, and decommissioning phases. Specifically, it relates to the offshore elements of the Transmission Assets seaward of Mean Low Water Springs (MLWS). Those elements of the Transmission Assets located landward of MLWS are addressed in Volume 3, Chapter 5: Historic Environment of the ES.

8.1.1.4 This ES chapter:

- identifies the key legislation, policy and guidance relevant to marine archaeology;
- details the EIA scoping and consultation process undertaken to date for marine archaeology;
- confirms the study area for the assessment, the methodology used to identify baseline environmental conditions and sets out the existing and future environmental baseline conditions, established from desk studies, surveys and consultation;
- identifies the scope of the assessment;
- details the mitigation and/or monitoring measures that are proposed to prevent, minimise, reduce or offset the possible environmental effects identified in the EIA process;
- defines the project design parameters used to inform for the impact assessment;
- identifies the impact assessment methodology and presents an assessment of the likely impacts and effects in relation to the construction, operation and maintenance and decommissioning phases of the Transmission Assets on marine archaeology; and
- identifies any cumulative, transboundary and/or inter-related effects in relation to the construction, operation and maintenance and

decommissioning phases of the Transmission Assets on marine archaeology.

8.1.1.5 The assessment presented is informed by the following technical documents and should be read in conjunction with:

- Volume 2, Annex 8.1: Marine Archaeology Technical Report; and
- Volume 2, Chapter 1: Physical Processes of the ES.

8.1.1.6 Additionally, an outline offshore written scheme of investigation (WSI) is submitted in support of this chapter (document reference: J17, as per CoT63).

8.2 Legislation, policy and guidance

8.2.1 Legislation

8.2.1.1 Legislation that is applicable to the marine archaeology within the context of offshore wind in England is set out in Volume 2, Annex 8.1: Marine Archaeology Technical Report of the ES.

8.2.2 Planning policy context

8.2.2.1 The Transmission Assets will be located in English offshore waters (beyond 12 nautical miles (nm) from the English coast) and English inshore waters (within 12 nm of the English coast), with the onshore infrastructure located wholly within England. As set out in Volume 1, Chapter 1: Introduction of this ES, the Secretary of State for the Department for Business, Energy and Industrial Strategy (BEIS) (the department which preceded the Department for Energy Security and Net Zero) has directed that the Transmission Assets are to be treated as development for which development consent is required under the Planning Act 2008, as amended.

National Policy Statements

8.2.2.2 There are currently six energy National Policy Statements (NPSs), three of which contain policy relevant to offshore wind development and the Transmission Assets, specifically:

- overarching NPS for Energy (NPS EN-1) which sets out the United Kingdom (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); and
- NPS for Electricity Networks Infrastructure (NPS EN-5) (Department for Energy Security & Net Zero 2023c).

8.2.2.3 Although NPS: EN-1, EN-3, and EN-5 all contain policy relevant to offshore wind development, only NPS EN-1 and NPS EN-3 include guidance on what matters are to be considered in the marine archaeology assessment, thus NPS EN-5 is not considered further within this chapter. Provisions relevant to marine archaeology are presented in **Table 8.1** and **Table 8.2**.

8.2.2.4 The policies within the current NPSs relevant to all topics in the ES can be viewed in the National Policy Statement tracker (document reference: J26) and Planning Statement (document reference: J28), submitted with the Application.

Table 8.1: Summary of the NPS EN-1 provisions relevant to marine archaeology

Summary of NPS provision	How and where considered in the ES
As a minimum, the applicant should have consulted the relevant Historic Environment Record (or, where the development is in English or Welsh waters, Historic England or Cadw) and assessed the heritage assets themselves using expertise where necessary according to the proposed development's impact [EN-1 Paragraph 5.9.10] (Department for Energy Security and Net Zero, 2023a)	A marine archaeology desktop assessment and technical report has been produced which informs the archaeological assessment (volume 2, appendix 8.1). The archaeological review of geophysical data is included in **section 8.6.4** and in volume 2, appendix 8.1.
Where a site on which development is proposed includes, or the available evidence suggests it has the potential to include, heritage assets with an archaeological interest, the applicant should carry out appropriate desk-based assessment and, where such desk-based research is insufficient to properly assess the interest, a field evaluation [EN-1 Paragraph 5.9.11] (Department for Energy Security and Net Zero, 2023a)	A marine archaeology desktop assessment and technical report has been produced which informs the archaeological assessment (volume 2, appendix 8.1). The archaeological review of geophysical data is included in **section 8.6.4** and in volume 2, appendix 8.1. The outline offshore WSI for archaeology (document reference: J17, as per CoT63) presents the archaeological input required prior to any site-specific work post-consent.
The applicant should ensure that the extent of the impact of the proposed development on the significance of any heritage assets can be adequately understood from the application and supporting documents. Studies will be required on those heritage assets affected by noise, vibration, light and indirect impacts, the extent and detail of these studies will be proportionate to the significance of the heritage asset affected [EN-1 Paragraph 5.9.12] (Department for Energy Security and Net Zero, 2023a)	The impacts that have been identified which may give rise to likely significant effects on marine archaeology receptors, including magnitude, extent, and duration are presented in **section 8.10.5.4**.
The applicant is encouraged, where opportunities exist, to prepare proposals which can make a positive contribution to the historic environment, and to consider how their scheme takes account of the significance of heritage assets affected. In particular, this includes the consideration of how impacts can affect heritage assets and whether there may be opportunities to enhance access to or understanding the heritage assets affected by the scheme. [EN-1 Paragraph 5.9.13] (Department for Energy Security and Net Zero, 2023a)	Objectives of archaeological research, based on research frameworks are written into the outline offshore WSI for archaeology (document reference: J17, as per CoT63). The objectives of the frameworks and the reporting on archaeological assessment of site-specific work within the Array will be reported to Historic England (HE) and the Online Access to the Index of Investigations (OASIS) and the Archaeology Data Service (ADS).

Table 8.2: Summary of the NPS EN-3 provisions relevant to marine archaeology

Summary of NPS provision	How and where considered in the ES
Micrositing/microrouting provides developers with flexibility to accommodate any unforeseen events, such as the discovery of previously unknown marine archaeology that it would be preferable to leave in situ. To inform micrositing / microrouting applicants should undertake high-resolution survey work and make provision for investigative work, such as archaeological examination, to assess the impacts of any proposed cables or foundation placement on potential heritage assets. [EN-3 Paragraph 2.8.76-77] (Department for Energy Security and Net Zero, 2023b)	The archaeological review of geophysical data is included in **section 8.6.4** and in volume 2, appendix 8.1. The outline offshore WSI for archaeology (document reference: J17, as per CoT63) provides provision for investigative work post-consent, and the assessment of impacts of any infrastructure is presented in **section 8.10.5.4**.
Applicants should submit an outline archaeological Written Scheme of Investigation (WSI) as part of the DCO submission, with a commitment to complete a project specific WSI post-consent in consultation with Historic England. [EN-3 Paragraph 2.8.78] (Department for Energy Security and Net Zero, 2023b)	The outline offshore WSI for archaeology (document reference: J17, as per CoT63) presents the archaeological input required prior to any site-specific work post-consent.
Applicants should consult at an early stage of pre-application with relevant statutory consultees and energy not-for profit organisations/non-governmental organisations as appropriate, on the assessment methodologies, baseline data collection, and potential avoidance, mitigation and compensation options which should be undertaken. [EN-3 Paragraph 2.8.104] (Department for Energy Security and Net Zero, 2023b)	Consultation with relevant statutory stakeholders has been carried out from the early stages of the array design process (**section 8.3** and **Table 8.5**).
Assessment may also include the identification of any beneficial effects on the marine historic environment, for example through improved access or the contribution to new knowledge that arises from investigation. [EN-3 Paragraph 2.8.176] (Department for Energy Security and Net Zero, 2023b).	The overarching EIA methodology is presented in volume 1, chapter 5. The methodology for determining whether an effect may be adverse or beneficial is summarised in **Table 8.19**. This methodology has been applied in the assessment of significant effects (**section 8.10.5.4**).

Summary of NPS provision	How and where considered in the ES
The avoidance of important heritage assets to ensure their protection in situ, is the most effective form of protection. This can be achieved through the implementation of exclusion zones around known and potential heritage assets which preclude development activities within their boundaries. [Paragraph 2.8.252 – 253] (Department for Energy Security and Net Zero, 2023b).	Mitigation measures to be adopted as part of the Array include the provision of Archaeological Exclusion Zones (AEZs) around all anomalies from the site-specific geophysical survey data identified as having medium and high archaeological potential, these are presented in **section 8.6.4**. Temporary Archaeological Exclusion Zones (TAEZs) may be applied if appropriately significant previously unknown archaeological assets are discovered. These TAEZs will then be reviewed and implemented as AEZs or removed.

Marine policy

UK Marine Policy Statement

8.2.2.5 In addition to NPS EN-1 and NPS EN-3, planning policy relevant to marine archaeology within the Transmission Assets is contained within a national Marine Policy Statement (MPS) (HM Government, 2011).

8.2.2.6 Further advice in relation specifically to the Transmission Assets has been sought through consultation with the statutory authorities and from the Planning Inspectorate's Scoping Opinion (**section 8.3** and **Table 8.5**) and the Preliminary Environmental Impact Report (PEIR) (Morgan Offshore Wind Ltd, 2023a).

8.2.2.7 **Table 8.3** sets out a summary of the policies within the UK Marine Policy Statement, relevant to marine archaeology.

Table 8.3: Summary of the MPS

Policy	Key provisions
Heritage assets in the marine environment should be conserved through marine planning in a manner appropriate and proportionate to their significance and opportunities should be taken to contribute to our knowledge and understanding of our past by capturing evidence from the historic environment and making this publicly available, particularly if a heritage asset is to be lost (paragraph 2.6.6.3 of MPS)	The assessment of effects (**section 8.10.5.1)** has considered the significance of all known and potential heritage assets within the Transmission Assets marine archaeology study area. The measures adopted as part of Transmission Assets (**section 8.8)** include the preservation in situ of all known heritage assets identified as medium and high archaeological potential through the implementation of AEZs (as per CoT63). The measures adopted also include archaeological input to any future geophysical and geotechnical surveys undertaken that may 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.

Policy	Key provisions
Many heritage assets with archaeological interest in these areas are not currently designated as scheduled monuments or protected wreck sites but are demonstrably of equivalent significance. The absence of designation…does not necessarily indicate lower significance and the marine plan authority should consider them [non designated heritage assets] subject to the same policy principles as designated heritage assets…based on information and advice from the relevant regulator and advisors (paragraph 2.6.6.5, of MPS)	The assessment of effects (**section 8.10.5.1**) has considered the significance of all known and potential heritage assets within the Transmission Assets marine archaeology study area. The measures adopted as part of Transmission Assets (**section 8.8**) include the preservation in situ of all known heritage assets identified as medium and high archaeological potential through the implementation of AEZs regardless of designation (CoT63). This approach has been adopted through discussion with HE and other stakeholders through the Archaeology and Heritage Engagement Forum (AHEF) and is set out in **section 8.10.5.**
The marine plan authority should identify and require suitable mitigating actions to record and advance understanding of the significance of the heritage asset before it is lost (paragraph 2.6.6.9 of MPS)	The measures adopted as part of Transmission Assets (**section 8.10.5.1**) includes geophysical survey of any low potential anomalies in order to record and advance understanding of the significance of the heritage asset before it is lost should avoidance not be possible. Avoidance remains the preferred method of mitigation to protect all potential heritage assets. Further details of the mitigation of low potential anomalies is presented in the accompanying outline offshore WSI for archaeology (document reference: J17, as per CoT63).

North West Inshore and North West Offshore Coast Marine Plans 2021

8.2.2.8 **Table 8.4** sets out a summary of the specific policies set out in the North West Inshore and North West Offshore Marine Plan (MMO, 2021) relevant to this chapter. A National Policy Statement Tracker (document reference: J26) and Planning Statement (document reference: J28) has been submitted alongside the application which collates compliance with relevant marine plans.

Table 8.4: Summary of inshore and offshore marine plan policies relevant to this chapter

Policy	Key provisions	How and where considered in the ES
NW-HER-1	'*This policy aims to conserve and enhance marine and coastal heritage assets by considering the potential for harm to their significance. This consideration will not be limited to designated assets and extends to those non-designated assets that are, or have the potential to become, significant. The policy will ensure that assets are considered in the decision-making process and will make*	The potential for harm to the significance of marine heritage assets by the Transmission Assets has been assessed in **section 8.10.5.1**, which includes the assessment of non-designated marine heritage assets identified within the Transmission Assets marine archaeology study area. Measures have been adopted as part of the Transmission Assets (**section 8.8**) to protect the known archaeology and make provisions for any archaeological material that may be discovered, as a result of the activities of the

Policy	Key provisions	How and where considered in the ES
	provisions for those assets that are discovered during developments'.	Transmission Assets, through the development of a PAD (see document reference: J17, CoT63) and implement these documents post-consent.

8.2.3 Relevant guidance

8.2.3.1 This chapter 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, 2014).
- Standard and Guidance for Historic Environment Desk Based Assessment (Chartered Institute for Archaeologists, 2014 (updated 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 (Wessex Archaeology for The Crown Estate, 2021).
- Principles of Cultural Heritage Impact Assessment in the UK (IEMA, IHBC and CIfA, 2021).
- Environmental Archaeology, A Guide to the Theory and Practice of Methods, from Sampling and Recovery to Post-excavation (second edition) (Historic England, 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).

8.3 Consultation

8.3.1 Scoping

8.3.1.1 On 28 October 2022, the Applicants submitted a Scoping Report to the Planning Inspectorate, which described the scope and methodology for the technical studies being undertaken to provide an assessment of any likely significant effects for the construction, operation and maintenance and decommissioning phases of the Transmission Assets.

8.3.1.2 Following consultation with the appropriate statutory bodies, the Planning Inspectorate (on behalf of the Secretary of State) provided a Scoping Opinion on 8 December 2022, as presented in **Table 8.5**.

8.3.2 Evidence plan process

8.3.2.1 Following scoping, consultation and engagement with interested parties specific to marine archaeology has continued. An Evidence Plan Process (EPP) has been developed for the Transmission Assets, seeking to ensure engagement with the relevant aspects of the EIA process throughout the pre-application phase. The development and monitoring of the Evidence Plan and its subsequent progress has been undertaken by the EPP Steering Group. The Steering Group comprises the Planning Inspectorate, the Applicants, the Marine Management Organisation, Natural England, Historic England, the Environment Agency and the Local Planning Authorities as the key regulatory and bodies.

8.3.2.2 As part of the EPP, Expert Working Groups (EWGs) were set up to discuss and agree topic specific queries with the relevant stakeholders.

8.3.2.3 The EWG for heritage consultation established an Archaeology Heritage Engagement Forum (AHEF) and consists of two forums, one for offshore and one for onshore heritage matters. The key stakeholders for the offshore AHEF are the Marine Management Organisation (MMO) and Historic England Meetings have been held at strategic intervals throughout the pre-application phase and a record of key points raised through the Offshore AHEF is presented in **Table 8.5**.

8.3.3 Statutory consultation responses

8.3.3.1 The preliminary findings of the EIA process were published in the PEIR in October 2023. The PEIR was prepared to provide the basis for formal consultation under the Planning Act 2008. This included consultation with statutory and non-statutory bodies under section 42 and 47 of the Planning Act 2008 as presented in **Table 8.5**.

8.3.4 Summary of consultation responses received

8.3.4.1 A summary of the key items raised specific to marine archaeology is presented in **Table 8.5**, together with how these have been considered in the production of this chapter. It should however be noted that formal responses

are provided for **all** consultation responses received and can be accessed in the Consultation Report (document reference: E1).

Table 8.5: Summary of key consultation comments raised during consultation activities undertaken for the Transmission Assets relevant to marine archaeology

Date	Consultee and type of response	Comment raised	Response to comment raised and/or where considered in this chapter
8 December 2022	The Planning Inspectorate – Scoping Opinion	Based on the information provided within the Scoping Report indicating that construction and decommissioning works are short term in duration, and the ES will consider sediment disturbance and deposition during these phases, the Inspectorate is in agreement that an assessment of the effects on archaeological deposits from the alteration of sediment transport regimes can be scoped out for construction and decommissioning phases only.	An assessment of the potential effects on archaeological receptors from the alteration of sediment transport regimes has been scoped out for construction and decommissioning phases only. The assessment for the operations and maintenance phase is presented in **section 8.11.3.13**.
8 December 2022	The Planning Inspectorate – Scoping Opinion	The Scoping Report describes the study area but does not explain why the area chosen (2 km buffer zone) is sufficient to reflect the likely zone of influence of the Proposed Development, other than to say “in line with best practice”. Some of the potential impacts to be assessed result from changes to marine physical processes, however the study area to be used for the marine archaeological assessment is different to that proposed for the assessment of physical processes.	The results of Physical Processes modelling as presented in Volume 2, chapter 1: Physical Processes of the ES has shown that the zone of influence for indirect impacts will be localised, additionally there is no pathway for direct impact beyond the extents of the Offshore Order Limits and therefore a 2 km study area is appropriate for establishing the presence of archaeological material that may be impacted by Transmission Assets (see **section 8.4**).
8 December 2022	The Planning Inspectorate – Scoping Opinion	The MMO highlights that the project is proposed to take place within the North West Inshore Marine Plan area. The MMO suggests that for the final ES, a table is produced to highlight all policies within this plan area and whether these have been screened in or out, including justification.	Policies relevant to marine archaeology within the North West Inshore Marine Plan and where they have been considered in this chapter are presented in **section 8.2.2** and **Table 8.4**.
8 December 2022	Historic England – Scoping Opinion	We note that a “technical report” and draft WSI, produced in reference to guidance published by The Crown Estate are to be prepared and it is important that such information is produced in time to inform an PEIR and any eventual ES submission. We note that	A WSI for the site-specific geophysical surveys has been submitted to and approved by Historic England. A further outline offshore WSI for archaeology (document reference: J17, as per CoT63) has been produced in support of this

Date	Consultee and type of response	Comment raised	Response to comment raised and/or where considered in this chapter
		the focus for attention is on archaeological analysis of geophysical data. It is important that such data is acquired at sufficient resolution to adequately characterise the historic environment, as could be encountered within the Transmission Assets Scoping Boundary. It is also relevant that to support preparation of any PEIR that detail is provided about the geotechnical survey campaign, as will be necessary to inform the design of this proposed project. Any draft WSI should therefore include a full set of methodological approaches for survey data capture and analysis.	chapter and the developed of which has been informed by consultation with Historic England through the AHEF. All geophysical data was 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) and is further detailed in Volume 2, Annex 8.1: Marine Archaeology Technical Report of the ES.
5 June 2023	Historic England – AHEF meeting 1	The methodology for the marine archaeology assessment was presented at the first AHEF on 5 June 2023. Historic England have offered comment that no agreement can be reached regarding the assessment of significant effects prior to receipt of the reports through the PEIR.	AHEF Road Map Consultation Log item 1: This was noted and a Marine Archaeology Chapter of the PEIR along with Annex 8.1: Marine Archaeology Technical Report was submitted at PEIR.
5 June 2023	Historic England – AHEF meeting 1	Historic England have advised of forthcoming advice regarding nationally significant designated heritage assets that will be produced by Historic England colleagues in their North West Region Office.	This forthcoming guidance is noted and will be consulted if available in time for application.
23 November 2023	Historic England – S42 Response	Section 3.7.2 (Pre-construction surveys) – the text explains that "…pre-construction site investigation surveys will be undertaken to provide detailed information on seabed conditions and morphology and to identify the presence/absence of any potential obstructions or hazards and to verify the seabed geology layers." Although the text does not explicitly include archaeology, we must add that it will be essential for this project to ensure that any pre-construction survey campaigns (such as outlined in Table 3.4) are designed to optimise archaeological analysis and interpretation. This point is made in	Measures adopted as part of the Transmission Assets (**section 8.8**) include the requirement for archaeological advice and input into pre-construction survey. Further information is provided in the outline offshore WSI for archaeology (document reference: J17, as per CoT63).

Date	Consultee and type of response	Comment raised	Response to comment raised and/or where considered in this chapter
		reference to the risk of this project encountering presently unknown elements of the historic environment.	
23 November 2023	Historic England - S42 Response	Section 8.1 (Overview) we note that this chapter relates to the offshore elements of the Transmission Assets seaward of Mean Low Water Springs (MLWS). It is therefore important that the ES explains clearly how any foreshore area will be included within either the marine and/or terrestrial WSIs. We concur with the matters identified in Table 8.6 (potential effects scoped into the assessment).	Agreement of effects scoped in noted. Two Outline WSIs and PADs have been produced for application and in support of both the Onshore Heritage Chapter and the Marine Archaeology Chapter. The Outline Offshore WSI for Archaeology (document reference: J17, as per CoT63) will cover the Offshore Order Limits seaward of MLWS whilst the Outline Onshore and Intertidal WSI (document reference: J9) will cover the Onshore Order Limits landward of MLWS
23 November 2023	Historic England - S42 Response	Regarding historic maritime activity we appreciate the attention given to the potential for encountering archaeological sites from different periods (as set out in Table 8.10), which is considered “moderate” for Early Medieval and Medieval and “high” for the post medieval and modern periods. In reference to Modern Military Remains, we note the identification from desk-based sources of information a First World War German submarine, U3 (Ref: NRHE 1597596) which was lost while being towed to be scraped in November 1918. We also note the records of Second World War aircraft losses attributed to the study area and that one of these losses is of a Blackburn Botha MK I (Ref: NRHE 1327855), for which there are no surviving examples of this aircraft type and therefore any identified remains will be considered important. Furthermore, the archaeological interpretation of geophysical survey data acquired for the Transmission Assets corridor has determined that:	Summary of baseline findings noted. United Kingdom Hydrographic Office (UKHO) Ref: 8292; National Record of the Historic Environment (NRHE) Ref: 1027211; Survey Ref: MG23_0059 has been interpreted as an unknown wreck site and as such, is considered to have a high potential to be an archaeological asset of significance. However without further site investigation no further information on the origin or significance of the asset can be determined at ES. All anomalies identified as having either a high (including MG23_0059) or medium potential to be archaeological in nature have been assigned an appropriate AEZ in order to ensure that there will be no direct impacts to these potential archaeological assets (CoT63). All AEZs are presented in **section 8.8.2**.

Date	Consultee and type of response	Comment raised	Response to comment raised and/or where considered in this chapter
		- three seabed anomalies have been classified as "high potential"; - four "medium potential"; and - 54 "low potential". We did note that some medium potential anomalies (e.g. Table 8.12, Ref: MG23_0051) could actually be contemporary infrastructure (e.g. cabling). It is therefore important that any subsequent survey campaigns are designed to differentiate such features. Within the proposed Morgan Offshore Wind Project, we note that five are classed as "high potential" anomalies, five are of "medium potential" and 42 have been classed as "low potential" anomalies. It was noted again that some provisional medium potential anomalies could be geological (Table 8.13, Ref: Morgan_0030). Morecambe Offshore Windfarm (generation assets) identified anomalies e.g. "unidentified debris" that could be of archaeological interest (Table 8.14). For the Transmission Assets Survey Area, it seems that from geophysical survey data, corroborated is possible with desk-based sources for the wreck of the Ben Rein (UKHO Ref: 5462; NRHE Ref: 909472, Survey Ref: MG23_0053), a cargo ship sunk by German submarine UB57 in 1918. An unknown vessel (UKHO Ref: 8292; NRHE Ref: 1027211; Survey Ref: MG23_0059) is also identifiable and therefore the ES should determine if it should be considered as a heritage asset.	
23 November 2023	Historic England - S42 Response	We did see the assumptions made about boulder and debris clearance activities that could, for example, apply to "…up to 40% of interconnector and Morgan export cables…" and "…up to 30% of Morecambe	The measures adopted as part of Transmission Assets (**section 8.8)** include mitigation to minimise impacts to any archaeological material that may be encountered in the course of

Date	Consultee and type of response	Comment raised	Response to comment raised and/or where considered in this chapter
		export cables will be subject to pre-lay preparation…" and that sand wave clearance could be required for "…up to 60% of Morgan interconnector cables, 60% of Morgan export cables and 30% of Morecambe export cables" during construction phase. We also note the detail provided in Section 8.9 (Assessment of effects) and the attention given to sediment disturbance and deposition at each phase. It is important that consideration is given to the risk of encountering presently unknown elements of the historic environment that could presently be buried in sand waves or in the seabed at locations where GBF dredging could be required. We note that for OSP GBF and monopile suction bucket foundations that diameters are given, but it would be helpful if the ES also includes depth of seabed preparation.	Transmission Assets (CoT63). Further details are provided in the outline offshore WSI for archaeology (document reference: J17, as per CoT63). Sandwave clearance and boulder clearance assumptions have been refined and Offshore Substation Platforms (OSPs) and interconnector cables removed from the Project Design from PEIR to ES. The updated maximum design scenarios (MDS) for sediment disturbance and deposition is presented in **Table 8.17**.
23 November 2023	Historic England - S42 Response	Section 8.3.3 (Receptor sensitivity/value) – we appreciate the attention given to Historic England guidance. However, it is important that for the marine area, a key first step is to determine whether heritage asset(s) (as defined within the UK Marine Policy Statement, 2011 and the North West Marine Plan Technical Annex, 2021) are present. Once sufficient certainty is available via archaeological analysis and interpretation of both desk-based sources of information and project-specific survey data, determination of receptor sensitivity is then possible. Furthermore, this will be especially relevant during any post-consent and pre-construction phase of survey planning and commissioning (for Scenario 1, 2 or 3). It is through this approach that the determination of the significance of effect (Section 8.8.4) becomes possible.	Archaeological analysis and interpretation of both desk-based sources and project-specific survey data has been completed to establish the presence of heritage assets within the marine archaeology study area and in support of this Chapter. The results are presented in the Marine Archaeology Technical Report (Volume 2, Annex 8.1 of the ES). This information has been used in the determination of receptor sensitivity for the assessment of effects (**section 8.10.5.1**).

Date	Consultee and type of response	Comment raised	Response to comment raised and/or where considered in this chapter
23 November 2023	Historic England - S42 Response	Section 8.9.6 (Effects on Historic Seascape Character (HSC)) – we are aware of the focus directed at trying to determine 'magnitude' and the effort to try and determine 'significant change'. However, in consideration of the detail of this proposed development, we can appreciate your perception that change can be accommodated, but we do not concur that this is "…without altering the existing characteristics of the HSC…" the physical placement of seabed infrastructure will influence other activities including (generic) 'fishing'. We therefore advise that further narrative is provided in the ES assessment to explain perceptions of change drawing on historic character.	Further discussion on approach to HSC was undertaken through the Offshore AHEF and advice from Historic England has been incorporated in the further development of assessing effects on HSC (**section 8.11**).
28 February 2024	Historic England - AHEF meeting 2	Historic England advised that HSC is about the legacy of the activities which characterise the development area. For the transmission assets, the consideration of HSC will be a narrative – explaining and describing the multitude of activities, the legacy of activity, and current operation to allow these to continue or not continue, thereby impacting the character of the area. It should provide context for the known and the risk of the unknown. An example of this is a particular industry that operated in an area which might produce material that is then encountered.	The advice from Historic England has been incorporated into a refinement of the methodology for assessing effects on HSC (**section 8.10.5**), and the assessment is presented in **section 8.11**.

8.4 Study area

8.4.1.1 The Transmission Assets marine archaeology study area (hereafter referred to as the study area) consists of the Offshore Order Limits with an additional 2 km buffer. This is shown in **Figure 8.1** (see Volume 2, Figures). This study area was used as the search area for obtaining records from relevant archive databases. This wider study area allows for a greater understanding of the wider archaeological baseline environment, with the dual purpose of enabling any archaeological trends within the region to be recognised and to allow any archaeological sites identified to be represented in a broader archaeological context. Physical processes modelling carried out for Transmission Assets (Volume 2, Chapter 1: Physical Processes of the ES) has shown that changes to the tidal regime are limited to within 2 km of the Offshore Order Limits. Therefore, changes in marine physical process beyond the 2 km 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 in line with industry best practice.

8.5 Baseline methodology

8.5.1 Methodology for baseline studies

Desk studies

8.5.1.1 A comprehensive desk-based review was undertaken to inform the baseline for marine archaeology. The existing studies and datasets referred to as part of the desk-based review are summarised in **Table 8.6**.

8.5.1.2 The principal archaeological archives relating to the study area is data from the United Kingdom Hydrographic Office (UKHO). The National Record of the Historic Environment (NRHE) as held by Historic England and the Isle of Man Shipwreck Inventory held by Manx National Heritage further resources utilised to corroborate positional information of known wrecks and obstructions on the seabed. Additional sources consulted include historic Ordnance Survey maps and Admiralty Charts.

Table 8.6: Summary of desk study sources

Title	Source	Year	Author
UKHO Wreck and Obstructions Data	UKHO	2023	United Kingdom Hydrographic Office (UKHO)
NRHE	Historic England	2021	Historic England
Isle of Man Shipwreck Inventory	Manx National Heritage	2023	Manx National Heritage
Merseyside Historic Environment Record	Sefton Council	2021	Merseyside Environmental Advisory Service

Title	Source	Year	Author
Historic Seascape Characterisation: The Irish Sea (English Sector)	Archaeology Data Service (ADS)	2011	Sam Turner, Caron Newman, 2011
West Coast Palaeolandscapes Survey	ADS	2011	Fitch, S., Gaffney, V., Ramsey, E., and Kitchen, E.
Submerged Landscapes Data	EMODnet Geology	2023	British Geological Survey
Morecambe Offshore Wind Farm: Generation Assets	Morecambe Offshore Wind Limited	2024	Flotation Energy
Morgan Offshore Wind Project: Generation Assets ES	Morgan Offshore Wind Farm Ltd	2024	Bp/EnBW

Site-specific surveys

8.5.1.3 In order to inform the ES, site-specific surveys were undertaken, and the statutory consultees notified. A summary of the surveys undertaken to inform the marine archaeology impact assessment is outlined in **Table 8.7**.

8.5.1.4 A comprehensive marine geophysical survey was carried out for the Survey Area 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 2, Annex 8.1: Marine Archaeology Technical Report of the ES.

8.5.1.5 Site-specific geophysical surveys were carried out from 1 April 2022 to 19 September 2022 over three separate survey campaigns conducted by Gardline Limited (Gardline), Titan Environmental Survey Limited (Titan) and XOcean respectively. The survey campaigns collected Multibeam Echo Sounder (MBES), a Sidescan Sonar (SSS), a Magnetometer, a parametric Sub-bottom Profiler (SBP), and a Pinger SBP. Geophysical survey operations were undertaken within a pre-defined boundary of approximately 250 km^2, the pre-defined boundary overlaps and, in places, exceeds the Offshore Order Limits and is referred to within this report as the Survey Area (**Figure 8.2** (see Volume 2, Figures)).

8.5.1.6 Geotechnical site investigations were conducted in 2022 by Fugro Marine Limited and Gardline within the Offshore Order Limits. This was in the form of vibrocore sampling and Penetrometer Testing (CPT) within the Offshore Infrastructure Area. 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).

Table 8.7: Summary of site-specific survey data

Survey type	Extent of survey	Overview of survey	Date	Reference to further information
SSS	Transmission Assets Survey Area	Geophysical survey to characterise the marine archaeology of the Offshore Order Limits.	April 2022 to September 2022	Volume 2, Annex 8.1: Marine Archaeology Technical Report of the ES.
MBES	Transmission Assets Survey Area	Geophysical survey to characterise the marine archaeology of the Offshore Order Limits.	April 2022 to September 2022	Volume 2, Annex 8.1: Marine Archaeology Technical Report of the ES.
SBP	Transmission Assets Survey Area	Geophysical survey to characterise the marine archaeology of the Offshore Order Limits.	April 2022 to September 2022	Volume 2, Annex 8.1: Marine Archaeology Technical Report of the ES.
Magnetometry	Transmission Assets Survey Area	Geophysical survey to characterise the marine archaeology of the Offshore Order Limits.	April 2022 to September 2022	Volume 2, Annex 8.1: Marine Archaeology Technical Report of the ES.
Geotechnical	Transmission Assets Survey Area, Morgan Generation Assets and Mona Generation Assets	Geotechnical survey to characterise the marine archaeology of the Offshore Order Limits.	2022 and 2023	Volume 2, Annex 8.1: Marine Archaeology Technical Report of the ES.

8.6 Baseline environment

8.6.1.1 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).

8.6.1.2 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 BP (Before Present), 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 8.8**.

Table 8.8: Overview of British archaeological chronology

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

8.6.2 Submerged prehistoric archaeology

8.6.2.1 The prehistoric archaeological record of the British Isles covers the period from the earliest hominin occupation potentially as early as c. 970,000 BP (Before Present see **Table 8.9** for geological timeline) 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) shaped the submerged prehistoric landscape within the 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 study area is summarised below and further information is presented in Volume 2, Annex 8.1: Marine Archaeology Technical Report of the ES.

8.6.2.2 Geological periods referred to in this section are defined by the date ranges presented in **Table 8.9**.

Table 8.9: Geological Periods

Period	Date Range	Notes
Holocene	10,000 BP to Present Day	Mesolithic, Neolithic, Bronze Age, Iron Age, Roman, Medieval, Post Medieval 19th century and Modern periods. The Holocene is the current time period within the larger geological time scale known as the Quaternary Period.
Devensian from Post Late Glacial Maximum to Late Glacial Interstadial	18,000 BP to 10,000 BP	Coincides with the Late Upper Palaeolithic and the early Mesolithic.
Devensian up to Late Glacial Maximum	c. 73,000 to 18,000 BP	Arrival in the UK of Late Middle Palaeolithic Neanderthals, who were followed approximately 31,000 BP by Early Upper Palaeolithic, anatomically modern humans (Homo sapiens).
Ipswichian (interglacial)	c. 130,000 to c. 115,000 BP	Last interglacial period in the UK. Overlaps with the Late Middle Palaeolithic.
Wolstonian	c. 374,000 to c. 130,000 BP	Predominantly Pleistocene glaciation. Incorporates the earliest period of the Late Middle Palaeolithic.

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

8.6.2.3 Deposits representing the final glacial stage of the Wolstonian glaciation are present within the study area, indicating that the area was subglacial during this period and therefore uninhabitable by humans.

8.6.2.4 The analysis of seismic data from within the study area and evidence from the wider area suggests that deposits representing environments favourable for human occupation dating to the Late Middle Palaeolithic are not likely to be present within the study area (Jackson *et al*., 1995; Mellett *et al*., 2015; Wood, 2022 and Wood & Deeks, 2022).

Upper Palaeolithic (45,000-10,000 BP, 43,000–12,000 BC)

8.6.2.5 Sea level and landscape changes within the study area and its surrounding environment during the Upper Palaeolithic are not conclusively understood. Some studies suggest that the Liverpool Bay area would have been an entirely marine environment during this time, whilst other evidence indicates that it would have been a partially terrestrial environment dominated by fluvial systems and related floodplains (Brooks *et al*., 2011, Jackson *et al*., 1995, Mellett *et al*., 2015 and Fitch *et al*., 2011).

8.6.2.6 The West Coast Palaeolandscape Study (WCPS) and the results of the geophysical and geotechnical archaeological assessments (Wood, 2022 and Wood & Deeks, 2022; Morecambe Offshore Wind Farm, 2024b) support the latter in suggesting that areas of Liverpool Bay would have been terrestrial

following the Last Glacial Maximum, the results of the WCPS are shown in **Figure 8.3** (see Volume 2, Figures).

8.6.2.7 However, even if the theory that the 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. And therefore the potential for archaeological material dating to the Upper Palaeolithic to be encountered within the study area remains low.

Mesolithic (10,000 – 6000 BP/12,000-4000 BC)

8.6.2.8 The exact date of submergence across the eastern Irish Sea is debated, with some studies suggesting an inundation date across the study area being as early as 13,000 BP. Other studies suggest a later date range of 7000 to 6000 BP for inundation. If we are to take the earliest possible date then the complete inundation of the study area would be before the start of the Mesolithic in Britain and therefore provide no possibility of human occupation. However, if the later date of 7000 to 6000 BP is accepted then the partially terrestrial environment may well have been inhabited by humans and represent the potential for the survival of archaeological material.

8.6.2.9 The WCPS has interpreted channels within its datasets as Mesolithic fluvial features; these channels have also been identified within the site-specific survey data within the study area and may represent a terrestrial or intertidal landscape during the Mesolithic. The WCPS has also mapped features such as kettle hole lakes which would represent attractive, resource rich environments for human exploitation, access to the sea would provide humans a food source in the form of fish and shellfish. The results of the geophysical survey support the WCPS, as the presence of a glacial lake has been identified within the data. The landscape has 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).

8.6.2.10 Geotechnical assessment from the Morgan Generation Assets (Morgan OWL, 2024) 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; Morecambe Offshore Wind Farm, 2024). Although the chronology for submergence is debated academically, the data shows that if the earlier date of 13,000 BP is accepted then the area would have been fully submerged by the advent of the Mesolithic and therefore incapable of sustaining human occupation and therefore would lack the potential for the survival of archaeological material.

8.6.2.11 The potential for the survival of Mesolithic archaeological material within the study area, however, remains low, due to the fluctuating marine environment and the sensitive nature of Mesolithic evidence.

Stage 1 geoarchaeological assessment

8.6.2.12 Only shallow vibrocores and CPTs were sampled from within the Offshore Order Limits for the Transmission Assets due to the nominal depths of cable burial being only up to 3 m. Deep boreholes were undertaken within the Offshore Order Limits for the Morgan Offshore Wind Project: Generation Assets (Morgan OWL, 2024) and Mona Offshore Wind Project Red Line Boundaries (Mona OWL, 2024). The boreholes for the Generation Assets informed the Stage 1 geoarchaeological assessment.

8.6.2.13 Based on the core descriptions, available photographs, and the evolving ground model interpretation, the cores from across all three projects were assessed in relation to their geoarchaeological potential.

8.6.2.14 A series of proglacial, possibly lacustrine/fluvial deposits, have been identified within the ground model. These offer the potential to be dated, and therefore improve the chronology of the timing of Devensian glacial advance and retreat, and presence of a submerged palaeolandscape, within the region, as well as provide palaeoenvironmental information that can help improve the classification of these features and provide additional refinement to the evolving ground models.

8.6.2.15 The boreholes held no evidence to suggest human occupation of the area and therefore any potential for the survival of prehistoric archaeological material. However, a series of sub-glacial and pro-glacial landscape features and deposits were identified. These have the potential to contribute to the understanding of the late Devensian dynamics of the Irish Sea Ice Stream, including the timing of ice retreat within the Eastern Irish Sea region.

8.6.3 Maritime and aviation archaeology

Maritime archaeology potential

8.6.3.1 This section provides a chronological overview of the maritime and aviation archaeology potential of the study area and its wider environs. Full details of the potential of the area are presented in Volume 2, Annex 8.1: Marine Archaeology Technical Report of the ES.

Early Prehistoric (Palaeolithic and Mesolithic)

8.6.3.2 There is no evidence in the UK for maritime archaeological remains that pre-date the start of the Holocene. However, there are examples from elsewhere in the world which suggest that primitive watercraft were in use by the Middle Palaeolithic period. During the Late Upper Palaeolithic (approximately 12,000 BC), it is possible that simple watercraft such as log boats or rafts were used for coastal journeys and fishing within the British Isles (Wessex Archaeology, 2007b and Dunkley, 2016), however no evidence of Palaeolithic sea-faring craft is currently known within the study area.

8.6.3.3 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. They are likely to have become increasingly important to the Mesolithic inhabitants with rising sea levels. However due to

the paucity of evidence and fluvial activity across the study area, the potential for the survival of any archaeology associated with the maritime environment from the Palaeolithic and Mesolithic periods is considered low.

Neolithic and Bronze Age

8.6.3.4 No evidence of Neolithic or Bronze Age maritime activity has been recorded within the study area.

8.6.3.5 Direct archaeological evidence for the exploitation of the marine environment and maritime activity within the Neolithic is rare and limited to logboat finds (Johnstone, 1980; Wilkinson and Murphy, 1995 and Bradley *et al.,* 1997) and shell middens containing the faunal remains of deep sea fish (Ellmers, 1996). Little is known of watercraft or vessels from this period and archaeological evidence of them is so rare that all examples of craft would be considered of high value, however the potential for these discoveries within the study area is low.

8.6.3.6 Evidence of Bronze Age maritime activity has been recorded throughout England in the discovery of a number of inland watercraft and sea faring vessels. No such examples have been recorded in the vicinity of the study area, however it is possible that similar crafts would have been utilised to traverse the area. The potential for the discovery of maritime archaeology from the Bronze Age is considered to be low.

Iron Age and Romano-British

8.6.3.7 Evidence of Iron Age maritime activity has been discovered in the UK in the form of Romano-Celtic boats which are examples of a new form of ship construction that was emerging in north west Europe at the time. The discovery of boats such as these indicates that maritime transport was an important part of Iron Age life, however the organic construction materials used mean that the potential for the survival of Iron Age archaeological material within the study area is low.

8.6.3.8 The Roman occupation of Britain was by necessity a maritime endeavour, which would have required continuous transportation of resources and people to the military and civilian sites established by the Romans. Sites such as the Roman town of Deva (modern day Chester) would have been supplied and accessed from Liverpool Bay and therefore it stands to reason that there would have been substantial Roman maritime traffic in this area. However, as stated above, the use of organic construction materials means that the potential for the survival of maritime archaeology material from this period is low to medium with the exception of areas where peat survives, as peat creates an anaerobic environment which facilitates the preservation of organic material.

Early Medieval and Medieval

8.6.3.9 The early medieval period marks a change in ship construction techniques evidenced within the archaeological record and coinciding with the end of the Roman occupation in the 5th century AD and an increasing Anglo-Saxon and

Norse presence. Influences on ship construction came from Scandinavian connections and with them the increased emphasis on clinker construction.

8.6.3.10 With the medieval period came a boom in maritime trade across Europe and further afield with the establishment of several trading confederations such as the Hanseatic league at this time. Trading networks across Europe expanded during the medieval period and several important trade routes emerged. 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.

8.6.3.11 Increased demand for goods meant that ship construction advanced rapidly during this period to accommodate larger cargoes. Examples of types of boats dating from early medieval and medieval include larger clinker-built merchant vessels called keels, cogs and possibly reverse clinker-built vessels termed hulks (Friel, 2003). The rapid technological advances in ship construction during the medieval period can also be attributed to increased military campaigns. This is particularly true in the Irish Sea where the campaigns of Edward I and Edward II against the Scots in the fourteenth century were supplied with men and resources from Ireland.

8.6.3.12 There is one record (NRHE 1447861) of a medieval vessel having been lost in the study area. The record pertains to an unnamed wooden cargo vessel which stranded at Lytham St. Annes on passage from Ireland with "goods and victuals for the munition of the castles in north Wales" in 1296. The position of this loss has not been corroborated through the UKHO or site-specific geophysical survey data and therefore the vessel may not be within the study area.

8.6.3.13 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 medium.

Post Medieval and Modern

8.6.3.14 The post-medieval and modern periods present the greatest potential for unrecorded archaeology to be discovered. The increasing incorporation of metal structural elements into vessel designs during this period means that wrecks for the 19th and early 20th centuries are also often more visible on the seabed than their wooden predecessors. They are visible to bathymetric and geophysical survey, and also generate strong magnetic anomalies, and this greater visibility is reflected in the increased number of known wrecks (i.e. those that have been located on the seabed) in contrast to earlier periods.

8.6.3.15 International trade with ports around the Irish Sea becomes increasingly important in the post medieval period. Trade between England and Ireland increased during the 16th century as England produced larger quantities of coal, a resource which was scarce in Ireland. This growth in trade led to the establishment and expansion of ports such as Maryport on the Solway Firth to the north of the study area.

8.6.3.16 During the 18th century, France planned a series of, ultimately unsuccessful, invasions of Ireland and Wales in 1759, 1796 and 1797. This led to a substantial increase of traffic in the Irish Sea, not just from the French but also in the form of British ships to stave off the threat of invasion and protect shipping and trade interests in the area.

8.6.3.17 From the 18th century onwards, records were kept of ship losses, with records becoming more detailed from the 19th century. Rapid industrialisation in the 18th and 19th centuries revolutionised shipbuilding, introducing technological innovation that precipitated fundamental changes in maritime technology. By the end of the 19th century, the advent of the steam engine, the introduction of iron hulls and the development of the screw propeller had wrought major transformations on ships and shipping (Lambert, 2001). Although steam and steel came to dominate shipping during the 19th century, there remained a strong local core of maritime activity around much of the coast of the UK which retained the more traditional, often wooden vessel types.

8.6.3.18 The potential for the discovery of unknown maritime archaeology from the post medieval and modern periods within the study area is high.

Modern Military Remains

8.6.3.19 The maritime archaeological record of the 20th century until the present day is dominated by remains associated with the two World Wars. Warships, submarines and U-boats along with cargo vessels, personnel transport vessels and aircraft, comprise the losses during this period.

8.6.3.20 The first World War (WWI) saw the advent of the use of submarines in European waters, following their widespread usage in the American Civil War. Shipping activity around Britain was targeted by enemy submarines and a great number of vessels were lost this way.

8.6.3.21 One record of a lost WWI German submarine, the U3 (NRHE 1597596), has been identified within the desktop data for the study area. U3 was one of two U-Boats commissioned for the German navy with that name, it foundered whilst being towed to Preston to be broken up following the end of the WWI, but its final position is unknown as it has not been confirmed through either the UKHO or site-specific survey data.

8.6.3.22 Advances in maritime technology during World War Two (WWII) meant an increase in naval offenses, this means there was a substantial increase in recorded losses from this period, and therefore the potential for the discovery of unknown maritime archaeology from both World Wars is considered to be high.

Aviation archaeology potential

8.6.3.23 Thousands of military and civilian aircraft casualties have occurred in UK waters since the advent of powered flight in the early 20th century. The bulk of these are casualties of WWII and most are concentrated off the south and south east coasts of England. However, there is evidence for substantial

numbers of aircraft casualties in the east Irish Sea (Wessex Archaeology, 2008).

8.6.3.24 Whilst the aviation archaeology record is potentially very large, the ephemeral nature of aircraft wrecks ensures that many sites remain unknown and unrecorded. In addition, although records of aircraft losses at sea are extensive, they are seldom tied to an accurate position, which further complicates any assessment of the likely presence of aircraft wreckage on any particular area of the seabed.

8.6.3.25 Five records of WWII aircraft lost in the vicinity of the study area have been identified within the NRHE data. These were all lost in 1942 and 1943 at the height of the war, of particular note is a record of a British Blackburn Botha, Botha MK I L6141 (NRHE 1327855), there are no surviving examples of these aircraft and therefore any positively identified remains would be considered of at least national significance. However, the locations of the remains have not been identified through the UKHO or site-specific survey data. Full details of the aircraft record are presented in Volume 2, Annex 8.1: Marine Archaeology Technical Report of the ES.

8.6.3.26 The full potential for post-war aircraft remains to be discovered within the study area, however due to the ephemeral nature aviation material, the potential for discoveries of this type is considered to be low. Civilian aircraft wrecks are not subject to protection under the terms of the Protection of Military Remains Act 1986.

8.6.4 Known and recorded maritime and aviation archaeology

8.6.4.1 No designated sites have been identified within the datasets for the study area. Non-designated sites are considered in the following sections.

Desktop study

8.6.4.2 Within the UKHO data there are 15 ‘live’ entries that relate to possible material of anthropogenic origin including wreck sites within the study area. The location of these are shown in **Figure 8.4** (see Volume 2: Figures). The details of the records are presented in **Table 8.10.** The locations of six records were corroborated by the assessment of site-specific geophysical survey data; further details from the geophysical survey are presented in section the Marine Archaeology Technical Report (Volume 2, Annex 8.1 of the ES). Of these 15, nine are within the Offshore Order Limits and six are outside the Order Limits but within the marine archaeology study area. Ten are named wreck locations, one indicates the possible remains of an aircraft, and three more entries correspond with unknown wrecks or debris.

Table 8.10: Live desktop records present within the Transmission Assets marine archaeology study area

UKHO ID (Anomaly ID)	NRHE ID	Name	Description
Desktop records within the Offshore Order Limits			
5462 (MG23_0053/Morgan_0096)	909472	*Ben Rein*	The wreck of the *Ben Rein,* previously the *Starling*, a general cargo ship that was built by G Brown & Co, Greenock in 1905 and sunk by the German submarine UB57 in 1918 whilst on passage from Liverpool to Belfast with a cargo of soap. The *Ben Rein* was located in the geophysical survey data within the Morgan Offshore Wind Project Generation portion of the Offshore Order Limits
5463 (Morgan_0008)	909403	*Limesfield*	Entire wreck. Captured by the German submarine UB57 and subsequently sunk by gunfire. Had been on passage from Belfast to Preston with a cargo of cotton waste.
8250 (Morgan_0017)	909493	*Flying Meteor*	Notable debris from the Flying Meteor. Built in 1864 by Blackwood & Gordon of Port Glasgow. The Flying Meteor was engaged in towing the barque the Ravensbourne from Liverpool to Troon when a strap of connecting rod broke and fell to the bottom of the hull.
7458 (Morgan_0097)	909402	*Hibernian*	Entire wreck. Built in 1875 by H Murray and Co, Port Glasgow. Sank following collision with British paddle steamer SS Prince of Wales whilst on passage from Garston to Glasgow. Hull only.
7559 (Morgan_0098)	506874	*Lucy*	Entire wreck. Built in 1899 by Scott and Sons, Bowling. One boiler, compound expansion engine of 32NHP. Single shaft. At time of loss, on 21 July 1910, the vessel was on passage from Weston Point to Douglas with a cargo of moulding.
8292 (MG23_0059)	1027211	Unknown	Recorded as an unknown fishing vessel.
5418	909495	Unknown Aircraft	A record of the wreck of an unknown aircraft considered ‘live’ by the UKHO reported by divers in 1991. No wreck, or material of anthropogenic origin was identified within the geophysical data at the stated position. The record may require further investigation as 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. As a precautionary approach a Temporary Archaeological Exclusion Zone (TAEZ) of 100 m from the UKHO coordinates is established to ensure the protection of any aviation material (see **Table 8.16**).
-	909496	Unknown	Record of the possible remains of a vessel
-	909497	Unknown	Record of the possible remains of a vessel

UKHO ID (Anomaly ID)	NRHE ID	Name	Description
Desktop records outside the Offshore Order Limits but within the marine archaeology study area			
7460		*Peveril*	Entire wreck. Sank following a collision with British SS. Monarch whilst on passage from Liverpool to Douglas.
8094	90901	*Montreal*	Entire wreck. Built in 1900 by C Swan & Hunter Ltd. Owned at the time of loss by Canadian Pacific Ocean Services Ltd. Four boilers, triple expansion, engine of 720NHP, single shaft. Sank following collision with SS Cedric whilst part of convoy HG47.
8279	-	*Irene Chalmers*	A modern (1995) fishing vessel that took on water and sank whilst on a delivery run from Preston to the Isle of Man; the crew of three were recovered
8295	1605439	*Leeds* (probably)	The remains of a broken up wreck with boilers and engine visible on the seabed were identified in 1987. In 1995 a sports diver provided the possible identity of the *Leeds*, a 19th century small steamship
58669		*Malaguena*	Entire wreck. Sank whilst under tow of the tug Wendy Ann on passage from the Isle of Man to Millom, Cumbria.
79646	-	Unknown	Record of the possible remains of a vessel

Geophysical survey results

8.6.4.3 One hundred and twenty-eight anomalies of potential archaeological interest were identified within the Offshore Order Limits. Of these, eight have been classified as high potential anomalies, 12 as medium potential and 108 as low potential anomalies. Within the marine archaeology study area, there are eight high potential anomalies, 14 medium potential anomalies and 125 low potential anomalies. The distribution of these can be seen in **Figure 8.6** (see Volume 2, Figures). Full details of the anomalies of archaeological interest identified during the geophysical survey are presented in Volume 2, Annex 8.1: Marine Archaeology Technical Report of the ES. A summary of the medium and high potential anomalies is presented in **Table 8.11**.

8.6.4.4 Additionally, magnetic-only anomaly MC22_MAG_0254 presented as a complex anomaly of 739.4 nT. The anomaly is isolated with no corresponding seabed anomaly identified within the other datasets, the most likely explanation is that the anomaly is buried, or potentially very low lying as to not be visible within the surface datasets. The anomaly is not visible on the adjacent lines of magnetometer data, which are approximately 75.0 m each side. Due to the size of the anomaly, and the visibility on adjacent lines, it is likely to be largely contained at the location. As there was no seabed expression the anomaly was not given an assessment of archaeological potential, but was provided with a TAEZ (see **Table 8.16**.)

Table 8.11: High and Medium Potential Anomalies within the marine archaeology study area (Figure 8.6)

Anomaly	Potential	Description
MG23_0014	High	The anomaly has been classified as high potential based on its form, the association with a large item of potential debris, and the uniqueness in the surrounding environment which could all indicate the presence of a potential wreck. The anomaly is visible in the both the SSS and MBES data.
MG23_0053	High	Also identified in a separate geophysical survey as Morgan_0096. Visible in the both the SSS and MBES data and has an associated magnetic anomaly of 70 nT and corresponds with UKHO 5462 and NRHE 909472, records for the *Ben Rein*. The *Ben Rein* was a British carrier sunk by gunfire from UB57 on 7 February 1918 whilst en route from Liverpool to Belfast with a general cargo. The vessel was identified following recovery of the ship's bell.
MG23_0059	High	Visible in the both the SSS and MBES data and has an associated magnetic anomaly of 7,925 nT. The anomaly corresponds with UKHO 8292 and NRHE 1027211. UKHO 8292 is an unidentified wreck. Diver reports from 2004 record a steam ship lying upright with the bow to the north, some damage along the port side, and appearing to be a fishing vessel. Whilst the description of the vessel is minimal, based on the MBES data it would appear that the vessel has deteriorated significantly since the diver reports in 2004. The nearby NRHE record is that of an unidentified seabed obstruction reported by fishermen.

Anomaly	Potential	Description
Morgan_008	High	Morgan_008 lies in the west of the study area, approximately 2.3 km south of the north east edge of the Offshore Order Limits. The anomaly is visible in both the SSS and MBES data and is recorded by the UKHO and NRHE as the *Limesfield* (UKHO 5463, NRHE 909403). A British steamship sunk by submarine UB57 on 7 February 1918 whilst on passage from Belfast to Preston with a cargo of cotton waste. There were no reported casualties. The wreck was originally recorded as a fastener by the Dutch Hydrographic Office in 1971 and confirmed as a wreck in 1991. Subsequent investigations by divers, including the recovery of the bell in 1995, confirmed the wreck as that of the *Limesfield*. The anomaly is visible in the data as a prominent feature measuring 48.8 m x 9.0 m with a measurable height of 4.8 m. The form of the feature is characteristic of a wrecked vessel. The wreck appears to be lying upright and is largely intact with the bow facing towards the north east. Slight scour is visible around the wreck to the north east, with accumulation along the west side. The coherent form of the wreck suggests either steel construction or a wreck of wooden construction of more recent origin.
Morgan_0017	High	Morgan_0017 lies in the west of the study area, approximately 4.8 km south of the north eastern boundary of the Offshore Order Limits. The anomaly is visible in the SSS and MBES data and is recorded by the UKHO and NRHE as the *Flying Meteor* (UKHO 8250, NRHE 909493). A British paddle steamer tug built in 1864 and sank on 13 March 1874 whilst towing the barque *Ravenbourne* from Liverpool to Troon. The crew of the *Flying Meteor* boarded the Ravensbourne which returned to Liverpool. The wreck was first recorded in 1991 as a fastener, and then amended to an isolated rock. In the same year divers noted the remains of a wreck. In 2000 divers identified the wreck as a paddle steamer tug, with the recovery of a wheel boss identifying it as the *Flying Meteor*. In 2001 divers reported the wreck to be well covered in shingle with the highest point being the paddle wheel boxes. The anomaly is visible in the MBES data as an incoherent mound in amongst a number of sand waves, within the SSS data the anomaly is still largely incoherent, but more wreck like in form. The anomaly consists of a number of parallel linear features in a broad wreck like shape over an area 28.9 m x 9.9 m with a measurable height of 1.7 m. The wreck appears in poor condition, with very little evidence of scour or accumulation.

Anomaly	Potential	Description
Morgan_0096	High	Morgan_0096 lies in the west of the study area, approximately 900 m south of the north easter boundary of the Offshore Order Limits. The anomaly is visible in the SSS and MBES data and is recorded by the UKHO and NRHE as the *Ben Rein* (UKHO 5462, NRHE 909472). A British carrier built in 1905 and sunk by submarine UB57 on 7 February 1918. The crew were allowed to leave the vessel on a small boat and no casualties were reported. The vessel was on passage to Belfast from Liverpool with a general cargo. The wreck was originally recorded as a fastener by the Dutch Hydrographic Office in 1971 and confirmed as a wreck in 1996. The wreck was dived on multiple occasions in 1997 where soap was observed packed into the hull, and a bell recovered bearing the inscription Starling. A further dive in 1998 reported crates containing waxed paper. The anomaly is visible in the data as a coherent wreck in amongst sandwaves and measuring 34.5 m x 7.6 m and with a measurable height of 2.8 m. The wreck appears largely intact and likely lying upright. Scour, or a disturbance in the sand waves, is visible to the north east which is likely the stern. This wreck lies outside the Offshore Order Limits but within the marine archaeology study area.
Morgan_0097	High	Morgan_0097 lies towards the west of the study area, approximately 3.3 km north east of the south west boundary of the Offshore Order Limits. The anomaly is visible in the SSS and MBES data and is recorded by the UKHO (7458), NRHE (909402) and NMRW (506875) as the wreck of the *Hibernian*, a British steam ship built in 1875 and lost on 12 August 1894 following a collision with the British paddle steamer *Prince of Wales* whilst on passage from Garston to Glasgow. Of the ten crew, two were lost. The wreck was first identified in 1991 with divers recovering the ships wheel bearing the name of the builders of the *Hibernian* in 1993. The most recent diver accounts from 1996 report the wreck as very broken up and partially buried with the boilers at the highest point. The anomaly is visible in the MBES data as an incoherent mound with low lying debris to the south east, within the SSS data the anomaly is still largely incoherent, but more wreck like in form with significant height amidships. The anomaly consists of a number of parallel linear features in a broad wreck like shape over an area 48.9 m x 19.7 m with a measurable height of 3.7 m. The wreck appears in poor condition, with evidence of scour extending to the north east.

Anomaly	Potential	Description
Morgan_0098	High	Morgan_0098 lies towards the west of the study area, approximately 3.6 km north east of the south west boundary of the Offshore Order Limits. The anomaly is visible in the SSS and MBES data and is recorded by the UKHO (7559) and NMRW (506874). Identified as the wreck of the *Lucy*, a small British steam ship built in 1899 and sunk on 21 July 1910 whilst on passage from Weston Point to Douglas with a cargo of moulding. All four crew were recovered. The wreck was first identified in 1991, the bell was recovered in 2006 confirming the identity as the *Lucy*. The divers reported the wreck as very low lying with the engine and boiling protruding above the seabed by 4 m. The anomaly is visible in the MBES data as a prominent and irregular mound, increasing in prominence to the west. Within the SSS data the anomaly is characterised by incoherent features and a large mound to the west, the anomaly covers an area 24.7 m x 8.9 m with a measurable height of 5.8 m. The form of the anomaly is clearly of anthropogenic origin, and the size likely indicates the remains of a wrecked vessel. Scour is visible extending to the north east.
MG23_0045	Medium	MG23_0045 is visible in both the SSS and MBES data, has no associated magnetic anomaly (although lies c. 76 m from the closest track) and does not directly correspond with any UKHO or NRHE records. The origination of the anomaly is not clear, and whilst the overall form could represent anthropogenic material, such as the remains of a wrecked vessel, it is not dissimilar in form to geological features in the surrounding area. However, notable differences in form, and a precautionary approach, mean that a medium potential rating has been assigned.
MG23_0051	Medium	MG23_0051 is visible in both the SSS and MBES data, has no associated magnetic anomaly, and does not directly correspond with any UKHO or NRHE records. The origination of the anomaly is not clear, and whilst the overall form could represent anthropogenic material, such as the low-lying remains of a small, wrecked vessel, it could potentially be related to the Morecambe CPP1 to DP3 electricity cable, or the additional cables and pipelines which run to the east. Due to the potential for both scenarios, a medium potential rating has been assigned.
MG23_0052	Medium	MG23_0052 () is visible in both the SSS and MBES data, has no associated magnetic anomaly (although lies c. 52 m from the closest track) and does not directly correspond with any UKHO record. The anomaly lies c. 26 m south west of NRHE 1027663, an unidentified seabed obstruction reported by fishermen. The overall form of the feature indicates material of anthropogenic origin. The form, and the presence of multiple elements, alongside the size suggests there is potential for the anomaly to represent material of archaeological interest, and a medium potential rating has been assigned. The nearby location of the NRHE record of an obstruction may confirm the presence of the anomaly since the creation of the record (1999) but adds little weight to the presence of material of archaeological interest due to the nature of the origination.

Anomaly	Potential	Description
MG23_0060	Medium	MG23_0060 is visible in both the SSS and MBES data, with an associated magnetic anomaly of 82 nT on the closest track c. 21 m to the south west. The position does not directly correspond with any UKHO or NRHE records. The association of the feature with a magnetic anomaly of 82 nT indicates the presence of ferrous, and thus anthropogenic, debris over an area of 10.5 m x 3.7 m. However, the low-lying nature of the feature may indicate that further material lies buried, but close to the surface in the vicinity. With the origination of the debris unknown a precautionary medium potential has been assigned.
Morgan_0005	Medium	The anomaly has been interpreted as an area of seabed disturbance measuring 33.7 m x 16.2 m with a measurable height of 0.2 m. Whilst likely a geological feature, a number of small features within the constraints may indicate anthropogenic material.
Morgan_0015	Medium	The anomaly measures 12.6 m x 7.3 m with a measurable height of 0.4 m and is made up of at least three smaller features. The anomaly is largely incoherent, but potentially represents material of anthropogenic origin.
Morgan_0025	Medium	The anomaly is characterised by a number of incoherent features covering an area 23.2 m x 8.7 m, with a measurable height of 1.2 m. The form of the anomaly is not consistent with other geological features in the vicinity and may represent anthropogenic debris.
Morgan_0030	Medium	The anomaly is in an area of poor data and is only visible in the MBES data as a small depression. However, the SSS shows the anomaly as a number of linear striations in a depression measuring 13.9 m x 3.2 m, with a measurable height of 0.4 m. Although potentially geological in origin, the linear form of the anomaly combined with the poor data means a precautionary medium potential rating is appropriate.
Morgan_0116	Medium	The anomaly measures 16.4 m, with a measurable height of 2.3 m, at the widest point it measures 6.4 m and is a prominent irregular mound. The form of the anomaly is unusual within the surrounding geology and potentially represents material of anthropogenic origin.
MC22_0013	Medium	MC22_0013 is only visible within the SSS data and has no associated magnetic anomaly and its position does not correspond with any records within the UKHO or NRHE datasets. The anomaly is visible as a curvilinear feature in association with a small area of seabed disturbance, and two further distinct features, covering an area 12.4 m x 7.3 m with a maximum height above seabed of 0.2 m. The anomaly is largely incoherent, but the form of the features may indicate anthropogenic origin.

Anomaly	Potential	Description
MC22_0014	Medium	MC22_0014 is visible in both the SSS and MBES data, has no associated magnetic anomaly, and does not directly correspond with any UKHO or NRHE records. The anomaly is visible in the SSS data as two prominent, and joined, curvilinear features over an area 6.6 m x 1.9 m with a measurable height of 0.3 m. Within the MBES data the anomaly lies within a slight depression, likely caused by scour, with a number of irregular features. The overall form of the anomaly indicates anthropogenic debris, although the origin cannot be determined.
MC22_0020	Medium	MC22_0020 is visible in both the SSS and MBES data, has no associated magnetic anomaly, and does not directly correspond with any UKHO or NRHE records. Within the SSS data the anomaly appears as a boulder-like feature measuring approximately 2 m x 1.5 m with irregular scour extending north east, south west. Within the MBES data the anomaly appears irregular with a prominent, roughly linear, feature orientated north east, south west measuring 3.9 m x 1.7 m. Up to 1.4 m to the north east smaller features are visible. Scour is evident all around the anomaly, but most prominent to the east. The form of the anomaly is indicative of anthropogenic debris, although the origin is not clear. The prominence of the associated scour may suggest a large object, or a number of smaller solid objects.
MC22_0032	Medium	MC22_0032 is visible in both the SSS and MBES data, has no associated magnetic anomaly, and does not directly correspond with any UKHO or NRHE records. The anomaly is visible in the SSS data as a line of multiple small features, some angular, extending 13.3 m x 2.2 m with a measurable height of 0.2 m, and running north, south, parallel with a sand wave. Within the MBES the form is less clear and appears as a small mound (2.1 m x 1.2 m) with two smaller features to the south forming a triangle. The MBES data does appear to show that the anomaly has disrupted the sandwave, with possible slight scour extending to the east north east. Three small magnetic anomalies lie within 100 m of the anomaly, the closest being 20.5 m to the east, due to the line spacing of the magnetometer there is potential for the closest magnetic anomaly to be related thus suggesting some ferrous content. The two south anomalies, and another to the east, form a line potentially indicative of a cable, or pipe. The form of the anomaly appears to indicate anthropogenic debris, although the origin is not clear.

Anomaly	Potential	Description
MC22_0039	Medium	MC22_0039 is visible in both the SSS and MBES data, with a correlating magnetic anomaly of 437.7 nT. The position does not correspond directly with any UKHO or NRHE records, however UKHO record 8299 lies 280 m to the north east, however, it is not believed the anomaly and the UKHO record are related. The anomaly is visible in the SSS data as a small feature within a sandwave, quite boulder like, and measuring 1.5 m x 1.4 m with a measurable height of 0.1 m. Within the MBES data the anomaly is visible as a small break in the sand, with a slight mound and a shallow depression. The anomaly has been identified primarily due to the associated large magnetic anomaly. Whilst the form of the anomaly, and the data in the surrounding area, does not suggest further buried material the magnetic anomaly indicates ferrous, and thus anthropogenic, material.

Historic Seascape Character

8.6.4.5 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 study area to be identified.

8.6.4.6 The HSC was categorised based on the data, the full results of which are presented in Volume 2, Annex 8.1: Marine archaeology technical report of the ES. 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.

8.6.4.7 Historical cultural processes which have shaped the character of the study area are predominantly related to fishing and navigation activity. Infrastructure for the modern energy industry dominates the current seascape character.

8.6.5 Future baseline conditions

8.6.5.1 The Infrastructure Planning (EIA) 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 ES. In the event that Transmission Assets does not come forward, an assessment of the future baseline conditions has been carried out and is described below.

8.6.5.2 It is unlikely that significant change will occur to the marine archaeology of the 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.

8.6.6 Data limitations

8.6.6.1 The records held by the United Kingdom Hydrographic Office (UKHO), NRHE and the other sources used in this assessment are not a record of all surviving cultural heritage assets, rather a record of the discovery of a wide range of archaeological and historical components of the marine historic

environment. The information held within these datasets is not complete and does not preclude the subsequent discovery of further elements of the historic environment that are, at present, unknown. In particular, this relates to buried archaeological features.

8.6.6.2 The data collected across the extents of the survey area is of good quality overall, and in the case of MBES provided 100% coverage. SBP data was collected to a pre-determined line plan, largely providing suitable coverage and penetration for the interpretation of the palaeoenvironment. The Magnetometer data was collected to pre-determined line plan suitable for the identification of ferrous material with a peak to peak amplitude of 5 nT, with the minimum detection size increasing with distance from the tracklines.

8.6.6.3 The data is considered of an appropriate specification, coverage and quality to undertake a robust archaeological assessment to inform the EIA process, noting that additional data collection and interpretation will be required prior to construction.

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

8.6.7 Key receptors

8.6.7.1 Key receptors for marine archaeology can be considered as submerged prehistoric archaeology, maritime archaeology and aviation archaeology. **Table 8.12** identifies the receptors taken forward into the assessment and agreed with stakeholders through the consultation process, as presented in **section 8.3**.

Table 8.12: Key receptors taken forward to assessment

Receptor	Description
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. The submerged prehistoric archaeology baseline is presented in **section 8.6.2**.
Maritime archaeology	Relates generally to craft or vessels and any of their associated structures and/or cargo. The maritime archaeology baseline is presented in **section 8.6.3**.
Aviation archaeology	Comprises all military and civilian aircraft crash sites and related wreckage. The aviation archaeology baseline is presented in **section 8.6.3**.

8.7 Scope of the assessment

8.7.1.1 The scope of the ES has been developed in consultation with relevant statutory and non-statutory consultees as detailed in **section 8.3** and **Table 8.5**. The Transmission Assets ES marine archaeology assessment has been informed by a variety of data sources. Specifically, this has included a review of published desktop data sources within the defined study area, including sources recommended by relevant consultees. The site-specific baseline characterisation surveys undertaken for the Morgan Offshore Wind Project: Generation Assets (as reported in Volume 2, Chapter 8: Marine archaeology, Morgan Offshore Wind Ltd, 2024) and the Morecambe Offshore Windfarm: Generation Assets technical report (Volume 1, Chapter 15: Marine archaeology; Morecambe Offshore Windfarm Ltd, 2023), hereafter referred to collectively as the Generation Assets, have also been incorporated in the desktop data review. The marine archaeology baseline characterisation of the Offshore Order Limits has also been informed by the results of the site-specific surveys undertaken in 2022 and 2023.

8.7.1.2 These sources have been used to inform the identification of marine archaeology receptors against which the assessment of the impacts potentially arising from the construction, operation and maintenance, and decommissioning phases of the Transmission Assets, as agreed via the scoping and consultation process.

8.7.1.3 Taking into account the scoping and consultation process, **Table 8.13** summarises the impacts considered as part of this assessment.

Table 8.13: Impacts considered within this assessment

Activity	Impacts scoped into the assessment
Construction phase	
Seabed preparation activities (i.e. boulder and sandwave clearance)	Sediment disturbance and distribution leading to indirect impact on marine archaeology receptors. Direct damage to near surface marine archaeology receptors.
Offshore export cable installation including anchor placements	
Removal of disused cables	
Operation and maintenance phase	
Presence of cable protection	Sediment disturbance and distribution leading to indirect impact on marine archaeology receptors. Direct damage to near surface marine archaeology receptors. Alteration of sediment transport regimes.
Cable reburial	
Cable repair	
Decommissioning phase	
Removal of offshore export cables.	Sediment disturbance and distribution leading to indirect impact on marine archaeology receptors. Direct damage to near surface marine archaeology receptors.

8.7.1.4 Impacts that are not likely to result in significant effects have been scoped out of the assessment. A summary of the impacts scoped out, together with justification for scoping them out and whether the approach has been agreed with key stakeholders through either scoping or consultation, is presented in **Table 8.14**.

Table 8.14: Impacts scoped out of the assessment

Impact	Justification
Alteration of sediment transport regimes during the construction and decommissioning phases.	The alteration of sediment transport regimes is assessed on the basis of the presence of infrastructure and is therefore applicable in the operation and maintenance phase only. The decision to scope out this impact was agreed at the scoping stage.
Direct damage to deeply buried marine archaeology receptors.	Direct damage to deeply buried marine archaeology receptors has been removed from the assessment of significant effects following the removal of the Morgan Offshore Booster station and OSPs form the Project Design (Volume 1, Chapter 3: Project Description of the ES). Cable burial depths are up to 3 metres (**Table 8.17**). As such, there is now no cabling infrastructure that will be buried at depth and therefore no pathway for direct damage to deeply buried receptors.

8.8 Measures adopted as part of the Transmission Assets (Commitments)

8.8.1 Overview

8.8.1.1 For the purposes of the EIA process, the term 'Measures adopted as part of the Transmission Assets' is used to include the following types of mitigation measures (adapted from IEMA, 2016). These measures are set out in the Commitments Register (Volume 1, Annex 5.3: Commitments register of the ES).

- Embedded mitigation. This includes the following.
  - Primary (inherent) mitigation – measures included as part of the project design. IEMA describes these as 'modifications to the location or design of the development made during the pre-application phase that are an inherent part of the project and do not require additional action to be taken'. This includes modifications arising through the iterative design process. These measures will be secured through the consent itself through the description of the project and the parameters secured in the Development Consent Order (DCO) and/or marine licences. For example, a reduction in footprint or height.
  - Tertiary (inexorable) mitigation. IEMA describes these as 'actions that would occur with or without input from the EIA feeding into the design process. These include actions that will be undertaken to meet other existing legislative requirements, or actions that are considered to be standard practices used to manage commonly occurring environmental effects. It may be helpful to secure such measures through a Code of Construction Practice or similar.
- Secondary (foreseeable) mitigation. IEMA describes these as '*actions that will require further activity in order to achieve the anticipated outcome'*. These include measures required to reduce the significance of environmental effects (such as lighting limits) and may be secured through an environmental management plan.

8.8.1.2 In addition, where relevant, measures have been identified that may result in enhancement of environmental conditions. Such measures are clearly identified within the Commitments Register (Volume 1, Annex 5.3: Commitments register of the ES). The measures relevant to this chapter are summarised in **Table 8.15**.

8.8.1.3 Embedded measures that will form part of the final design (and/or are established legislative requirements/good practice) have been taken into account as part of the initial assessment presented in **section 8.10.5.1** (i.e., the initial determination of impact magnitude and significance of effects assumes implementation of these measures). This ensures that the measures that the Applicants are committed to are taken into account in the assessment of effects.

8.8.1.4 Where an assessment identifies likely significant adverse effects, further or secondary mitigation measures may be applied. These are measures that

could further prevent, reduce and, where possible, offset these effects. They are defined by IEMA as actions that will require further activity in order to achieve the anticipated outcome and may be imposed as part of the planning consent, or through inclusion in the ES (referred to as secondary mitigation measures in IEMA, 2016). For further or secondary measures both pre-mitigation and residual effects are presented.

Table 8.15: Measures (commitments) adopted as part of the Transmission Assets

Commitment number	Measure adopted	How the measure will be secured
Embedded measures		
CoT45	The Outline Offshore Cable Specification and Installation Plan (CSIP) for the Fylde MCZ includes: details of cable burial depths, cable protection, and cable monitoring. The Outline CSIP also includes an Outline Cable Burial Risk Assessment (CBRA). Detailed CSIP(s) and CBRA(s) will be prepared by the Applicants covering the full extent of their respective offshore export cable corridors. Detailed CSIPs will be developed in accordance with the Outline CSIP and will ensure safe navigation is not compromised including consideration of under keel clearance. No more than 5% reduction in water depth (referenced to Chart Datum) will occur at any point on the offshore export cable corridor route without prior written approval from the MCA.	DCO Schedule 14 (Marine Licence 1: Morgan Offshore Wind Project Transmission Assets) Part 2 - Condition18(1)(e) (Pre-construction plans and documentation) and DCO Schedule 15 (Marine Licence 2: Morecambe Offshore Wind Farm Transmission Assets), Part 2 - Condition 18(1)(e) (Pre-construction plans and documentation).
CoT54	An Outline Offshore Cable Specification and Installation Plan (CSIP) includes for cable burial to be the preferred option for cable protection, where practicable. Detailed CSIP(s) will be developed in accordance with the Outline CSIP..	DCO Schedule 14 (Marine Licence 1: Morgan Offshore Wind Project Transmission Assets) Part 2 - Condition18(1)(e) (Pre-construction plans and documentation) and DCO Schedule 15 (Marine Licence 2: Morecambe Offshore Wind Farm Transmission Assets), Part 2 - Condition 18(1)(e) (Pre-construction plans and documentation).
CoT63	An Outline Offshore Written Scheme of Investigations (WSI) for Archaeology has been prepared and submitted with the application for development consent. The Outline Offshore WSI for Archaeology includes: - the requirement for Archaeological Exclusion Zones (AEZs) around those sites identified as having high and medium archaeological potential, as presented in the Offshore Historic Environment Plan; -the requirement for Temporary Archaeological Exclusion Zones (TAEZs), as presented in the Offshore Historic Environment Plan; -implementation of a Protocol for Archaeological Discoveries (PAD) in accordance with 'Protocol for	DCO Schedule 14 (Marine Licence 1: Morgan Offshore Wind Project Transmission Assets) Part 2 - Condition18(1)(g) (Pre-construction plans and documentation) and DCO Schedule 15 (Marine Licence 2: Morecambe Offshore Wind Farm Transmission Assets), Part 2 - Condition18(1)(g) (Pre-construction plans and documentation).

Commitment number	Measure adopted	How the measure will be secured
	Archaeological Discoveries: Offshore Renewables Projects' (The Crown Estate, 2014); - the incorporation of marine archaeology specification and analysis in further pre-construction surveys such as geophysical, geotechnical, or ROV/diver surveys; - operational awareness and avoidance, where possible, of low potential anomalies; - where avoidance of low potential anomalies is not possible, mitigation measures for potential direct impacts to marine archaeology; and - details of reporting and archival requirements. Detailed Offshore WSI(s) for Archaeology will be developed in accordance with the Outline Offshore WSI for Archaeology, in consultation with Historic England.	

8.8.2 Archaeological Exclusion Zones

8.8.2.1 Best practice favours the preservation in situ of archaeological remains, therefore the ideal preferred mitigation for archaeological remains is avoidance (Wessex Archaeology for the Crown Estate, 2021). For the Transmission Assets, AEZs have been proposed to protect the extent of marine archaeology with medium and high potential. The extents to which protection is necessary vary depending upon the nature of the site. The final Transmission Assets project design will take into account these zones, which may evolve or be removed (with the agreement of the MMO and Historic England) as the Transmission Assets progresses, subject to the project design and additional subsequent surveys that may be required.

8.8.2.2 The AEZs identified for the study area have been compiled from the results of the archaeological assessments of geophysical and hydrographic data for Morgan Offshore Wind Project: Transmission Assets, Morgan Offshore Wind Project: Generation Assets and Morecambe Offshore Windfarm: Generation Assets. These have been reviewed against desk based and site-specific data, and as a result of this review AEZs have been identified of varying sizes according to the size and spread of the individual archaeological receptor. The locations of AEZs are shown in **Figure 8.6** and are detailed in **Table 8.16**. Two receptors have been assigned TAEZs.

8.8.2.3 Low potential anomalies are not provided AEZs or TAEZs but will be considered, where practicable, in the final Project Design through micrositing via the acquisition of high-resolution geophysical data, to be acquired post-consent and as part of the mitigation strategy, as outlined in **Table 8.15**.

8.8.2.4 All AEZs are detailed in the outline offshore WSI for archaeology (document reference: J17) and are marked on the offshore historic environment plan (document reference: B17). The outline offshore WSI for archaeology (document reference: J17, as per CoT63) is a live document which presents the AEZs and TAEZs identified within the Offshore Order Limits. Further AEZs may be added to the post-consent detailed offshore WSI(s) and PAD

documents, or existing AEZs may be removed - in consultation with Historic England and the MMO - 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.

Table 8.16: Proposed AEZs and TAEZs within the marine archaeology study area

ID	Description	Potential	Eastings	Northings	AEZ (m)
AEZs Within Offshore Order Limits					
MG23_0014	AEZ for potential wreck	High	493906.9465	5956919.39	50 m extents
MG23_0053	AEZ for wreck (Ben Rein)	High	441190.8211	5986903.303	75 m extents
MG23_0059	AEZ for wreck	High	475821.7833	5958140.665	75 m extents
Morgan_0008	AEZ for wreck (Limesfield)	High	438011.85	5987429.65	50 m extents
Morgan_0017	AEZ for wreck (Flying Meteor)	High	443931.72	5981226.52	50 m extents
Morgan_0096	AEZ for wreck (Ben Rein)	High	441193.65	5986904.68	50 m extents
Morgan_0097	AEZ for wreck (Hibernian)	High	433834.14	5978659.42	50 m extents
Morgan_0098	AEZ for wreck (Lucy)	High	431230.2	5980514	50 m extents
MC22_0013	AEZ for potential debris	Medium	460388.2777	5958939.326	30 m radius
MC22_0014	AEZ for unidentified debris	Medium	461851.3453	5958082.265	15 m radius
MC22_0020	AEZ for unidentified debris	Medium	466231.124	5956833.227	15 m radius
MC22_0039	AEZ for unidentified debris	Medium	460876.753	5962642.231	15 m radius
MG23_0045	AEZ for possible anthropogenic material	Medium	446829.7745	5971064.58	50 m extents
MG23_0052	AEZ for material of anthropogenic origin	Medium	440882.6844	5987420.054	25 m extents
MG23_0051	AEZ for potential debris	Medium	462371.6	5965060.6	25 m extents

ID	Description	Potential	Eastings	Northings	AEZ (m)
MG23_0060	AEZ for material of anthropogenic origin	Medium	476440.2484	5957757.061	25 m extents
Morgan_0015	AEZ for unidentified debris	Medium	440592.83	5984185.02	25 m radius
Morgan_0025	AEZ for potential debris	Medium	431565.53	5983703.41	35 m radius
Morgan_0030	AEZ for material of potential debris	Medium	427532.81	5984191.77	25 radius
Morgan_0116	AEZ for unidentified debris	Medium	440109.5	5982030	30 m radius
AEZs Outside Offshore Order Limits, Within Transmission Assets Marine Archaeology Study Area					
MC22_0032	AEZ for unidentified debris	Medium	456543.3086	5966579.177	25 m radius
Morgan_0005	AEZ for seabed disturbance	Medium	428856.5	5994556	50 m radius
TAEZs Within Offshore Order Limits					
MC22_MAG_0254	TAEZ for large magnetic anomaly	-	458129.8396	5957731.912	50 m radius
UKHO 5418	TAEZ for the record of a possible unknown aircraft	-	430634.9	5985017	100 m radius

8.8.3 Preservation by record

8.8.3.1 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 Transmission Assets will be offset by carrying out survey, recording excavation, where required, prior to the impact occurring (Wessex Archaeology for The Crown Estate, 2021). In view of the potential for the presence of palaeolandscapes, associated prehistoric sites and unidentified wrecks, archaeological monitoring is deemed appropriate where seabed material is brought to the surface and must be recorded. These proposals may be refined on the basis of the results of any further surveys.

8.8.3.2 A PAD for archaeology has been developed and included within the outline offshore WSI for archaeology (document reference: J17) based on the Offshore Renewables Protocol for Archaeological Discoveries (The Crown Estate, 2014). Post-consent PAD documents will be implemented and adhered to and will involve the reporting of archaeological discoveries made during the lifetime of the Transmission 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. 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).

8.9 Key parameters for assessment

8.9.1 Maximum design scenario

8.9.1.1 The MDS identified in **Table 8.17** have been selected as those having the potential to result in the greatest effect on an identified receptor or receptor group. These scenarios have been selected from the Project Design Envelope provided in Volume 1, Chapter 3: Project description of the ES. Effects of greater adverse significance are not predicted to arise should any other development scenario, based on details within the Project Design Envelope (e.g., different infrastructure layout), to that assessed here be taken forward in the final design.

8.9.1.2 The MDS in **Table 8.17** and assessed within **Section 8.11** consider the relevant construction scenario (i.e. sequential or concurrent) that equate to the MDS for that impact pathway. For example, for direct damage to near surface marine archaeology receptors the MDS is for the sequential construction scenario (i.e. site preparation and construction will take place over a maximum of 30 months, noting that there is potential for a gap between the construction periods for Morgan and Morecambe) as this equates to the greatest time over which impacts to archaeological receptors may occur. It should, however, be noted that the total magnitude of each impact (e.g. spatial scale and extent of impacts) is the same for both the concurrent and sequential scenarios.

Table 8.17: Maximum design scenario considered for the assessment of impacts

Potential impact	Phase[a]			Maximum Design Scenario	Justification
	C	O	D		
Sediment disturbance and deposition leading to indirect impacts on marine archaeology receptors.	✓	✓	✓	**Construction phase** **Site preparation**: Sandwave clearance of up to 1,426,800, m^3 undertaken over the 30 month site sequential site preparation and construction period: • Morgan export cable: sandwave clearance along 9% of 400 km of export cable length, with a width of 60 m and a maximum depth of 5 m. This equates to a total spoil volume of 1,080,000 m^3 associated with the cable corridor. • Morecambe export cable: sandwave clearance along 9% of 84 km of export cable length, with a width of 48 m, to a maximum depth of 5 m. This equates to a total spoil volume of 346,800 m^3. • Removal of up to 28 m of disused cables. Sandwave clearance material deposition undertaken over the 30 month sequential site preparation and construction period of Up to 2,853,600 m^2 of seabed disturbance associated with the deposition of: • 1,080,000 m^3 of sandwave clearance material associated with the Morgan export cables affecting up to 2,160,000 m^2; and • 346,800 m^3 of sandwave clearance material associated with the Morecambe export cables affecting up to 693,504 m^2. **Cable installation**: Total spoil volume of up to 2,178,000 m^3 for cable installation over 24 months (sequential construction scenario).	**Construction phase** **Site preparation** • The volume of material to be cleared from individual sandwaves will vary according to the local dimensions of the sandwave (height, length, and shape) and the level to which the sandwave must be reduced. As shown in **Figure 1.4** (Volume 2, Figures), sandwaves are most prevalent within the Offshore Order Limits where sandwave heights can be as great as 5 m at the bedforms crest. Given updated analysis of bedforms and morphology within the Offshore Order Limits, sandwave clearance values used within the ES have been significantly reduced to 9% of the total length (as per 47). • Site clearance activities may be undertaken using a range of techniques, the suction hopper dredger will result in the greatest increase in suspended sediment and largest plume extent as material is released near the water surface during the disposal of material. • Boulder clearance activities will result in minimal increases in Suspended Sediment Concentrations (SSC) and have therefore not been considered in the assessment. • The scenario assessed relates to the largest potential volume of material related to site preparation activities. **Cable Installation** • Cable routes inevitably include a variety of seabed material and in some areas 3 m 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

Potential impact	Phase[a]			Maximum Design Scenario	Justification
	C	O	D		
				• Export cables: Installation via trenching of up to 484 km of cable, with a trench width of up to 3 m and a depth of up to 3 m. Total spoil volume of 2,178,000 m^3. Comprising: – Morgan export cable ○ Installation via trenching of up to 400 km of cable, with a trench width of up to 3 m and a depth of up to 3 m. Total spoil volume of 1,800,000 m^3. – Morecambe export cable ○ Installation via trenching of up to 84 km of cable, with a trench width of up to 3 m and a depth of up to 3 m. Total spoil volume of 378,000 m^3. **Operations and maintenance phase** Operational life of 35 years. Morgan subtidal export cables: • Up to 14 subtidal cable repair events (up to 4 km per event) totalling up to 56 km of subtidal cable repair over the lifetime of the Morgan Offshore Wind Project. • Up to 7 subtidal cable reburial events (up to 16 km per event) totalling up to 112 km over the lifetime of the Morgan Offshore Wind Project. Morecambe subtidal export cables: • Up to 7 subtidal cable repair events (up to 4 km per event) totalling up to 28 km subtidal repair over the lifetime of the Morecambe Offshore Windfarm. • Up to 7 subtidal cable reburial events (up to 3.4 km per event) totalling up to 23.8 km over the lifetime of the Morecambe Offshore Windfarm. **Decommissioning phase**	bound in terms of suspended sediment and dispersion potential assuming a trench with “v” shape cross section. • Cables may be buried by ploughing, trenching or jetting with jetting mobilising the greatest volume of material to increase SSCs. • The sequential construction scenario is included as the maximum design scenario as this results in the longest duration of impact. **Operation and maintenance phase** • The greatest foreseeable number of cable reburial and repair events is considered to be the MDS for sediment dispersion. **Decommissioning phase** • 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.

Potential impact	Phase[a]			Maximum Design Scenario	Justification
	C	O	D		
				• Cables to be removed but scour and cable protection will remain *in situ*. All external cable protection used within the MCZ will be designed to be removable (CoT108) with the requirement for removal agreed with stakeholders and regulators in lines with best practice and guidance at the time of decommissioning (CoT109).	
Direct damage to near surface marine archaeology receptors.	✓	✓	✓	**Pre Construction and Construction phase** Up to 14,830,184 m^2 of seabed impact : • Pre-construction UXO removal: clearance of up to 25 UXOs ranging from 250 kg up to 1,500 kg, with 250 kg being the most likely. • export cable installation: up to 11,331,680 m^2 of impact from installation of up to 484 km of buried offshore export cables (assumes 100% of all cables are buried) over a 24 month period (sequential construction scenario): – Morgan Offshore Wind Project: Transmission Assets up to 60 m wide sandwave clearance along 400 km Morgan export cables – Morecambe Offshore Windfarm: Transmission Assets up to 48 m wide sanwave clearance for 84 km Morecambe export cables; – seabed impact width of up to 20 m for boulder clearance along Morgan and Morecambe export cables; – seabed impact width of up 3 m for cable burial; – sandwave clearance: required for up to 9% of 400 km Morgan export cables and 9% of 48 km Morecambe export cables; and – pre-lay preparation (boulder and debris clearance): is likely to be required across all export cables. Although, for the purposes of the MDS, boulder clearance only has been assumed across up to 91% of the 400 km Morgan	Maximum footprint which would be affected during the construction, operation and maintenance and decommissioning phases. **Construction phase** Site preparation: The MDS assumes that the width of disturbance for sandwave and pre-lay preparation (boulder and debris clearance) also includes subsequent burial. Pre-lay preparation (boulder and debris clearance) is likely to be required across all export cables. For the purposes of the MDS, and to avoid double counting of the total footprint with sandwave clearance activities, the MDS assumes up to 91% of Morgan export cables will be subject to pre-lay preparation (boulder and debris clearance) only and up to 91% of Morecambe export cables will be subject to pre-lay preparation (boulder and debris clearance) only. It is anticipated that 9% of the cable route will require sandwave clearance and the sandwaves requiring clearance are likely to be in the range of 5 m in height. 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

Potential impact	Phase[a]			Maximum Design Scenario	Justification
	C	O	D		
				export cables and 91% of 84 km Morecambe export cables (see justification). • anchor placements: up to 60,000 m² of seabed impact from a 100 m² anchor set placement (five anchors per set) event every 500 m during offshore export cable installation within the nearshore area (10 km for each of the four Morgan export cables and each of the two Morecambe export cables); • cable removal: Up to 585,000 m² from the removal of 28 km of disused cables; and **Operation and maintenance phase** Up to 4,648,000 m² of seabed impact due to repair/reburial of export cables. • Up to 1,120,000 m² for repair of Morgan subtidal export cables: Up to 14 subtidal cable repair events (up to 4 km per event) totalling up to 56 km of subtidal cable repair over the lifetime of the Morgan Offshore Wind Project. • Up to 2,240,000 m² for the reburial of Morgan subtidal export cables: Up to 7 subtidal cable reburial events (up to 16 km per event) totalling up to 112 km over the lifetime of the Morgan Offshore Wind Project. • Up to 700,000 m² for repair of Morecambe subtidal export cables: Up to 7 subtidal cable repair events (up to 4 km per event) totalling up to 28 km subtidal repair over the lifetime of the Morecambe Offshore Windfarm. • Up to 588 000 m² for reburial of Morecambe subtidal export cables: Up to 7 subtidal cable reburial events (up to 3.4 km per event) totalling up to 23.8 km over the lifetime of the Morecambe Offshore Windfarm. Operational phase up to 35 years.	affected has been calculated, for the purposes of the MDS, assuming a mound of uniform thickness of 0.5 m height. 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. The sequential construction scenario is included as the maximum design scenario as this results in the longest duration of impact. **Operation and maintenance phase:** The MDS for seabed impact associated with export cable maintenance includes repairs/reburial of subtidal cables. **Decommissioning phase:** The MDS assumes the complete removal of all cables but that all cable protection may be left *in situ.*

Potential impact	Phase[a]			Maximum Design Scenario	Justification
	C	O	D		
				Decommissioning phase Temporary seabed impact due to: • subtidal cable removal: disturbance from the removal of up to 484 km of Morgan and Morecambe export cables.	
Alteration of sediment transport regimes	×	✓	×	During the construction phase the potential changes will be gradual as the presence of infrastructure increases reaching the MDS outlined below in the operations and maintenance phase. The MDS in terms of the presence of infrastructure in the form of cable protection would be on the completion of construction, during the operations and maintenance phase. **Operation and maintenance phase** • Morgan export cables (400 km): cable protection (armouring) along 10%/40 km of the cable for ground conditions, with a height of up to 2 m and up to 10 m width. Up to 45 cable crossings, each crossing has a height of up to 2.8 m, a width of up to 30 m and a length of up to 50 m. • Morecambe export cables (84 km): cable protection (armouring) along 10%/8.4 km of the cable for ground conditions, with a height of up to 2 m and up to 10 m width. Up to six cable crossings, each crossing has a height of up to 2.8 m, a width of up to 30 m and a length of up to 150 m.	This provides the largest obstruction to flow in the water column. See Volume 2, Chapter 1: Physical processes of the ES.

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

8.10 Assessment methodology

8.10.1 Overview

8.10.1.1 This assessment has been undertaken in accordance with Principles of Cultural Heritage Impact Assessment in the UK (IEMA, IHBC and CIfA, 2021).

8.10.1.2 The approach to determining the significance of effects is a two-stage process that involves defining the magnitude of the impact and the sensitivity of the receptor. This section describes the criteria applied in this chapter to assign values to the magnitude of impacts and the sensitivity of the receptors. The terms used to define magnitude and sensitivity are based on those which are described in further detail in Volume 1, Chapter 5: EIA Methodology of the ES.

8.10.2 Receptor sensitivity/value

8.10.2.1 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.

8.10.2.2 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.

8.10.2.3 Based on Historic England'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.

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

- period;
- rarity;
- documentation;
- group value;
- survival/condition; and
- potential.

8.10.2.5 The criteria for defining value, and therefore sensitivity, in this chapter are outlined in **Table 8.18** below.

Table 8.18: Value criteria

Value	Definition
Very High	Singular or excellent example and/or high potential to contribute to knowledge and understanding. Receptors with a demonstrable international or national dimension to their importance are likely to fall within this category. Wrecked ships and aircraft that are protected under the Protection of Wrecks Act 1973, Ancient Monuments and Archaeological Areas Act 1979 or Protection of Military Remains Act 1986 with an international dimension or their importance as well as as-yet undesignated sites that are demonstrably of very high archaeological value. Known submerged prehistoric sites and landscapes with a confirmed presence of largely in situ artefactual material or palaeogeographic features with demonstrable potential to include artefactual and/or palaeoenvironmental material, possibly as part of a prehistoric site or landscape.
High	Good example and/or high potential to contribute to knowledge and understanding. Includes shipwrecks and aircraft that are protected under the Protection of Wrecks Act 1973, Ancient Monuments and Archaeological Areas Act 1979 or Protection of Military Remains Act 1986 as well as as-yet undesignated sites that do not have statutory protection or equivalent significance, but have high potential based on an assessment of their importance in terms of build, use, loss, survival and investigation (BULSI). Prehistoric deposits with high potential to contribute to an understanding of the palaeoenvironment.
Medium	Average example and/or moderate potential to contribute to knowledge and understanding and/or outreach. Includes wrecks of ships and aircraft that do not have statutory protection or equivalent significance, but have moderate potential based on an assessment of their importance in terms of BULSI. Prehistoric deposits with moderate potential to contribute to an understanding of the palaeoenvironment.

Value	Definition
Low	Below average example and/or low potential to contribute to knowledge and understanding and/or outreach. Includes wrecks of ships and aircraft that do not have statutory protection or equivalent significance, but have low potential based on an assessment of their importance in terms of BULSI. Prehistoric deposits with low potential to contribute to an understanding of the palaeoenvironment.
Negligible	Poor example and/or little or no potential to contribute to knowledge and understanding and/or outreach. Assets with little or no surviving archaeological interest.

8.10.3 Magnitude of impact

8.10.3.1 The criteria for defining magnitude in this chapter are outlined in **Table 8.19** below.

Table 8.19: Magnitude of Impact criteria

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 or 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, or alteration to, one (maybe more) key characteristics, composition or attributes
	Beneficial	Minor benefit to, or addition of, one (maybe more) key characteristics, composition or attributes some beneficial impact on 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
No change		No loss or alteration of characteristics, composition or attributes; no observable impact in either direction.

8.10.4 Significance of effect

8.10.4.1 The significance of the effect upon marine archaeology has been determined by taking into account the value (and therefore sensitivity) of the receptor and the magnitude of the impact. The method employed for this assessment is presented in **Table 8.20**.

8.10.4.2 In all cases, the evaluation of receptor value (and therefore sensitivity), impact magnitude and significance of effect has been informed by professional judgement and is underpinned by narrative to explain the conclusions reached. Where a range of significance levels is presented, the final assessment for each effect is based upon expert judgement.

8.10.4.3 For the purpose of this assessment, any effects with a significance level of minor or less are not considered to be significant in terms of the EIA Regulations.

Table 8.20: Assessment matrix

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

8.10.4.4 Where the magnitude of impact is 'no change', no effect would arise.

8.10.4.5 The definitions for significance of effect levels are described as follows.

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

8.10.5 Approach to HSC

8.10.5.1 The assessment of effects on HSC has been undertaken in accordance with An Approach to Seascape Character Assessment (Natural England, 2012) and a methodology developed through consultation with Historic England.

8.10.5.2 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 Cumulative Effects Assessment (CEA).

8.10.5.3 HSC is not something that can be physically impacted, but something that can be changed; therefore, the approach to HSC 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 possible scale of change only.

8.10.5.4 The Transmission Assets will involve the construction of new infrastructure which has the potential to alter the HSC of the wider East Irish Sea and Liverpool Bay area, therefore the effects on the HSC are evaluated to determine the capacity of the HSC to accommodate change due to the introduction of Transmission Assets infrastructure.

8.10.5.5 The HSC assessment identified a variety of seascape characteristics within the 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); and
- seabed types and characteristics including coarse and fine sediment plains.

8.10.5.6 The Transmission Assets will introduce new infrastructure such as offshore export cables into the seabed and these will be managed through commitments to mitigation (namely CoT45 and CoT54). These would be modern installations and are in line with the existing seascape characteristics identified, including submarine cables.

8.10.5.7 The presence of Transmission Assets would not alter the character of modern fishing methods and activities within the area. The assessment provided within Volume 2, Chapter 6: Commercial Fisheries of the ES has concluded that there will be no significant effects to commercial fishery operations and therefore this character of the area will be retained.

8.10.5.8 Potential change to HSC regarding maritime debris (i.e. wrecks and associated material) have been mitigated through the measures adopted as part of the Transmission Assets for marine archaeology, for example, the implementation of AEZs and establishment of the PAD. Thus the project relationship to HSC regarding maritime debris is in line with the assessment for direct damage to near surface marine archaeology receptors (**section 8.11.3**): this is considered to be **no change** for known receptors and **low** for previously unknown receptors.

8.10.5.9 There are also known to be a number of proposed offshore wind farms within the wider seascape, including Morecambe Offshore Windfarm: Generation Assets, Morgan Offshore Wind Project: Generation Assets, and Mona 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 Transmission Assets would be in line with the modern installations already present in, and anticipated to be introduced to, the area.

8.10.5.10 It is therefore considered the HSC can accommodate the introduction of the Transmission Assets without altering the existing characteristics of the HSC.

8.11 Assessment of effects

8.11.1 Introduction

8.11.1.1 The impacts arising from the construction, operation and maintenance, and decommissioning phases of the Transmission Assets have been assessed. The impacts arising from the construction, operation and maintenance, and decommissioning phases of the Transmission Assets are listed in **Table 8.17**, along with the MDS against which each impact has been assessed. For clarity, MDS parameters are presented once across all phases as the embedded mitigation to reduce the magnitude of impact would be the same regardless of in which phase the impact occurred.

8.11.1.2 A description of the likely effect on receptors caused by each identified impact is given below.

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

8.11.2.1 The construction, operation and maintenance, and decommissioning of the Transmission Assets may lead to sediment disturbance and deposition leading to indirect impacts on marine archaeology receptors as identified in **section 8.6.** The MDS is represented by sandwave clearance and cable installation and is summarised in **Table 8.17**.

8.11.2.2 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 a beneficial impact through the re-burial of archaeological receptors.

Construction, operation and maintenance, and decommissioning phases

Sensitivity of the receptor

8.11.2.3 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 identified in **section 8.6** are vulnerable sites and sediment disturbance can expose them, thus potentially and adversely increasing the rate of degradation, or bury them and thereby afford the benefit of additional protection.

8.11.2.4 Additionally, there is potential for palaeolandscapes and associated submerged prehistoric archaeology to survive in the study area. The marine sediments overlying the subaerial quaternary sequence within the Offshore Order Limits is of variable thickness, so it is possible that activities associated with the Transmission Assets have the potential to indirectly impact marine archaeology receptors through exposure or burial. Material of this nature is rare and therefore valuable. Any discoveries would be considered important.

8.11.2.5 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 the sensitivity of the receptors, as per the methodology described in **section 8.10.2,** is considered to be **high**.

Magnitude of impact

8.11.2.6 The project design includes the provision of site preparation/sandwave clearance activities and installation of export cables which have the potential to increase suspended sediment concentrations in the construction phase with associated deposition.

8.11.2.7 The MDS for sandwave clearance for cable installation was along 9% of the 400 km export cable with a width of 60 m for Morgan Generation Assets and along 9% of the 84 km Morecambe export cable length with a width of 48 m. In practice, plough dredging 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 which may be undertaken. However, the assessment is undertaken applying modelling carried out for the Morgan Offshore Wind Project: Generation Assets ES (Morgan OWL, 2024) which simulated the use of a suction hopper dredger with a phasing representative of the scale of the sandwaves; dredging, and then depositing material by side casting within the cable corridor as it progressed along the route, resulting in higher SSC and dispersion plumes compared to plough dredging.

8.11.2.8 Sandwave clearance operations mobilise the greatest volume of material when compared to the range of construction activities. Modelling of sample sandwave clearance was undertaken along the north east corner of the Offshore Order Limits. The sediment plume extends circa 5 km in a principally east/west orientation. Suspended sediment concentrations are at their greatest at the dredging site and where they have remobilisation

following slack tide and may reach up to 1000 mg/l. However average concentrations are typically one tenth of this value and near background levels at the edge of the plume's extent. Sedimentation following the operation is in the order of 3 to 5 mm across the region where material is redistributed and < 0.1 mm at the extent of the plume.

8.11.2.9 The installation of inter-array and interconnector cables associated with the Morgan Offshore Wind Project: Generation Assets was modelled as part of the Morgan Offshore Wind Project: Generation Assets ES (Morgan OWL, 2024), the outputs of which can be seen in Volume 2, Annex 1.1: Physical processes associated modelling studies. As with the sandwave clearance, it is expected that cable installation activities will create a suspended sediment plume extending up to 5 km of the trenching operation. In the direct vicinity of the trenching SSC was found to be typically 500 mg/l whilst at the extents of the plume SSC levels dropped to 0.5 mg/l which is in the order of background level variation. Sedimentation levels beyond the immediate vicinity of the trench were circa 50 mm and reducing to < 0.5 mm within 2 km. Noting that much of the displaced material would, in reality, be used to backfill the trench.

8.11.2.10 Sediment disturbance and deposition during the operation and maintenance phase is represented by repair and reburial activities and associated anchoring and as such seabed disturbance and associated sediment deposition is expected to be minimal.

8.11.2.11 During the decommissioning phase disturbance and associated deposition may occur from the removal of up to 484 km of Morgan and Morecambe export cables and associated anchoring. The magnitude of sediment disturbance and deposition during the decommissioning phases are expected to be the same, or less than, the construction phase.

8.11.2.12 The measures adopted as part of the Transmission Assets such as the implementation of and adherence to the outline offshore WSI for archaeology (document reference: J17, as per CoT63) and as described in **section 8.8** 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.

8.11.2.13 Sediment disturbance and deposition leading to indirect impacts on marine archaeology receptors during the construction, operation and maintenance, and decommissioning of the Transmission 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**.

Significance of the effect

8.11.2.14 Overall, the sensitivity of the receptor is **high** and the magnitude of the impact is **low**. The effect will, therefore, be of **minor** adverse significance, which is not significant in EIA terms.

8.11.3 Direct damage to near surface marine archaeology receptors

8.11.3.1 Direct damage to near surface marine archaeology receptors within the Offshore Order Limits as identified in **section 8.8** has the potential to occur during the construction, operation and maintenance, and decommissioning phases. Direct damage may result from activities including sandwave clearance, pre-lay preparation (e.g. boulder and debris clearance), cable installation and repair, removal of existing cables and anchor placements associated with these activities. The MDS for direct damage to near surface marine archaeology receptors is summarised in **Table 8.17**.

Construction, operation and maintenance, and decommissioning phases

Sensitivity of the receptor

8.11.3.2 The study area retains a substantial 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. Shipwrecks are regarded as being of importance, as they add to our understanding of ship construction, maritime routes and movements of their period.

8.11.3.3 Activities associated with the Transmission Assets, such as trenching for cable burial have the potential to directly impact marine archaeology receptors during construction activities. There is potential for palaeolandscapes and associated submerged prehistoric archaeology to survive in the study area. Material of this nature is rare and therefore valuable. Any discoveries would be considered important.

8.11.3.4 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, as per the methodology described in **section 8.10.2,** the sensitivity of the receptor is considered to be **high**.

Magnitude of impact

8.11.3.5 The MDS for the construction phase is comprised of seabed preparation activities for the installation of export cables and associated cable protection and any associated vessel anchoring activities.

8.11.3.6 The MDS for the operation and maintenance phase is comprised of cable repair or reburial activities and any associated vessel anchor deployments.

8.11.3.7 Decommissioning of the Transmission Assets infrastructure will involve cable decommissioning and any associated and vessel anchoring activities. For the purposes of this assessment, the impacts of operation and maintenance and decommissioning activities are predicted to be no greater than those for construction.

8.11.3.8 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.

8.11.3.9 The measures adopted as part of the Transmission Assets such as the implementation of and adherence to AEZs and the adoption of PADs as detailed in the outline offshore WSI for archaeology (document reference: J17, as per CoT63) and as described in **section 8.8,** will ensure that all known archaeological receptors will be avoided and that there will be procedures in place for the reporting, recording and protection of any as yet unknown archaeology that may be encountered in the course of the Transmission Assets. This, along with the implementation and adherence to the PAD (document reference: J17, as per CoT63) for any prehistoric discoveries, ensures preservation by record, reducing the magnitude of the impact on submerged prehistoric archaeology to **low**.

8.11.3.10 AEZs will be established around each medium and high potential anomaly, within which no activities will take place unless agreed via consultation with Historic England and the MMO (AEZ are detailed in the offshore historic environment plan of the ES, document reference: B17). This will reduce the magnitude of the impact on known marine archaeology receptors to **no change**.

8.11.3.11 The outline offshore WSI for archaeology includes provision for archaeological input into surveys and the monitoring of AEZs. Provision will also be made for the recording of any new discoveries via the outline offshore WSI for archaeology (document reference: J17, as per CoT63). These measures will ensure preservation by record and reduce the magnitude of the impact on as yet unknown marine archaeology receptors to **low**.

8.11.3.12 Direct damage to near surface marine archaeology receptors is predicted to result in very minor loss or detrimental alteration to one or more characteristics, composition or attributes of the marine archaeology receptors. Due to the primary measures adopted as part of the project (**section 8.8**), the magnitude is considered to be **low** or **no change**.

Significance of the effect

8.11.3.13 Overall, the magnitude of the impact is **low** or **no change** and the sensitivity of the receptor is **high.** The effect will, therefore, be of **minor adverse** significance, which is not significant in EIA terms.

8.11.4 Alteration of sediment transport regimes

8.11.4.1 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 indirectly impact on the marine archaeology receptors identified in **section 8.6.2** and those that are as yet unknown within the study area and the immediate vicinity.

Operation and maintenance

Sensitivity of the receptor

8.11.4.2 The study area lies in a wider area that retains a substantial number of shipwrecks. Shipwrecks are rare, valuable, and vulnerable sites and significant alteration of the sediment transport regimes can expose them, thus potentially and adversely increasing the rate of degradation, or bury them and thereby afford the benefit of additional protection.

8.11.4.3 There is potential for palaeolandscapes and associated submerged prehistoric archaeology to survive in the study area. Material of this nature is rare and therefore valuable. Any discoveries would be considered important.

8.11.4.4 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, as per the methodology described in **section 8.10.2,** the sensitivity of the receptor is considered to be **high**.

Magnitude of impact

8.11.4.5 The presence of infrastructure relating to the Transmission Assets may lead to changes in sediment transport regime during the operation and maintenance phase. Specific modelling was not undertaken for this impact, with the assessment instead being based on and adapted from modelling for nearby projects, such as the Morgan Offshore Wind Project: Generation Assets (Morgan OWL, 2024), and the Mona Offshore Wind Project (Mona OWL, 2024). It is anticipated that cable protection may be required, however, this would only be necessary where a suitable burial depth may not be achieved due to ground conditions or the presence of existing infrastructure (i.e. cable crossing is required).

8.11.4.6 Although cable protection was included in the Morgan Offshore Wind Project: Generation Assets ES modelling its impact on physical processes is not readily isolated from the infrastructure as a whole (Morgan OWL, 2024). However, as part of the Mona Offshore Wind Project ES modelling it was provided along sections of the export cable (Mona OWL, 2024). Therefore, changes in sediment transport regimes have the potential to indirectly impact marine archaeology receptors adversely through exposure or beneficially through burial.

8.11.4.7 In the case of wave climate where the cable protection height was less than approximately 15% of the water depth there was no change in wave climate; whilst in shallower water the change was 0.5 to 1% of background levels at the site of cable protection reducing rapidly with distance and indistinguishable from background levels within 1 km of the site.

8.11.4.8 For tidal currents, where cables were perpendicular to tidal currents and continuous length of cable protection was provided there was a highly localised increase in current speed of circa 1% as flow is accelerated over and around the structure due to the depth reduction. The area influenced

extended circa 500 m from the structure however the influence diminished rapidly within this zone.

8.11.4.9 With regards to the impact of cable protection on sediment transport regimes, the magnitude of the impact would be highly dependent on the length and orientation of the cable protection. Baseline sediment transport, driven by residual tidal currents, runs in an easterly direction offshore and therefore largely parallel to the cable routes. However, closer inshore the sediment transport is parallel to the coast where cable protection, if required, may be perpendicular to these pathways. If and where cable protection is required in shallow subtidal conditions, the measures used will be of sufficiently low profile to cause minimal interruption to sediment transport. Descriptions of the possible types of cable protection to be utilised can be found in Volume 1, Chapter 3: Project description of the ES with the detail of design be outlined within the Cable Specification and Installation Plan (CSIP) to ensure that the most suitable protection is applied in line with the project commitments (as per CoT45).

8.11.4.10 To minimise the potential impact from the cables and removal of cables there is a commitment to bury cables where possible (as per CoT45). Where burial cannot be achieved to the required depth cable protection may be required. A Cable Burial Risk Assessment, which has been developed as part of the CSIP, establishes these parameters. The detail of design and construction will be outlined within the CSIP and would also determine the likely extent of any potential scour and would aim to mitigate this through site specific detailed design of scour protection measures. It is therefore likely that any secondary scour effects associated with cable protection would be confined to within a few meters of the direct footprint of that cable protection material.

8.11.4.11 The measures adopted as part of the Transmission Assets such as commitment to the ongoing monitoring of AEZs and the adoption of PADs as detailed in the outline offshore WSI and PAD for archaeology (document reference: J17, as per CoT63) and as described in **section 8.8** will ensure that the condition of all known archaeological receptors will be monitored through the operation and maintenance phase and that procedures are in place for the reporting, recording and protection of any as yet unknown archaeology that may be exposed in the course of the Transmission Assets.

8.11.4.12 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**.

Significance of the effect

8.11.4.13 Overall, the sensitivity of the receptor is **high** and the magnitude of the impact is **negligible**. 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

8.11.5 Future monitoring

8.11.5.1 **Table 8.21** below outlines the proposed monitoring commitments.

Table 8.21: Monitoring commitments

Commitment number	Measure adopted	How the measure will be secured
CoT63	An outline offshore written scheme of investigations (WSI) for archaeology has been prepared and submitted with the application for development consent. The outline offshore WSI for archaeology includes: • the requirement for Archaeological Exclusion Zones (AEZs) around those sites identified as having high and medium archaeological potential, as presented in the offshore historic environment plan; • the requirement for Temporary Archaeological Exclusion Zones (TAEZs), as presented in the offshore historic environment plan; • implementation of a protocol for archaeological discoveries (PAD) in accordance with 'Protocol for Archaeological Discoveries: Offshore Renewables Projects' (The Crown Estate, 2014); • the incorporation of marine archaeology specification and analysis in further pre-construction surveys such as geophysical, geotechnical, or ROV/diver surveys; • operational awareness and avoidance, where possible, of low potential anomalies; • where avoidance is not possible, mitigation measures for potential direct impacts to marine archaeology; • details of reporting and archival requirements; and • Post-consent detailed offshore WSI(s) for archaeology will be developed in accordance with the outline offshore WSI for archaeology, in consultation with Historic England.	Is secured as a condition of the deemed marine licence (outline offshore WSI for archaeology, document reference:J17, as per CoT63).

8.12 Cumulative effect assessment methodology

8.12.1 Introduction

8.12.1.1 The CEA takes into account the impact associated with the Transmission Assets together with other projects and plans. The projects and plans selected as relevant to the CEA presented within this chapter are based upon the results of a screening exercise (see Volume 1, Annex 5.5: Cumulative screening matrix and location plan of the ES).

8.12.1.2 The marine archaeology CEA methodology has followed the methodology set out in Volume 1, Chapter 5: EIA methodology of the ES. The cumulative assessment considers four scenarios.

- Scenario 1: Transmission Assets together with Morecambe Offshore Windfarm: Generation Assets.
- Scenario 2: Transmission Assets together with Morgan Offshore Wind Project: Generation Assets.
- Scenario 3: Transmission Assets together with Morgan Offshore Wind Project: Generation Assets and Morecambe Offshore Windfarm: Generation Assets.
- Scenario 4a to 4c: Scenario 3 together with Tier 1, Tier 2 and Tier 3 projects, defined as follows.
  - Scenario 4a: Scenario 3 and Tier 1 projects, plans and activities which are:
    - under construction;
    - permitted application;
    - submitted application; or
    - those currently operational that were not operational when baseline data were collected, and/or those that are operational but have an ongoing impact.
  - Scenario 4b: Scenario 4a and Tier 2 projects, plans and activities which a:
    - scoping report has been submitted in the public domain.
  - Scenario 4c: Scenario 4b and Tier 3 projects, plans and activities which are:
    - where a scoping report has not been submitted and it is not in the public domain;
    - identified in the relevant Development Plan; or
    - identified in other plans and programmes.

8.12.1.3 This assessment is followed by all other relevant projects, identified by tier.

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

8.12.1.5 The specific projects, plans and activities scoped into the CEA, are outlined in **Table 8.22**. 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, such as those occurring within the 2 km buffer for the purposes of this assessment.

Table 8.22: List of other projects, plans and activities considered within the CEA

Project/Plan	Status	Distance from the Transmission Assets (nearest point, km)	Description of project/plan	Dates of construction (if applicable)	Dates of operation (if applicable)	Overlap with the Transmission Assets
Generation Assets						
Morecambe Offshore Windfarm: Generation Assets	Submitted	0.00	480 MW Offshore wind farm (generating assets)	2026 - 2029	2029 - 2064	The construction, operation and maintenance and decommissioning phases of this project will overlap with the construction, operation and maintenance and decommissioning phases of the Transmission Assets.
Morgan Offshore Wind Project: Generation Assets	Submitted	0.00	1.5 GW Offshore wind farm (generating assets)	2026 - 2030	2030 – 2065	Considered alongside the Transmission Assets in Scenarios 1, 3, 4a, 4b and 4c.

Project/Plan	Status	Distance from the Transmission Assets (nearest point, km)	Description of project/plan	Dates of construction (if applicable)	Dates of operation (if applicable)	Overlap with the Transmission Assets
Tier 1						
Remedial works						
Isle of Man to UK Interconnector Cable - maintenance and repair (MLA/2016/00211)	Operational	0	This licence is for depositing additional armouring or protection whilst carrying out contingency repair and maintenance works on the Isle of Man interconnector cable. This includes placement of additional armouring or protection whilst carrying out contingency repair and maintenance works on the interconnector.	n/a	2018 to 2033	The maintenance activities associated with this project will overlap with the construction and operation and maintenance phases of the Transmission Assets.
Isle of Man Interconnector Cable - Cable Protection Remedial Works (MLA/2014/00201)	Operational	0	Maintenance works on the Isle of Man Interconnector cable protection. The installation of flexible filter units, comprising of three bags at two separate locations, but up to a maximum of eight at a cable crossing. Two original concrete mattresses used for cable protection will be removed.	n/a	2014 to 2065	The maintenance activities associated with this project will overlap with the construction and operation and maintenance phases of the Transmission Assets.

Project/Plan	Status	Distance from the Transmission Assets (nearest point, km)	Description of project/plan	Dates of construction (if applicable)	Dates of operation (if applicable)	Overlap with the Transmission Assets
Oil and gas infrastructure						
Millom West Platform	Decommissioning	0.49	Millom west field platform proposed for decommissioning. Wells will be plugged and cut 3 m below the level of the seabed. Wellheads will be removed and all equipment above the seabed will be removed.	n/a	Decommissioning 2024 to 2030	The decommissioning phase of this project will overlap with the construction and operation and maintenance phases of the Transmission Assets.
Tier 3						
Cables and pipelines						
Isle of Man – UK Interconnector 2	Pre-application	N/A	A new 70 MW to 100 MW HVAC interconnector to be operational by 2030 between the Isle of Man and north west England.	2024 to 2030	2030 onwards	The construction, operation and maintenance, and decommissioning phases of this project will temporally overlap with the construction and operation and maintenance phases of the Transmission Assets.

8.12.2 Scope of cumulative effects assessment

8.12.2.1 The impacts identified in **Table 8.23** have been selected as those having the potential to result in the greatest effect on an identified receptor or receptor group. The cumulative effects presented and assessed in this section have been selected from the Project Design Envelope provided in Volume 1, Chapter 3: Project Description, of this ES as well as the publicly available information available on other projects and plans. Effects of greater adverse significance are not predicted to arise should any other development scenario, based on details within the Project Design Envelope (e.g., different foundation type or substation layout), to that assessed here, be taken forward in the final design scheme.

8.12.2.2 The range of potential cumulative impacts identified in **Table 8.23** below is a subset of those considered for the Transmission Assets alone assessment (**Table 8.17**). This is for one of two reasons:

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

8.12.2.3 Of the impacts set out in **Table 8.17**, direct damage to deeply buried marine archaeology receptors has not been included in the CEA as there is no impact receptor pathway for deeply buried deposits.

Table 8.23: Scope of assessment of cumulative effects

Cumulative effect	Phase[a]			Project(s) considered	Justification
	C	O	D		
Sediment disturbance and deposition leading to indirect impacts on marine archaeology receptors.	✓	✓	✓	Maximum design scenario as described for the Transmission Assets (**Table 8.17**) assessed cumulatively with the following other projects/plans: • **Scenario 1** MDS as described for the Transmission assets **(Table 8.13**) assessed cumulatively with the Morecambe Offshore Windfarm: Generation Assets. **Scenario 2** MDS as described for the Transmission assets **(Table 8.13**) assessed cumulatively with the Morgan Offshore Wind Project: Generation Assets. **Scenario 3** MDS as described for the Transmission assets (**Table 8.13**) assessed cumulatively with Morgan Offshore Wind Project: Generation Assets and Morecambe Offshore Windfarm: Generation Assets. **Scenario 4a** The MDS as described for Scenario 3 assessed cumulatively with the following other projects/plans. Tier 1 • Remedial works: – Isle of Man to UK Interconnector Cable maintenance licences (MLA/2016/00211 and MLA/2014/00201). • Oil and Gas Projects:	Maximum potential for cumulative effects of sediment disturbance and deposition leading to indirect effects on marine archaeology receptors.

Cumulative effect	Phase[a]			Project(s) considered	Justification
	C	O	D		
				– Millom West Platform decommissioning phase **Scenario 4b** The MDS as described for Scenario 4a assessed cumulatively with the following other projects/plans. Tier 2 • Tier 1 projects (Scenario 4a). – No tier 2 projects overlap with the construction phase of the Transmission Assets. **Scenario 4c** The MDS as described for Scenario 4b assessed cumulatively with the following other projects/plans. Tier 3 • Tier 1 and 2 projects. • Cables and pipelines: – Isle of Man Interconnector Cable 2 construction phase.	
Direct damage to near surface marine archaeology receptors.	✓	✓	✓	MDS as described for the Transmission Assets assessed cumulatively with the following other projects/plans. **Scenario 1** MDS as described for the Transmission assets (**Table 8.13**) assessed cumulatively with the Morecambe Offshore Windfarm: Generation Assets. **Scenario 2** MDS as described for the Transmission assets **(Table 8.13**) assessed cumulatively with the Morgan Offshore Wind Project: Generation Assets.	Maximum potential for culminative effects of direct damage to near surface marine archaeology receptors.

Cumulative effect	Phase[a]			Project(s) considered	Justification
	C	O	D		
				Scenario 3 MDS as described for the Transmission assets (**Table 8.13**) assessed cumulatively with Morgan Offshore Wind Project: Generation Assets and Morecambe Offshore Windfarm: Generation Assets. **Scenario 4a** The MDS as described for Scenario 3 assessed cumulatively with the following other projects/plans. Tier 1 • Remedial works: – Isle of Man to UK Interconnector Cable maintenance licences (MLA/2016/00211 and MLA/2014/00201). • Oil and Gas Projects: – Millom West Platform decommissioning phase **Scenario 4b** The MDS as described for Scenario 4a assessed cumulatively with the following other projects/plans. Tier 2 • Tier 1 projects (Scenario 4a). – No tier 2 projects overlap with the construction phase of the Transmission Assets. **Scenario 4c** The MDS as described for Scenario 4b assessed cumulatively with the following other projects/plans. Tier 3 • Tier 1 and 2 projects.	

Cumulative effect	Phase[a]			Project(s) considered	Justification
	C	O	D		
				• Cables and pipelines: – Isle of Man Interconnector Cable 2 construction phase.	
Alteration of sediment transport regimes.	✗	✓	✗	MDS as described for the Transmission Assets assessed cumulatively with the following other projects/plans. **Scenario 1** MDS as described for the Transmission assets (**Table 8.13**) assessed cumulatively with the Morecambe Offshore Windfarm: Generation Assets. **Scenario 2** MDS as described for the Transmission assets **(Table 8.13**) assessed cumulatively with the Morgan Offshore Wind Project: Generation Assets. **Scenario 3** MDS as described for the Transmission assets (**Table 8.13**) assessed cumulatively with Morgan Offshore Wind Project: Generation Assets and Morecambe Offshore Windfarm: Generation Assets. **Scenario 4a** The MDS as described for Scenario 3 assessed cumulatively with the following other projects/plans. Tier 1 • Remedial works: – Isle of Man to UK Interconnector Cable maintenance licences (MLA/2016/00211 and MLA/2014/00201). • Oil and Gas Projects: – Millom West Platform decommissioning phase	Maximum potential for cumulative effects of alteration of transport regimes to have indirect impacts on marine archaeology receptors.

Cumulative effect	Phase[a]			Project(s) considered	Justification
	C	O	D		
				Scenario 4b The MDS as described for Scenario 4a assessed cumulatively with the following other projects/plans. Tier 2 • Tier 1 projects (Scenario 4a). – No tier 2 projects overlap with the construction phase of the Transmission Assets. **Scenario 4c** The MDS as described for Scenario 4b assessed cumulatively with the following other projects/plans. Tier 3 • Tier 1 and 2 projects. • Cables and pipelines: – Isle of Man Interconnector Cable 2 construction phase.	

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

8.13 Cumulative effects assessment

8.13.1 Introduction

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

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

- Scenario 1: Transmission Assets together with Morecambe Offshore Windfarm: Generation Assets.
- Scenario 2: Transmission Assets together with Morgan Offshore Wind Project: Generation Assets.
- Scenario 3: Transmission Assets together with Morgan Offshore Wind Project: Generation Assets and Morecambe Offshore Windfarm: Generation Assets.
- Scenario 4a to 4c: Transmission Assets together with Morgan Offshore Wind Project: Generation Assets and Morecambe Offshore Windfarm: Generation Assets (Scenario 3) and other relevant projects and plans.

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

8.13.2.1 Increases in SSC may arise due to seabed preparation involving sandwave clearance activities and the installation, repair and removal of export cables. Should the other projects cited take place concurrently with the Transmission Assets and Generation Assets (construction, operation and maintenance, or decommissioning phase), there is potential for cumulative increased turbidity levels.

8.13.2.2 The CEA for impacts associated with increases in SSC and sediment deposition for scenarios 1 to 3 are presented in **Table 8.24**.

Table 8.24: Sediment disturbance and deposition leading to indirect impacts on marine archaeology receptors (Scenarios 1-3)

	Scenario 1: Transmission Assets + Morecambe Offshore Windfarm: Generation Assets	Scenario 2: Transmission Assets + Morgan Offshore Wind Project: Generation Assets	Scenario 3: Transmission Assets + Morecambe Offshore Windfarm: Generation Assets and Morgan Offshore Wind Project: Generation Assets
Construction phase			
Sensitivity of receptor	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. 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. Material of this nature is rare and therefore valuable. Any discoveries would be considered important. The sensitivity of the submerged prehistoric archaeology across both project areas is deemed to be **high**.	The sensitivity of the receptor is **high** as per Scenario 1.	The sensitivity of the receptor is **high** as per Scenario 1.
Magnitude of impact	The construction phase of Transmission Assets is due to overlap with the construction phase of Morecambe Offshore Windfarm: Generation Assets within the Offshore	The construction phase of Transmission Assets is due to overlap with the construction phase of Morgan Offshore Wind Project: Generation Assets, construction	The construction phase of Transmission Assets is due to overlap with the construction phases of both the Morecambe Offshore Windfarm: Generation Assets and Morgan

	Scenario 1: Transmission Assets + Morecambe Offshore Windfarm: Generation Assets	Scenario 2: Transmission Assets + Morgan Offshore Wind Project: Generation Assets	Scenario 3: Transmission Assets + Morecambe Offshore Windfarm: Generation Assets and Morgan Offshore Wind Project: Generation Assets
	Order Limits and therefore have the potential to increase sediment disturbance and deposition from the additional site preparation and turbine installation associated with the Generation Assets, leading to a cumulative indirect impact on marine archaeology receptors. Construction activities such as site preparation, cable and foundation installation may result in increased suspended sediment concentration, and associated deposition of sediment. The MDS for the Morecambe Offshore Windfarm: Generation Assets includes seabed preparation for 35 conical gravity bases, two conical gravity base OSPs, up to 8 km of sandwave clearance, foundation installation of 30 monopile wind turbine structures, two monopile OSPs and 80 km of cable trenching.. In terms of sedimentation, 'light' deposition (in the order of millimetres) is anticipated (Morecambe OWL, 2024). It is noted that given the relationship of these projects' site preparation and construction scenarios would be phased and SSC increases would not occur concurrently. However, should multiple operations be undertaken plumes would be advected on the tide	activities such as site preparation, cable and foundation installation may result in increased suspended sediment concentration, and associated deposition of sediment. Construction activities for the MDS for SSC include site preparation with sandwave clearance along 286 km inter-array and interconnector cables, installation of up to 45 three-legged jacket piles, 23 conical gravity base foundations, a six-legged OSP with three piles per leg and trenching for 450 km of inter-array and interconnector cables. Sedimentation depth is typically <50 mm beyond the immediate vicinity of the installation and less than one tenth of this value in the wider domain and is generally limited to the Morgan Offshore Wind Project: Generation Assets. The measures adopted as part of the Transmission Assets as outlined in **section 8.8** and **Table 8.15** include the record of AEZs for all known medium and high potential assets on a plan and development of and adherence to a PAD (document reference: J17; CoT63) to ensure that any newly exposed	Offshore Wind Project: Generation Assets. However, no additional cumulative effects will arise other than those stated in Scenarios 1 and 2, as the Morgan The decommissioning phase of Transmission Assets is due to overlap with the construction phases of both the Morecambe Offshore Windfarm: Generation Assets and Morgan Offshore Wind Project: Generation Assets. However, no additional cumulative effects will arise other than those stated in Scenarios 1 and 2, as the Morgan Generation Assets and Morecambe Generation Assets are too far apart for the impacts from those projects to interact. The cumulative effect will result in very minor loss or detrimental alteration to one or more characteristics, composition or attributes. The magnitude is therefore considered to be **negligible**.

	Scenario 1: Transmission Assets + Morecambe Offshore Windfarm: Generation Assets	Scenario 2: Transmission Assets + Morgan Offshore Wind Project: Generation Assets	Scenario 3: Transmission Assets + Morecambe Offshore Windfarm: Generation Assets and Morgan Offshore Wind Project: Generation Assets
	and not towards one another and these activities would be of limited spatial extent and frequency and plume interactions likely of a low magnitude and short duration. In both cases the majority of sedimentation would occur within close proximity to each installation however, given the active sediment transport regime deposited material would be redistributed across the 5 km area of the modelled plume. The measures adopted as part of the Transmission Assets as outlined in **section 8.8** and **Table 8.15** include the record of AEZs for all known medium and high potential assets on a plan and development of and adherence to a PAD (document reference: J17; CoT63) to ensure that any newly exposed archaeological assets are recorded and, where appropriate, TAEZs and AEZs can be implemented. 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**.	archaeological assets are recorded and, where appropriate, TAEZs and AEZs can be implemented. 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**.	

	Scenario 1: Transmission Assets + Morecambe Offshore Windfarm: Generation Assets	Scenario 2: Transmission Assets + Morgan Offshore Wind Project: Generation Assets	Scenario 3: Transmission Assets + Morecambe Offshore Windfarm: Generation Assets and Morgan Offshore Wind Project: Generation Assets
Significance of effect	Overall, 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.	Overall, 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.	Overall, 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.
Further mitigation and residual significance	N/A	N/A	N/A
Operation and maintenance phase			
Sensitivity of receptor	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. 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. Material of this nature is rare and therefore valuable. Any discoveries would be considered important. The sensitivity of the submerged prehistoric archaeology	The sensitivity of the receptor is **high** as per Scenario 1.	The sensitivity of the receptor is **high** as per Scenario 1.

	Scenario 1: Transmission Assets + Morecambe Offshore Windfarm: Generation Assets	Scenario 2: Transmission Assets + Morgan Offshore Wind Project: Generation Assets	Scenario 3: Transmission Assets + Morecambe Offshore Windfarm: Generation Assets and Morgan Offshore Wind Project: Generation Assets
	across both project areas is deemed to be **high**.		
Magnitude of impact	The operation and maintenance phase of Transmission Assets is due to overlap with the operation and maintenance phase of Morecambe Offshore Windfarm: Generation Assets and therefore have the potential to increase sediment disturbance and deposition leading to a cumulative indirect impact on marine archaeology receptors. Activities such as cable repair and reburial may result in increased suspended sediment concentration, and associated deposition of sediment. Potential cumulative impacts may relate to a repair and reburial footprint of up to 200 m of cable repaired or replaced annually and 100 m of cable reburied annually, assuming a 10 m disturbance width at Morecambe Offshore Wind Farm: Generation Assets per year. However, maintenance activities are both intermittent and a smaller scale than that of the construction phase and therefore any potential cumulative impacts are less likely to occur and be on a smaller scale.	The operation and maintenance phase of Transmission Assets is due to overlap with the operation and maintenance phase of Morgan Offshore Wind Project: Generation Assets and therefore activities such as cable repair and reburial may result in increased suspended sediment concentration, and associated deposition of sediment. The MDS for repair and reburial of inter-array cables is for up to 8 km in one event every five years and 20 km in one event every five years. Similarly, for the interconnector the MDS states three repair events of 19.63 km in 10 years and one reburial event of up to 3 km every five years. However, maintenance activities are both intermittent and a smaller scale than that of the construction phase and therefore any potential cumulative impacts are less likely to occur and be on a smaller scale. If maintenance works to Transmission Assets and the Morgan Offshore Wind Project: Generation Assets occur	The operation and maintenance phase of Transmission Assets is due to overlap with the construction phases of both the Morecambe Offshore Windfarm: Generation Assets and Morgan Offshore Wind Project: Generation Assets. However, no additional cumulative effects will arise other than those stated in Scenarios 1 and 2, as the Morgan Generation Assets and Morecambe Generation Assets are too far apart for the impacts from those projects to interact. The cumulative effect will result in very minor loss or detrimental alteration to one or more characteristics, composition or attributes. The magnitude is therefore considered to be **negligible**.

	Scenario 1: Transmission Assets + Morecambe Offshore Windfarm: Generation Assets	Scenario 2: Transmission Assets + Morgan Offshore Wind Project: Generation Assets	Scenario 3: Transmission Assets + Morecambe Offshore Windfarm: Generation Assets and Morgan Offshore Wind Project: Generation Assets
	If maintenance works to the Transmission Assets and the Morecambe Offshore Windfarm: Generation Assets occur simultaneously, it is likely that suspended sediment plumes from export cable and inter array cable repair or reburial could interact. However, these activities would be of limited spatial extent and frequency and plume interactions likely of a low magnitude and short duration. The measures adopted as part of the Transmission Assets as outlined in **section 8.8** and **Table 8.15** include the development of and adherence to a PAD (document reference: J17, as per CoT63) to ensure that any newly exposed archaeological assets are recorded and, where appropriate, TAEZs and AEZs can be implemented. The cumulative effect will result in very minor loss or detrimental alteration to one or more characteristics, composition or attributes. The magnitude is therefore considered to be **negligible**.	simultaneously, it is likely that suspended sediment plumes from cable repair or reburial could interact. However, these activities would be of limited spatial extent and frequency and plume interactions likely of a low magnitude and short duration. The measures adopted as part of the Transmission Assets as outlined in **section 8.8** and **Table 8.15** include the development of and adherence to a PAD (document reference: J17, as per CoT63) to ensure that any newly exposed archaeological assets are recorded and, where appropriate, TAEZs and AEZs can be implemented. The cumulative effect will result in very minor loss or detrimental alteration to one or more characteristics, composition or attributes. The magnitude is therefore considered to be **negligible**.	
Significance of effect	Overall, the magnitude of the cumulative impact is deemed to be	Overall, the magnitude of the cumulative impact is deemed to be	Overall, the magnitude of the cumulative impact is deemed to be

	Scenario 1: Transmission Assets + Morecambe Offshore Windfarm: Generation Assets	Scenario 2: Transmission Assets + Morgan Offshore Wind Project: Generation Assets	Scenario 3: Transmission Assets + Morecambe Offshore Windfarm: Generation Assets and Morgan Offshore Wind Project: Generation Assets
	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.	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.	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.
Further mitigation and residual significance	N/A	N/A	N/A
Decommissioning phase			
Sensitivity of receptor	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. 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. Material of this nature is rare and therefore valuable. Any discoveries would be considered important. The sensitivity of the submerged prehistoric archaeology across both project areas is deemed to be **high**.	The sensitivity of the receptor is **high** as per Scenario 1.	The sensitivity of the receptor is **high** as per Scenario 1.

	Scenario 1: Transmission Assets + Morecambe Offshore Windfarm: Generation Assets	Scenario 2: Transmission Assets + Morgan Offshore Wind Project: Generation Assets	Scenario 3: Transmission Assets + Morecambe Offshore Windfarm: Generation Assets and Morgan Offshore Wind Project: Generation Assets
Magnitude of impact	The decommissioning phase of Transmission Assets is due to overlap with the decommissioning phase of Morecambe Offshore Windfarm: Generation Assets and therefore have the potential to increase sediment disturbance and deposition leading to a cumulative indirect impact on marine archaeology receptors. The magnitude of the increase in SSCs arising from decommissioning activities has been described in **section 8.9.1** as having an MDS, at worst, equal to the construction phase. The primary source of SSC increase would be through the removal of cabling through similar trenching techniques as implemented during site preparation and installation. Decommissioning of the Morecambe Offshore Windfarm: Generation Assets will most likely occur on the same projected timeline as the Transmission Assets, with cumulative impacts of the same magnitude described for the construction phase to be expected. The measures adopted as part of the Transmission Assets as outlined in **section 8.8** and **Table 8.15** include the development of and adherence to a PAD to ensure that any newly	Decommissioning of the Morgan Offshore Wind Project: Generation Assets will most likely occur on the same projected timeline as the Transmission Assets, with cumulative impacts of the same magnitude described for the construction phase to be expected. The measures adopted as part of the Transmission Assets as outlined in **section 8.8** and **Table 8.15** 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. 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**.	The decommissioning phase of Transmission Assets is due to overlap with the construction phases of both the Morecambe Offshore Windfarm: Generation Assets and Morgan Offshore Wind Project: Generation Assets. However, no additional cumulative effects will arise other than those stated in Scenarios 1 and 2, as the Morgan Generation Assets and Morecambe Generation Assets are too far apart for the impacts from those projects to interact. The cumulative effect will result in very minor loss or detrimental alteration to one or more characteristics, composition or attributes. The magnitude is therefore considered to be **negligible**.

	Scenario 1: Transmission Assets + Morecambe Offshore Windfarm: Generation Assets	Scenario 2: Transmission Assets + Morgan Offshore Wind Project: Generation Assets	Scenario 3: Transmission Assets + Morecambe Offshore Windfarm: Generation Assets and Morgan Offshore Wind Project: Generation Assets
	exposed archaeological assets are recorded and, where appropriate, TAEZs and AEZs can be implemented. 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**.		
Significance of effect	Overall, 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.	Overall, 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.	Overall, 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.
Further mitigation and residual significance	N/A	N/A	N/A

Table 8.25: Sediment disturbance and deposition leading to indirect impacts on marine archaeology receptors (Scenarios 4a-4c)

	Scenario 4a Scenario 3 + Tier 1	Scenario 4b: Scenario 4a + Tier 2	Scenario 4c: Scenario 4b + Tier 3
Construction Phase			
Sensitivity of receptor	The sensitivity of all receptors is **high** as described in scenario 1-3, and as listed in **section 8.10.2**.		
Magnitude of impact	The cumulative effects assessment for Scenario 4a includes the Transmission and Generation Assets (Scenario 3) together with the following Tier 1 projects: Tier 1 projects include: • Millom West Platform decommissioning phase • Remedial works for Isle of Man to UK Interconnector Cable maintenance licences (MLA/2016/00211 and MLA/2014/00201). The construction phase of the Transmission Assets and Generation Assets also coincides with the maintenance and repair of cables and cable protection of the Isle of Man to UK Interconnector Cable. Additionally, maintenance works may involve the replacement of concrete mattressing cable protection with rock filled filter units. The route of the interconnector runs directly through the Transmission Assets Order Limits and aligns with the north offshore export cable corridor. Thus, is likely that if activities overlap that suspended sediment plumes could interact, as they may originate from a similar source.	There are no Tier 2 developments considered within the CEA which have a spatial or temporal overlap with the construction phase of the Transmission Assets.	The cumulative effects assessment for Scenario 4c considers Scenario 4b with the following Tier 3 projects: • Isle of Man Interconnector Cable 2. The construction of a second interconnector cable between the Isle of Man and the UK may occur during the construction phase of the Transmission Assets as it is due to be operational in 2030. Interconnector cable installation activities would likely be of similar magnitude and extent as those associated with the Transmission Assets cable installation operations. Dependent on the detailed design and cable routing associated with the interconnector cable a cumulative impact may arise with the Transmission Assets. As a Tier 3 project there is limited information available in this respect, however it is anticipated that this impact would be temporary in nature and of limited scale. The measures adopted as part of the Transmission Assets as outlined in **section 8.8** and **Table 8.15** include the development of and adherence to a PAD to ensure that any newly exposed archaeological assets are recorded and,

	Scenario 4a Scenario 3 + Tier 1	Scenario 4b: Scenario 4a + Tier 2	Scenario 4c: Scenario 4b + Tier 3
	The measures adopted as part of the Transmission Assets as outlined in **section 8.8** and **Table 8.15** 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 (as per CoT63). 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**.		where appropriate, TAEZs and AEZs can be implemented (as per CoT63) 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**.
Significance of effect	Overall, 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.	There are no Tier 2 developments considered within the CEA which have a spatial or temporal overlap with the construction phase of the Transmission Assets.	Overall, 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.
Further mitigation and residual significance	No effects which are significant in EIA terms have been identified therefore no further mitigation measures are proposed.		
Operation and Maintenance Phase			
Sensitivity of receptor	The sensitivity of the receptors will be the same as described for the construction phase, and as listed in **section 8.10.2**.		
Magnitude of Impact	The cumulative effects assessment for Scenario 4a considers Scenario 3 together with the following Tier 1 projects: • Millom West Platform decommissioning phase.	There are no Tier 2 developments considered within the CEA which have a spatial or temporal overlap with the operation and maintenance phase of the Transmission Assets.	There are no Tier 3 developments considered within the CEA which have a spatial or temporal overlap with the operation and maintenance phase of the Transmission Assets.

	Scenario 4a Scenario 3 + Tier 1	Scenario 4b: Scenario 4a + Tier 2	Scenario 4c: Scenario 4b + Tier 3
	• Remedial works for Isle of Man to UK Interconnector Cable maintenance licences (MLA/2016/00211 and MLA/2014/00201). As described in Scenario 3, a small cumulative change in SSC and deposition is expected between the Transmission Assets and the Tier 1 projects. 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**.		
Significance of effect	Overall, the magnitude of the cumulative impact 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.	There are no Tier 2 developments considered within the CEA which have a temporal overlap with decommissioning phase of the Transmission Assets. Overall, the magnitude of the cumulative impact is low and the sensitivity of the receptors is high in line with the Transmission Assets and Generation Assets (Scenario 3). The cumulative effect will, therefore, be of **minor** adverse significance, which is not significant in EIA terms.	There are no Tier 3 developments considered within the CEA which have a temporal overlap with the decommissioning phase of the Transmission Assets. Overall, the magnitude of the cumulative impact is low and the sensitivity of the receptors is high in line with the Transmission Assets and Generation Assets (Scenario 3). The cumulative effect will, therefore, be of **minor** adverse significance, which is not significant in EIA terms.
Further mitigation and residual significance	No effects which are significant in EIA terms have been identified therefore no further mitigation measures are proposed.		
Decommissioning Phase			
Sensitivity of receptor	The sensitivity of the receptors will be the same as described for the construction phase, and as listed in **section 8.10.2**.		

	Scenario 4a Scenario 3 + Tier 1	Scenario 4b: Scenario 4a + Tier 2	Scenario 4c: Scenario 4b + Tier 3
Magnitude of Impact	There are no Tier 1 developments considered within the CEA which have a temporal overlap with the operation and maintenance phase of the Transmission Assets.	There are no Tier 2 developments considered within the CEA which have a spatial or temporal overlap with the decommissioning phase of the Transmission Assets.	There are no Tier 3 developments considered within the CEA which have a spatial or temporal overlap with the decommissioning phase of the Transmission Assets.
Significance of effect	There are no Tier 1 developments considered within the CEA which have a temporal overlap with the operation and maintenance phase of the Transmission Assets. Overall, the magnitude of the cumulative impact is low and the sensitivity of the receptors is high in line with the Transmission Assets and Generation Assets (Scenario 3). The cumulative effect will, therefore, be of **minor** adverse significance, which is not significant in EIA terms.	There are no Tier 2 developments considered within the CEA which have a temporal overlap with decommissioning phase of the Transmission Assets. Overall, the magnitude of the cumulative impact is low and the sensitivity of the receptors is high in line with the Transmission Assets and Generation Assets (Scenario 3). The cumulative effect will, therefore, be of **minor** adverse significance, which is not significant in EIA terms.	There are no Tier 3 developments considered within the CEA which have a temporal overlap with the decommissioning phase of the Transmission Assets. Overall, the magnitude of the cumulative impact is low and the sensitivity of the receptors is high in line with the Transmission Assets and Generation Assets (Scenario 3). The cumulative effect will, therefore, be of **minor** adverse significance, which is not significant in EIA terms.
Further mitigation and residual significance	No effects which are significant in EIA terms have been identified therefore no further mitigation measures are proposed.		

8.13.3 Direct damage to near surface marine archaeology receptors

8.13.3.1 The Transmission Assets, together with the Morgan Offshore Wind Project: Generation Assets and Morecambe Offshore Windfarm: Generation Assets as identified in **Table 8.22**, may result in direct damage to near surface marine archaeology receptors identified in **section 8.6** and those that are as yet unknown in areas where the footprints of the projects overlap. During all phases of Transmission Assets there is the potential for seabed impacts through construction, operation and maintenance, and decommissioning activities.

8.13.3.2 The CEA for impacts associated with increases in SSC and sediment deposition for scenarios 1 to 3 are presented in **Table 8.26** and for scenarios 4a to 4c in **Table 8.27**.

Table 8.26: Direct damage to near surface marine archaeology receptors (Scenarios 1-3)

	Scenario 1: Transmission Assets + Morecambe Offshore Windfarm: Generation Assets	Scenario 2: Transmission Assets + Morgan Offshore Wind Project: Generation Assets	Scenario 3: Transmission Assets + Morecambe Offshore Windfarm: Generation Assets and Morgan Offshore Wind Project: Generation Assets
Construction phase			
Sensitivity of receptor	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. 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. Material of this nature is rare and therefore valuable. Any discoveries would be considered important. The sensitivity of the submerged prehistoric archaeology across both project areas is deemed to be **high**.	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. 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**.	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. 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**.
Magnitude of impact	The construction phase of Transmission Assets is due to overlap with the construction phase of Morecambe Offshore Windfarm: Generation Assets and therefore	The construction phase of Transmission Assets is due to overlap with the construction phase of Morgan Offshore Wind Project: Generation Assets and therefore activities such	The construction phase of Transmission Assets is due to overlap with the construction phase of both the Morecambe Generation Assets and the Morgan Offshore Wind

	Scenario 1: Transmission Assets + Morecambe Offshore Windfarm: Generation Assets	Scenario 2: Transmission Assets + Morgan Offshore Wind Project: Generation Assets	Scenario 3: Transmission Assets + Morecambe Offshore Windfarm: Generation Assets and Morgan Offshore Wind Project: Generation Assets
	activities such as site preparation, cable and foundation installation may result in direct damage to near surface marine archaeology receptors. These two projects may result in up to 18.29 km^2 of seabed impact. This includes all of the seabed impact associated with the construction of the Transmission Assets together with up to 3.46 km^2 of seabed impact associated with the construction of the Morecambe Offshore Windfarm: Generation Assets (i.e. installation of wind turbines, OSPs and inter-array and interconnector cables; Morecambe Offshore Windfarm Ltd., 2023a). The measures adopted as part of the Transmission Assets as outlined in **section 8.8** and **Table 8.15** include the development of and adherence to AEZs within the Generation Assets Order Limits, as these sit within the Offshore Order Limits, to ensure avoidance of all known archaeological receptors and the implementation of a PAD to ensure that any newly exposed archaeological assets are recorded and, where appropriate,	as site preparation, cable and foundation installation may result in direct damage to near surface marine archaeology receptors. These two projects may result in up to 76.25 km^2 of seabed impact. This includes all of the activities associated with the construction of the Transmission Assets together with up to 61.42 km^2 of seabed impact associated with the construction of the Morgan Offshore Wind Project: Generation Assets (i.e. installation of wind turbines, OSPs and inter-array and interconnector cables for the Morgan Offshore Wind Project: Generation Assets as well as jack-up events and anchoring; Morgan Offshore Wind Ltd., 2023). The measures adopted as part of the Transmission Assets as outlined in **section 8.8** and **Table 8.15** include the development of and adherence to AEZs to ensure avoidance of all known archaeological receptors and the implementation of a PAD (document reference: J17, as per CoT63) to ensure that any newly exposed archaeological assets are recorded and, where appropriate,	Project: Generation Assets and therefore activities such as site preparation, cable and foundation installation may result in direct damage to near surface marine archaeology receptors. These three projects may result in up to 79.71 km^2 of seabed impact. This does not represent a significant increase in the area of seabed impact to each scenario separately. The measures adopted as part of the Transmission Assets as outlined in **section 8.8** and **Table 8.15** include the development of and adherence to AEZs within the Generation Assets Order Limits, as these are within the Offshore Order Limits, to ensure avoidance of all known archaeological receptors and the implementation of a PAD (document reference: J17, as per CoT63) to ensure that any newly exposed archaeological assets are recorded and, where appropriate, TAEZs and AEZs can be implemented. The cumulative effect will result in some measurable change in attributes, quality or vulnerability, minor loss or alteration to, one, maybe more, key characteristics,

	Scenario 1: Transmission Assets + Morecambe Offshore Windfarm: Generation Assets	Scenario 2: Transmission Assets + Morgan Offshore Wind Project: Generation Assets	Scenario 3: Transmission Assets + Morecambe Offshore Windfarm: Generation Assets and Morgan Offshore Wind Project: Generation Assets
	TAEZs and AEZs can be implemented. 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**.	TAEZs and AEZs can be implemented. 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**.	composition or attributes. The magnitude is therefore considered to be **low**.
Significance of effect	Overall, 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.	Overall, 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.	Overall, 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.
Further mitigation and residual significance	N/A	N/A	N/A
Operation and maintenance phase			
Sensitivity of receptor	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.	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.	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.

	Scenario 1: Transmission Assets + Morecambe Offshore Windfarm: Generation Assets	Scenario 2: Transmission Assets + Morgan Offshore Wind Project: Generation Assets	Scenario 3: Transmission Assets + Morecambe Offshore Windfarm: Generation Assets and Morgan Offshore Wind Project: Generation 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. Material of this nature is rare and therefore valuable. Any discoveries would be considered important. The sensitivity of the submerged prehistoric archaeology across both project areas is deemed to be **high**.	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**.	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**.
Magnitude of impact	The operation and maintenance phase of Transmission Assets is due to overlap with the operation and maintenance phase of Morecambe Offshore Windfarm: Generation Assets and therefore activities such as cable repair and reburial may result in direct damage to near surface marine archaeology receptors. These two projects may result in up to 4.81 km^2 of seabed impact. This includes all of the seabed impact associated with the operations and maintenance of the Transmission Assets together with up to 0.16 km^2 seabed impact associated with the operations and maintenance of the	The operation and maintenance phase of Transmission Assets is due to overlap with the operation and maintenance phase of Morgan Offshore Wind Project: Generation Assets and therefore activities such as cable repair and reburial may result in direct damage to near surface marine archaeology receptors. These two projects may result in up to 16.01 km^2 of seabed impact. This includes all of the seabed impact associated with the operations and maintenance of the Transmission Assets together with up to 11.36 km^2 of seabed impact associated with the operations and maintenance of the	As the operation and maintenance phase of Transmission Assets is due to overlap with the operation and maintenance phases of both Morecambe Offshore Windfarm: Generation Assets and therefore activities such as cable repair and reburial may result in direct damage to near surface marine archaeology receptors. These three projects may result in up to 16.17 km^2 of seabed impact. This does not represent a significant increase in the area of seabed impact compared to each scenario separately. The measures adopted as part of the Transmission Assets as outlined in

	Scenario 1: Transmission Assets + Morecambe Offshore Windfarm: Generation Assets	Scenario 2: Transmission Assets + Morgan Offshore Wind Project: Generation Assets	Scenario 3: Transmission Assets + Morecambe Offshore Windfarm: Generation Assets and Morgan Offshore Wind Project: Generation Assets
	Morecambe Offshore Windfarm: Generation Assets (i.e. jack up events and cable repair and replacement; Morecambe Offshore Windfarm Ltd., 2023a). This cumulative impact from the two projects will occur intermittently across the 35 year life span of the Transmission Assets. The measures adopted as part of the Transmission Assets as outlined in **section 8.8** and **Table 8.15** include the development of and adherence to AEZs within the Morecambe Offshore Windfarm: Generation Assets, as these sit within the Offshore Order Limits, to ensure avoidance of all known archaeological receptors and the implementation of a PAD to ensure that any newly exposed archaeological assets are recorded and, where appropriate, TAEZs and AEZs can be implemented. 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**.	Morgan Offshore Wind Project: Generation Assets (i.e. jack up events and repair and replacement for the inter-array and interconnector cables; Morgan Offshore Wind Ltd., 2023). This cumulative impact from the two projects will occur intermittently across the 35 year life span of the Transmission Assets. The measures adopted as part of the Transmission Assets as outlined in **section 8.8** and **Table 8.15** include the development of and adherence to AEZs to ensure avoidance of all known archaeological receptors and the implementation of a PAD (document reference: J17, as per CoT63) to ensure that any newly exposed archaeological assets are recorded and, where appropriate, TAEZs and AEZs can be implemented. 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**.	**section 8.8** and **Table 8.15** include the development of and adherence to AEZs to ensure avoidance of all known archaeological receptors and the implementation of a PAD (document reference: J17, as per CoT63) to ensure that any newly exposed archaeological assets are recorded and, where appropriate, TAEZs and AEZs can be implemented. 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**.

	Scenario 1: Transmission Assets + Morecambe Offshore Windfarm: Generation Assets	Scenario 2: Transmission Assets + Morgan Offshore Wind Project: Generation Assets	Scenario 3: Transmission Assets + Morecambe Offshore Windfarm: Generation Assets and Morgan Offshore Wind Project: Generation Assets
Significance of effect	Overall, 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.	Overall, 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.	Overall, 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.
Further mitigation and residual significance	N/A	N/A	N/A
Decommissioning phase			
Sensitivity of receptor	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. 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. Material of this nature is rare and therefore valuable. Any discoveries would be considered important. The sensitivity of the submerged prehistoric archaeology	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. 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**.	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. 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**.

	Scenario 1: Transmission Assets + Morecambe Offshore Windfarm: Generation Assets	Scenario 2: Transmission Assets + Morgan Offshore Wind Project: Generation Assets	Scenario 3: Transmission Assets + Morecambe Offshore Windfarm: Generation Assets and Morgan Offshore Wind Project: Generation Assets
	across both project areas is deemed to be **high**.		
Magnitude of impact	The decommissioning phase of Transmission Assets is due to overlap with the decommissioning phase of Morecambe Offshore Windfarm: Generation Assets and therefore activities such as cable removal may result in direct damage to near surface marine archaeology receptors. These two projects may result in a similar level of seabed impact as in the construction phase which had the potential to result in up to 18.29 km^2 of seabed impact. This assumes that the extent of seabed impact during the decommissioning phase could be the same as in the construction phase. 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 phase assumes the removal of cables for both projects and the removal of wind turbines, OSPs and cable protection for the Morecambe Offshore Windfarm: Generation	The decommissioning phase of Transmission Assets is due to overlap with the decommissioning phase of Morgan Offshore Wind Project: Generation Assets and therefore activities such as cable removal may result in direct damage to near surface marine archaeology receptors. These two projects may result in a similar level of seabed impact as in the construction phase which had the potential to result in up to 76.25 km^2 of seabed impact. This assumes that the extent of seabed impact during the decommissioning phase could be the same as in the construction phase. 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 phase assumes the removal of cables for both projects and the removal of wind turbines, OSPs and cable protection for the Morecambe Offshore Windfarm: Generation	The decommissioning phase of Transmission Assets is due to overlap with the decommissioning phase of both Morecambe Offshore Windfarm: Generation Assets Morgan Offshore Wind Project: Generation Assets and therefore activities such as cable removal result in direct damage to near surface marine archaeology receptors. These three projects may result in a similar level of seabed impact as in the construction phase which had the potential to result in up to 79.71 km^2 of seabed impact. This does not represent a significant increase in the area of seabed impact compared to each scenario separately. 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**.

	Scenario 1: Transmission Assets + Morecambe Offshore Windfarm: Generation Assets	Scenario 2: Transmission Assets + Morgan Offshore Wind Project: Generation Assets	Scenario 3: Transmission Assets + Morecambe Offshore Windfarm: Generation Assets and Morgan Offshore Wind Project: Generation Assets
	Assets (Morecambe Offshore Windfarm Ltd., 2023a). The measures adopted as part of the Transmission Assets as outlined in **section 8.8** and **Table 8.15** include the development of and adherence to AEZs to ensure avoidance of all known archaeological receptors and the implementation of a PAD to ensure that any newly exposed archaeological assets are recorded and, where appropriate, TAEZs and AEZs can be implemented. 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**.	Assets (Morgan Offshore Wind Ltd., 2023a). The measures adopted as part of the Transmission Assets as outlined in **section 8.8** and **Table 8.15** include the development of and adherence to AEZs to ensure avoidance of all known archaeological receptors and the implementation of a PAD (document reference: J17, as per CoT63) to ensure that any newly exposed archaeological assets are recorded and, where appropriate, TAEZs and AEZs can be implemented. 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**.	
Significance of effect	Overall, 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.	Overall, 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.	Overall, 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.

	Scenario 1: Transmission Assets + Morecambe Offshore Windfarm: Generation Assets	Scenario 2: Transmission Assets + Morgan Offshore Wind Project: Generation Assets	Scenario 3: Transmission Assets + Morecambe Offshore Windfarm: Generation Assets and Morgan Offshore Wind Project: Generation Assets
Further mitigation and residual significance	N/A	N/A	N/A

Table 8.27: Direct damage to near surface marine archaeology receptors (Scenarios 4a-4c)

	Scenario 4a Scenario 3 + Tier 1	Scenario 4b: Scenario 4a + Tier 2	Scenario 4c: Scenario 4b + Tier 3
Construction Phase			
Sensitivity of receptor	The sensitivity of all receptors will be the same as in scenario 1-3, and as listed in **section 8.10.2**.		
Magnitude of impact	The cumulative effects assessment for Scenario 4a considers Scenario 3 together with the following Tier 1 projects. • Millom West Platform decommissioning phase. • Remedial works for Isle of Man to UK Interconnector Cable maintenance licences (MLA/2016/00211 and MLA/2014/00201). The construction phase of the Transmission Assets and Generation Assets also coincides with the maintenance and repair of cables and cable protection of the Isle of Man to UK Interconnector Cable. Additionally, maintenance works may involve the replacement of concrete mattressing cable protection with rock filled filter units. The route of the interconnector runs directly through the Transmission Assets Order Limits and aligns with the north offshore export cable corridor. Direct damage as a result of decommissioning activities could interact with seabed disturbance as a result of Scenario 3 activities, thereby increasing the potential effect on marine archaeology receptors.	There are no Tier 2 developments considered within the CEA which have a spatial or temporal overlap with the construction phase of the Transmission Assets.	The cumulative effects assessment for Scenario 4c considers Scenario 4b with the following Tier 3 projects. • Isle of Man Interconnector Cable 2. The Isle of Man to UK Interconnector 2 may be under construction during the Transmission Assets, Morgan Offshore Wind Project: Generation Assets and Morecambe Offshore Windfarm: Generation Assets construction phases. There is currently very limited information available on this project however it is understood that the project is likely to commence construction before 2030 (Manx Utilities, 2023). The seabed disturbance associated with these projects is likely to be similar in both nature and magnitude to that arising from the installation of export cables for the Transmission Assets. As Tier 3 projects there is limited information available in this respect, however it is anticipated that this impact would be of limited scale. The measures adopted as part of the Transmission Assets as outlined in **section 8.8** and **Table 8.15** include the development of and adherence to a PAD to ensure that any newly exposed archaeological assets are recorded and,

	Scenario 4a Scenario 3 + Tier 1	Scenario 4b: Scenario 4a + Tier 2	Scenario 4c: Scenario 4b + Tier 3
	The measures adopted as part of the Transmission Assets as outlined in **section 8.8** and **Table 8.15** 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. 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**.		where appropriate, TAEZs and AEZs can be implemented. 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**.
Significance of effect	Overall, 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.	There are no Tier 2 developments considered within the CEA which have a spatial or temporal overlap with the construction phase of the Transmission Assets. Overall, the magnitude of the cumulative impact is low and the sensitivity of the receptors is high in line with the Transmission Assets and Generation Assets (Scenario 3). The cumulative effect will, therefore, be of **minor** adverse significance, which is not significant in EIA terms.	Overall, 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.
Further mitigation and residual significance	No effects which are significant in EIA terms have been identified therefore no further mitigation measures are proposed.		
Operation and Maintenance Phase			
Sensitivity of receptor	The sensitivity of the receptors will be the same as described for the construction phase, and as listed in **section 8.10.2**.		

	Scenario 4a Scenario 3 + Tier 1	Scenario 4b: Scenario 4a + Tier 2	Scenario 4c: Scenario 4b + Tier 3
Magnitude of Impact	The cumulative effects assessment for Scenario 4a considers Scenario 3 together with the following Tier 1 projects: Tier 1 projects include: • Millom West Platform decommissioning phase; and • Remedial works for Isle of Man to UK Interconnector Cable maintenance licences (MLA/2016/00211 and MLA/2014/00201). The measures adopted as part of the Transmission Assets as outlined in **section 8.8** and **Table 8.15** 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. 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**.	There are no Tier 2 developments considered within the CEA which have a spatial or temporal overlap with the operations and maintenance phase of the Transmission Assets. Overall, the magnitude of the cumulative impact is negligible and the sensitivity of the receptors is low in line with the Transmission Assets and Generation Assets (Scenario 3).	The cumulative effects assessment for Scenario 4c considers Scenario 4b with the following Tier 3 projects. • Isle of Man Interconnector Cable 2. The magnitude of the impact during the operations and maintenance phase is not expected to be higher than for the construction phase. The measures adopted as part of the Transmission Assets as outlined in **section 8.8** and **Table 8.15** 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. 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**.
Significance of effect	Overall, 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.	Overall, 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.	Overall, 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.

	Scenario 4a Scenario 3 + Tier 1	Scenario 4b: Scenario 4a + Tier 2	Scenario 4c: Scenario 4b + Tier 3
Further mitigation and residual significance	No effects which are significant in EIA terms have been identified therefore no further mitigation measures are proposed.		
Decommissioning Phase			
Sensitivity of receptor	The sensitivity of the receptors will be the same as described for the construction phase, and as listed in **section 8.10.2**.		
Magnitude of Impact	There are no Tier 1 projects which spatially or temporally overlap with the decommissioning of the Transmission Assets and Generation Assets, and therefore no further assessment beyond Scenario 3 is required for this impact.	There are no Tier 2 projects which spatially or temporally overlap with the decommissioning of the Transmission Assets and Generation Assets, and therefore no further assessment beyond Scenario 4a is required for this impact.	There are no Tier 3 projects which spatially or temporally overlap with the decommissioning of the Transmission Assets and Generation Assets, and therefore no further assessment beyond Scenario 4b is required for this impact.
Significance of effect	Overall, 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.	Overall, 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.	Overall, 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.
Further mitigation and residual significance	No effects which are significant in EIA terms have been identified therefore no further mitigation measures are proposed.		

8.13.4 Alteration of sediment transport regimes

8.13.4.1 The Transmission Assets, together with the Generation assets as identified in **Table 8.22**, may result in alteration of transport regimes. During the operation and maintenance phase the presence of infrastructure may alter the sediment transport and sediment transport pathways leading to changes in the Transmission Assets project area which expose or bury the marine archaeology receptors identified in **section 8.6** and those that are as yet unknown.

8.13.4.2 The CEA for impacts associated with alteration of sediment transport regimes for scenarios 1 to 3 are presented in **Table 8.28**.

Table 8.28: Alteration of sediment transport regimes (Scenarios 1-3)

	Scenario 1: Transmission Assets + Morecambe Offshore Windfarm: Generation Assets	Scenario 2: Transmission Assets + Morgan Offshore Wind Project: Generation Assets	Scenario 3: Transmission Assets + Morecambe Offshore Windfarm: Generation Assets and Morgan Offshore Wind Project: Generation Assets
Operation and maintenance phase			
Sensitivity of receptor	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. 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. Material of this nature is rare and therefore valuable. Any discoveries would be considered important. The sensitivity of the submerged prehistoric archaeology across both project areas is deemed to be **high**.	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. 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**.	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. 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**.
Magnitude of impact	The operation and maintenance phase of Transmission Assets is due to overlap with the operation and maintenance phase of Morecambe Offshore Windfarm: Generation Assets and therefore the presence of infrastructure on the seabed may lead to the alteration of sediment transport regimes.	The operation and maintenance phase of Transmission Assets is due to overlap with the operation and maintenance phase of Morgan Offshore Wind Project: Generation Assets and therefore the presence of infrastructure on the seabed may lead to the alteration of sediment transport regimes. The Morgan Offshore Wind Project: Generation Assets MDS comprises of 68	As the operation and maintenance phase of Transmission Assets is due to overlap with the operation and maintenance phases of both Morecambe Offshore Windfarm: Generation Assets and therefore the presence of infrastructure on the seabed may lead to the alteration of sediment transport regimes.

	Scenario 1: Transmission Assets + Morecambe Offshore Windfarm: Generation Assets	Scenario 2: Transmission Assets + Morgan Offshore Wind Project: Generation Assets	Scenario 3: Transmission Assets + Morecambe Offshore Windfarm: Generation Assets and Morgan Offshore Wind Project: Generation Assets
	The Morecambe Offshore Windfarm: Generation Assets MDS comprises of 35 turbines 65 m in diameter with conical gravity base suction foundations, each with scour protection extending 15 m from foundations. Changes are expected in close proximity to these structures with said changes decreasing rapidly with distance from the infrastructure, the impact to physical processes will be indistinguishable from natural variability. Thus, there are no cumulative impacts with the Transmission Assets. The measures adopted as part of the Transmission Assets as outlined in **section 8.8** and **Table 8.15** 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. The cumulative effect will result in very minor loss or detrimental alteration to one or more characteristics, composition or attributes. The magnitude is therefore considered to be **negligible**.	turbines that will be in operation during the operation and maintenance phase of the Transmission Assets. Changes are expected in close proximity to these structures with said changes decreasing rapidly with distance from the infrastructure. The Morgan Offshore Wind Project: Generation Assets MDS also contains an OSP with rectangular gravity base foundation which may affect waves and tides up to 200 m by c. 2 – 4%, at which point changes would rapidly decline. The measures adopted as part of the Transmission Assets as outlined in **section 8.8** and **Table 8.15** include the development of and adherence to a PAD (document reference: J17, as per CoT63) to ensure that any newly exposed archaeological assets are recorded and, where appropriate, TAEZs and AEZs can be implemented. The cumulative effect will result in very minor loss or detrimental alteration to one or more characteristics, composition or attributes. The magnitude is therefore considered to be **negligible**.	The magnitude of the cumulative effect to physical processes and seabed morphology from the Transmission Assets and both sets of Generation Assets will be a combination of scenario 1 and 2 in a spatial sense. However, in terms of impacts due to overlapping changes in physical processes and morphology the magnitude of impact will be no greater than the scenario 1 or 2. This being due to the fact the two Generation Assets are separated by a distance of 16.76 km and owing to the principal orientation of the tidal currents. The measures adopted as part of the Transmission Assets as outlined in **section 8.8** and **Table 8.15** include the development of and adherence to a PAD (document reference: J17, as per CoT63) to ensure that any newly exposed archaeological assets are recorded and, where appropriate, TAEZs and AEZs can be implemented. The cumulative effect will result in very minor loss or detrimental alteration to one or more characteristics, composition or attributes. The magnitude is therefore considered to be **negligible**.
Significance of effect	Overall, the magnitude of the cumulative impact is deemed to be negligible and the sensitivity of the receptor is considered to	Overall, the magnitude of the cumulative impact is deemed to be negligible and the sensitivity of the receptor is considered to be	Overall, the magnitude of the cumulative impact is deemed to be negligible and the sensitivity of the receptor is considered to

	Scenario 1: Transmission Assets + Morecambe Offshore Windfarm: Generation Assets	Scenario 2: Transmission Assets + Morgan Offshore Wind Project: Generation Assets	Scenario 3: Transmission Assets + Morecambe Offshore Windfarm: Generation Assets and Morgan Offshore Wind Project: Generation Assets
	be high. The cumulative effect will, therefore, be of **minor adverse** significance, which is not significant in EIA terms.	high. The cumulative effect will, therefore, be of **minor adverse** significance, which is not significant in EIA terms.	be high. The cumulative effect will, therefore, be of **minor adverse** significance, which is not significant in EIA terms.
Further mitigation and residual significance	No effects which are significant in EIA terms have been identified therefore no further mitigation measures are proposed.	No effects which are significant in EIA terms have been identified therefore no further mitigation measures are proposed.	No effects which are significant in EIA terms have been identified therefore no further mitigation measures are proposed.

Table 8.29: Alteration of sediment transport regimes (Scenarios 4a-4c)

	Scenario 4a Scenario 3 + Tier 1	Scenario 4b: Scenario 4a + Tier 2	Scenario 4c: Scenario 4b + Tier 3
Operation and Maintenance Phase			
Sensitivity of receptor	The sensitivity of all receptors will be the same as in scenario 1-3, and as listed in **section 8.10.2**.		
Magnitude of Impact	The cumulative effects assessment for Scenario 4a considers Scenario 3 together with the following Tier 1 projects: Tier 1 projects include: • Millom West Platform decommissioning phase; and • Remedial works for Isle of Man to UK Interconnector Cable maintenance licences (MLA/2016/00211 and MLA/2014/00201). Replacement of concrete mattresses used for cable protection with rock-filled filter units may affect the wave climate and coincide with the operation and maintenance phase. The construction and operation and maintenance phases of Transmission Assets also overlap with the decommissioning phase of the Millom West offshore platform. When this platform is removed from the water column there a potential for cumulative effects with infrastructure associated with the Transmission Assets. Given the Millom West offshore platform utilised suction bucket foundations of a similar scale to those suction bucket foundations assessed for the Morgan Offshore Wind Project: Generation Assets, a similar spatial impact	There is no overlap between the Transmission Assets and Generation Assets and Tier 2 developments during the operation and maintenance phase.	There is no overlap between the Transmission Assets and Generation Assets and Tier 3 developments during the operation and maintenance phase.

	Scenario 4a Scenario 3 + Tier 1	Scenario 4b: Scenario 4a + Tier 2	Scenario 4c: Scenario 4b + Tier 3
	and magnitude is expected. This change will take the form of a restoration of natural physical processes. This effect of the decommissioning of the Millom West platform may have effects to physical processes up to 500 m from the structure's original location. The presence of cable protection associated with the Transmission Assets may alter physical processes in the lee of the structure up to a distance of c. 1 km. Given the projects are situated c. 0.49 km from each other it is possible that a cumulative change in physical processes may arise, however this cumulative change would be minor and highly localised. The assessment for the Transmission Assets demonstrates that changes in wave climate and tidal regime may potentially be experienced 1 km and 500 m respectively from the installation of cable protection when this occurs in shallow water. The magnitude of changes in the sediment transport regime has been assessed as **negligible** for the Transmission Assets with very localised impacts in the immediate vicinity.		
Significance of effect	Overall, 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.	There is no overlap between the Transmission Assets and Tier 2 developments during the operation and maintenance phase.	There is no overlap between the Transmission Assets and Tier 3 developments during the operation and maintenance phase.

	Scenario 4a Scenario 3 + Tier 1	Scenario 4b: Scenario 4a + Tier 2	Scenario 4c: Scenario 4b + Tier 3
Further mitigation and residual significance	No effects which are significant in EIA terms have been identified therefore no further mitigation measures are proposed.		

8.14 Transboundary effects

8.14.1.1 A screening of transboundary impacts has been carried out based on the distance of the Marine Archaeology Study Area to international borders and is presented in Volume 1, Annex 5.4 Transboundary Screening of this ES. The screening has identified that there was no potential for significant transboundary effects with regard to marine archaeology from the Transmission Assets upon the interests of other states.

8.15 Inter-related effects

8.15.1.1 Inter-relationships are the impacts and associated effects of different aspects of the Transmission Assets on the same receptor, these are as follows.

- Project lifetime effects: Assessment of the scope for effects that occur throughout more than one phase of the Transmission Assets (construction, operation and maintenance, and decommissioning), to interact to potentially create a more significant effect on a receptor group than if just one phase were assessed in isolation.
- Receptor led effects: Assessment of the scope for all relevant effects across multiple topics to interact, spatially and temporally, to create inter-related effects on a receptor.

8.15.1.2 A description of the likely interactive effects arising from the Transmission Assets on marine archaeology is provided in Volume 4, Chapter 3: Inter-relationships of the ES.

8.15.1.3 There is no change to the significance of effects resulting from inter-related assessment, when compared with the project assessment or CEA.

8.16 Summary of impacts, mitigation measures and monitoring

8.16.1.1 The marine archaeology baseline was established through desktop review, site-specific surveys and consultation.

8.16.1.2 **Table 8.30** presents a summary of the potential impacts, measures adopted as part of the Transmission Assets, 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 near surface marine archaeology receptors; and alteration of sediment transport regimes. Overall, it is concluded that there will be no significant effects arising from the Transmission Assets during the construction, operation and maintenance, or decommissioning phases.

8.16.1.3 **Table 8.31** presents a summary of the potential cumulative impacts, mitigation measures and residual effects. The cumulative impacts assessed are: Sediment disturbance and deposition leading to indirect impacts on marine archaeology receptors and alteration of transport regimes. Overall, it is concluded that there will be no significant cumulative effects from the Transmission Assets alongside other projects/plans.

8.16.1.4 No potential transboundary impacts have been identified in regard to effects of the Transmission Assets.

8.16.1.5 No significant inter-related effects have been identified in regard to effects of the Transmission Assets.

Table 8.30: Summary of environmental effects, mitigation and monitoring

Description of impact	Phase[a]			Commitment number	Magnitude of impact	Sensitivity of the receptor	Significance of effect	Further mitigation	Residual significant effect	Proposed monitoring
	C	O	D							
Sediment disturbance and deposition leading to indirect impacts on marine archaeology receptors	✓	✓	✓	CoT63	C: Low O: Low D: Low	C: High O: High D: High	C: Minor adverse O: Minor adverse D: Minor adverse	None proposed beyond existing commitments.	C: Minor adverse O: Minor adverse D: Minor adverse	CoT63
Direct damage to near surface marine archaeology receptors (e.g. wrecks, debris, submerged prehistoric receptors (palaeolandscapes and associated archaeological receptors)	✓	✓	✓		C: Low or no change O: Low or no change D: Low or no change	C: High O: High D: High	C: Minor adverse O: Minor adverse D: Minor adverse		C: Minor adverse O: Minor adverse D: Minor adverse	
Alteration of sediment transport regimes	×	✓	×		O: Negligible	O: High	O: Minor Adverse		O: Minor Adverse	
Effects on HSC	✓	✓	✓	N/A	C: No change O: No change D: No change	N/A	C: No change O: No change D: No change	N/A	C: No change O: No change D: No change	N/A

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

Table 8.31: Summary of cumulative environmental effects, mitigation and monitoring

Description of effect	Phase[a]			Commitment number	Magnitude of impact	Sensitivity of the receptor	Significance of effect	Further mitigation	Residual significant effect	Proposed monitoring
	C	O	D							
Sediment disturbance and deposition leading to indirect impacts on marine archaeology receptors	✓	✓	✓	CoT63	C: Low O: Negligible D: Low	C: High O: High D: High	C: Minor adverse O: Minor adverse D: Minor adverse	None proposed beyond existing commitments.	C: Minor adverse O: Minor adverse D: Minor adverse	CoT63
Direct damage to near surface marine archaeology receptors (e.g. wrecks, debris, submerged prehistoric receptors (palaeolandscapes and associated archaeological receptors)	✓	✓	✓		C: Low O: Low D: Low	C: High O: High D: High	C: Minor adverse O: Minor adverse D: Minor adverse		C: Minor adverse O: Minor adverse D: Minor adverse	
Alteration of sediment transport regimes	×	✓	×		O: Negligible	O: High	O: Minor adverse		O: Minor adverse	

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

8.17 References

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