Morecambe Offshore Windfarm: Generation Assets

Development Consent Order Documents

Volume 6

Outline Offshore Written Scheme of Investigation

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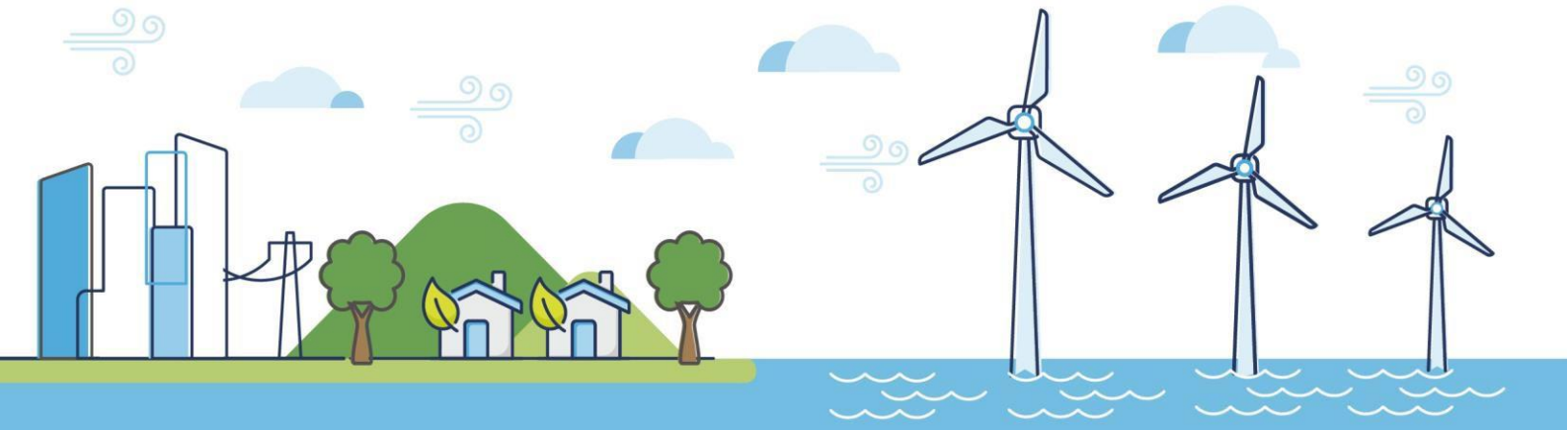

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Glossary of Acronyms

AEZ	Archaeological Exclusion Zone
AfL	Agreement or Lease
ALARP	As Low as Reasonably Possible
BABAO	British Association of Biological Anthropology and Osteoarchaeology
BC	Before Christ
BCE	Before the Common (or current) Era
BGS	British Geological Survey
BP	Before Present
CAD	Computer Aided Design
Cal	Calibrated
CEA	Cumulative Effects Assessment
CIfA	Chartered Institute for Archaeologists
DC	Direct Current
DESNZ	Department for Energy Security and Net Zero
EIA	Environmental Impact Assessment
ES	Environmental Statement
FEED	Front-end engineering design
GI	Ground Investigations
GIS	Geographic Information System
HER	Historic Environment Record
JNAPC	Joint Nautical Archaeology Policy Committee
LGP	Last Glacial Period
MAG	Magnetometer
MBES	Multibeam Echosounder
MHWS	Mean High Water Springs
MMO	Marine Management Organisation
MW	Megawatts
NMHR	National Marine Heritage Record
NHLE	National Heritage List for England
NRHE	National Record of the Historic Environment
OASIS	Online Access to the Index of Archaeological Investigations
ORPAD	Offshore Renewables Protocol for Archaeological Discoveries
ORR	Offshore Regional Report
OS	Ordnance Survey

OSP	Offshore substation platform
OWSI	Offshore Written Scheme of Investigation
PAD	Protocol for Archaeological Discoveries
ROV	Remote Operated Vehicle
SBP	Sub-bottom Profiler
SSS	Side Scan Sonar
TEZ	Temporary Exclusion Zone
UK	United Kingdom
UKHO	United Kingdom Hydrographic Office
UXO	Unexploded Ordnance
WCPS	West Coast Palaeolandscape Survey
WSI	Written Scheme of Investigation
WTG	Wind turbine generator
WWI	World War I
WWII	World War II

Glossary of Unit Terms

km	Kilometre
km^2	Square Kilometre
m	Metre
nT	Nano Tesla

Glossary of Terminology

Applicant	Morecambe Offshore Windfarm Ltd
Aviation archaeology	The remains of crashed aircraft and archaeological material associated with historic aviation activities.
Dead Wreck	Wrecks which have not been detected by repeated surveys and are therefore considered not to exist.
Devensian	The Last Glacial Period (LGP), also known colloquially as the last ice age or simply ice age, occurred from the end of the Eemian to the end of the Younger Dryas, encompassing the period c. 115,000 –c. 11,700 years ago. British geologists refer to the LGP as the Devensian.
Fisherman's Fastener	An unidentified seabed obstruction reported by fishermen.
Generation Assets (the Project)	Generation assets associated with the Morecambe Offshore Windfarm. This is infrastructure in connection with electricity production, namely the fixed foundation wind turbine generators (WTGs), inter-array cables, offshore substation platform(s) (OSP(s)) and possible platform link cables to connect OSP(s).
Geoarchaeology	The application of earth science principles and techniques to the understanding of the archaeological record. Includes the study of soils and sediments and of natural physical processes that affect archaeological sites such as geomorphology, the formation of sites through geological processes and the effects on buried sites and artefacts.
Glacial/interglacial	A glacial period is a period within an ice age that is marked by colder temperatures and glacier advances. Interglacial correspond to periods of warmer climate between glacial periods. There are three main periods of glaciation within the last 1 million years: the Anglian, the Wolstonian and the Devensian which ended about 12,000 years ago. The Holocene period corresponds to the current interglacial.
Historic seascape character	The attributes that contribute to the formation of the historic character of the seascape.
Holocene	The Holocene is the current geological epoch. It began approximately 11,650 cal years before present (c. 9700BCE), after the LGP, which concluded with the Holocene glacial retreat.
Inter-array cables	Cables which link the WTGs to each other and the OSP(s).
Marine isotope stage	Marine isotope stages are alternating warm and cool periods in the Earth's paleoclimate, deduced from oxygen isotope data reflecting changes in temperature derived from data from deep sea core samples.
Maritime archaeology	The remains of boats and ships and archaeological material associated with prehistoric and historic maritime activities.
Mean high water springs	The average tidal height throughout the year of two successive high waters during those periods of 24 hours when the range of the tide is at its greatest.
Mean sea level	The average tidal height over a long period of time.

Mesolithic	10000 to 4000BC (The Middle Stone Age), falling between the Palaeolithic and Neolithic and marking the beginning of a move from a hunter gatherer society towards a food producing society.
Morgan and Morecambe Offshore Wind Farms: Transmission Assets	The transmission assets for the Morgan Offshore Wind Project and the Morecambe Offshore Windfarm. This includes the OSP(s)[1], interconnector cables, Morgan offshore booster station, offshore export cables, landfall site, onshore export cables, onshore substations, 400kV cables and associated grid connection infrastructure such as circuit breaker infrastructure. Also referred to in this chapter as the Transmission Assets, for ease of reading.
Neolithic	4000BC to 2000BC, often referred to as the New Stone Age. This period marks the transition from a hunter gatherer society to that of a farming society.
Offshore substation platform(s)	A fixed structure located within the windfarm site, containing electrical equipment to aggregate the power from the WTGs and convert it into a more suitable form for export to shore.
Palaeoenvironmental analysis	The study of sediments and the organic remains of plants and animals to reconstruct the environment of a past geological age.
Palaeogeographic features	Features seen within sub-bottom profiler (SBP) data (buried) and multibeam bathymetry data (sea floor) interpreted as representing prehistoric physical landscape features such as former river channels (palaeochannels).
Palaeolithic	500000 to 10000BC (The Old Stone Age) defined by the practice of hunting and gathering and the use of chipped flint tools. This period is usually divided into Lower, Middle and Upper Palaeolithic.
Platform link cable	An electrical cable which links one or more OSP(s).
Seabed features	Features seen on the seafloor in the sidescan sonar (SSS) or multibeam bathymetry data which are interpreted to represent heritage assets, or potential heritage assets. Also includes magnetic anomalies which may represent shallow buried ferrous material of archaeological interest.
Seabed prehistory	Archaeological remains on the seabed corresponding to the activities of prehistoric populations that may have inhabited what is now the seabed when sea levels were lower.
Study area	This is an area which is defined for each EIA topic which includes the windfarm site as well as potential spatial and temporal considerations of the impacts on relevant receptors. The study area for each EIA topic is intended to cover the area within which

[1] At the time of writing the Environmental Statement (ES), a decision had been taken that the offshore substation platforms (OSP(s)) would remain solely within the Generation Assets application and would not be included within the Development Consent Order application for the Transmission Assets. This decision post-dated the Preliminary Environmental Information Report (PEIR) that was prepared for the Transmission Assets. The OSP(s) are still included in the description of the Transmission Assets for the purposes of this ES as the Cumulative Effects Assessment (CEA) carried out in respect of the Generation/Transmission Assets is based on the information available from the Transmission Assets PEIR

	an effect can be reasonably expected. For this topic, the study area corresponds to the footprint within which development activities could occur.
Setting assessment study area	A 50km radius around the windfarm site to assess the potential effects to the setting of onshore heritage assets as a result of the Project.
Triassic Period	The Triassic is a geologic period and system which spans 50.6 million years from the end of the Permian Period 251.902 million years ago (Mya), to the beginning of the Jurassic Period 201.36 Mya.
Windfarm site	The area within which the WTGs, inter-array cables, OSP(s) and platform link cables will be present.
Wind turbine generator (WTG)	A fixed structure located within the windfarm site that converts the kinetic energy of wind into electrical energy.
Wolstonian Stage	The Wolstonian Stage is a middle Pleistocene stage of the geological history of Earth from approximately 374,000 until 130,000 years ago. It precedes the Eemian Stage in Europe and follows the Hoxnian Stage in the British Isles.

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1 Introduction

1. This Outline Offshore Written Scheme of Investigation (OWSI), including a Protocol for Archaeological Discoveries (PAD), forms part of a set of documents that supports the Development Consent Order (DCO) application submitted by Morecambe Offshore Windfarm Ltd (the Applicant) for the Morecambe Offshore Windfarm Generation Assets (the Project).

2. Morecambe Offshore Windfarm is a proposed offshore windfarm located in the Eastern Irish Sea, with an expected nominal capacity of 480 megawatts (MW). The windfarm site is located approximately 30km off the Lancashire coast.

3. The Project includes the Generation Assets to be located within the windfarm site (wind turbine generators (WTGs), inter-array cables, offshore substation platform(s) (OSP(s)) and possible platform link cables to OSP(s)). The Environmental Impact Assessment (EIA) of the transmission assets, including offshore export cables to landfall and onshore infrastructure, is part of a separate Development Consent Order (DCO) application as outlined in **Chapter 1 Introduction** of the Environmental Statement (ES) (Document Reference 5.1.1).

4. A full description of the Project is provided in **Chapter 5 Project Description** of the ES (Document Reference 5.1.5). The Project is shown in **Figure 1.1**.

2 Project background

2.1 Purpose and structure of the Outline OWSI

5. This Outline OWSI has been produced to set out the proposed approach to the archaeological mitigation measures and investigations to be undertaken post-consent associated with the Project in accordance with Paragraph 2.8.78 of NPS EN-3 (Department for Energy Security and Net Zero (DESNZ), 2023) which states:

> *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*.

6. An updated, final Offshore archaeological WSI would be developed post-consent in consultation with Historic England. The updated, final Offshore WSI would be submitted to the Marine Management Organisation (MMO) for approval in accordance with the relevant conditions in the draft Deemed Marine Licences (DML) in the draft Development Consent Order (DCO) (Document Reference 3.1).

7. This Outline OWSI has been prepared in accordance with 'Archaeological Written Schemes of Investigation for Offshore Wind Farm Projects' (The Crown Estate, 2021). As stated in The Crown Estate guidance, a WSI forms an umbrella document, for all survey, investigation and assessment required for a project, supported by activity-specific method statements. A WSI:

   - Sets out the roles and respective responsibilities of the Project team, contractors, retained archaeologist and archaeological contractor(s), and formal lines of communication between the parties and with archaeological curator(s) (**Section 5**)
   - Outlines the known and potential archaeological receptors that could be impacted by the Project (**Section 3** and **Section 4**)
   - Outlines the agreed mitigation and archaeological actions that are to take place in various circumstances (**Section 4.2** and **Section 7**)
   - Sets out the importance of research frameworks in setting objectives that are delivered through realisation of the work (**Section 2.3** and **Section 10**)
   - Provides summarised details on methodologies for these archaeological actions, which would be clarified in more detail in subsequent activity-specific method statements (**Section 6** and **Section 10.1**)

2.2 Study area

8. The Project study area for marine archaeology and cultural heritage is defined by the windfarm site and has been developed and finalised in consultation with Historic England. This study area represents the footprint within which activities corresponding to the construction, operation or decommissioning of the Project could occur and, consequently, the area of potential impacts to the marine archaeology and cultural heritage existing environment, as shown in **Figure 1.1**.

2.3 Approach

9. This OWSI has been developed as part of the EIA process to set out the framework for assumed mitigation that has been submitted with the DCO Application.

10. A commitment to investigation and mitigation is set out in **Chapter 15 Marine Archaeology and Cultural Heritage** (Document Reference 5.1.15) of the ES comprising:

- Archaeological assessment of marine geophysical data
- Geoarchaeological assessment of geotechnical data
- Refinement of the design of offshore infrastructure post-consent to avoid Archaeological Exclusion Zones (AEZs) and geophysical anomalies of potential archaeological interest (where possible)
- Further investigation where avoidance is not possible and additional mitigation to reduce or offset impacts should impacts be unavoidable
- Implementation of a PAD to address unexpected discoveries which might be encountered during the course of planned activities
- Commitment to realising the public benefit of data sharing, and to the creation of joined-up objectives for post-consent investigation and mitigation, including links with academic and industry wide research initiatives

11. It is important to note that, while mitigation measures are secured through DCO requirements and DML conditions which require the implementation of a WSI, it is the implementation of the procedures detailed in the WSI, rather than its production, that discharges the requirements/conditions. To this end, the approach set out in the WSI anticipates these archaeological works delivered using a phased approach as follows:

- Pre-consent: desk-based, marine geophysical and geoarchaeological assessments undertaken to date (**Section 3**) including preliminary identification of AEZs (**Section 7.1**)
- Post-application/pre-commencement: acquisition of further geotechnical data and progression of geoarchaeological assessment (**Section 6.2**)

- Pre-construction:
  - Archaeological assessment of high resolution marine geophysical data (including Unexploded Ordnance (UXO) specification magnetometer data) acquired from refined layouts (**Section 6.1**)
  - Acquisition of further geotechnical data (if required) and progression/completion of geoarchaeological/palaeolandscape assessment (**Section 6.2**)
  - Archaeological investigation of selected anomalies as part of planned UXO investigation and clearance (**Section 6.3**)
  - Updates/amendments to AEZs (**Section 7.1**)
  - Micrositing of the design to avoid AEZs and any other anomalies of possible archaeological interest (where possible) or further mitigation where avoidance is not possible (**Section 7.2**)
  - Implementation of PAD during seabed preparation (e.g. Boulder clearance, sandwave levelling, pre-lay grapnel run) (**Section 7.4**)
  - Watching briefs (if required) during seabed preparation in high potential areas (**Section 7.2**)
- Construction:
  - Watching briefs (if required) during construction activities in high potential areas (**Section 7.2**)
  - Operation of PAD during construction phase (**Section 7.4**)
- Post-construction:
  - Archaeological assessment of post-construction geophysical data to monitor construction and post-construction effects on offshore archaeology and cultural heritage (**Section 8**)
- All stages:
  - Consideration of opportunities for data sharing and to the creation of joined-up objectives for post-consent investigation and mitigation, including links with academic and industry wide research initiatives (**Section 10**)

12. Archaeological requirements for the Operations and Maintenance (O&M) and decommissioning phases of the Project would be determined based on the outcomes of this phased approach (**Section 9**).

13. As an ‘Outline’ WSI, this document has been developed as part of the EIA process to set out the framework for the assumed mitigation that is submitted with the DCO Application.

14. Prior to further surveys taking place for the Project, which may take place pre-determination, a pre-commencement survey Draft WSI (or WSIs) (in

accordance with this Outline WSI) would be required to ensure archaeological objectives are considered.

15. A final (post-consent), agreed WSI would set out the overarching approach to survey and archaeological investigations. This would be agreed with Historic England and the MMO prior to pre-construction works commencing (see **Section 2.4**). The regulatory body responsible for enforcing conditions specified in the final DMLs is the MMO. The archaeological curator for heritage matters offshore (below mean high water springs (MHWS)) is Historic England.

16. The Crown Estate document (The Crown Estate, 2021) sets out high-level guidance on a range of archaeological methodologies that may be required in the production of WSIs. For each individual work package set out in **Section 6** and **Section 7**, account has been taken of these standard, high-level methodologies. Each section sets out how they are relevant to the delivery of the Project and explains any necessary adaptations and amendments for agreement with Historic England.

17. Once the final WSI (or WSIs) is agreed, detailed archaeological method statements would be produced prior to survey or construction work, in order to provide a detailed methodology for each package of development or survey works, as required. Each method statement would be consistent with the WSI, applicable guidance and would reflect the recommended methodologies set out in The Crown Estate (2021) guidance.

18. Specific archaeological objectives would be tailored to all surveys and work packages. This would be achieved with reference to all relevant project datasets (and associated archaeological and geoarchaeological interpretations) and to other relevant research and investigations with specific reference to established research agendas. These include (but are not limited to):

    - Identifying and Protecting Palaeolithic Remains (English Heritage, 1998)
    - People and the Sea: A Maritime Research Agenda for England (Ransley *et al.*, 2013)
    - The Archaeology of North West England An Archaeological Research Framework for the North West Region: Volume 1 Resource Assessment (Brennand, 2007)
    - Research and Archaeology in North West England An Archaeological Research Framework for North West England: Volume 2 Research Agenda and Strategy (Brennand, 2007)
    - West Coast Palaeolandscape Survey (WCPS) (Fitch *et al.*, 2011)

19. The objectives for each work package would be set out in the relevant method statement and would be agreed with the relevant archaeological curator prior to works commencing.

20. In demonstrating adherence to industry good practice, this Outline OWSI also draws upon available archaeological guidance for offshore development including:

- Protocol for Archaeological Discoveries: Offshore Renewables Projects (The Crown Estate, 2014)
- Chartered Institute for Archaeologists (CIfA) - Code of conduct: professional ethics in archaeology (CIfA, 2022).
- Standards and guidance for an archaeological watching brief (CIfA, 2020a)
- Standards and guidance for the creation, compilation, transfer and deposition of archaeological archives (CIfA, 2020b).
- Standards and guidance for the collection, documentation, conservation and research of archaeological materials (CIfA, 2020c)
- Marine Geophysical Data Acquisition, Processing and Interpretation – guidance notes (Plets *et al*., 2013)
- Offshore Geotechnical Investigations and Historic Environment Analysis: Guidance for the Renewable Energy Sector (Gribble and Leather, 2011)
- Historic Environment Guidance for the Offshore Renewable Energy Sector Guidance (Wessex Archaeology, 2007)
- Code of Practice for Seabed Development (Joint Nautical Archaeology Policy Committee (JNAPC), 2006)

2.4 Consultation

21. This Outline OWSI has been prepared for submission, with a commitment to complete a Project-specific, final WSI post-consent in consultation with Historic England. All revisions of this WSI, including a pre-commencement survey Draft WSI (or WSIs), would be prepared in consultation with the Historic England and agreed with the MMO prior to works commencing. Consultation undertaken as part of the process would be documented in subsequent drafts and the final version of this WSI.

3 Baseline summary of offshore archaeology and cultural heritage

3.1 Summary of assessment to date

3.1.1 Marine geophysical survey

22. The baseline information is described in Section 15.5 of **Chapter 15 Marine Archaeology and Cultural Heritage** of the Project ES. This was informed by the archaeological assessment and interpretation of site-specific survey data acquired for the Project (see **Appendix 15.1 Archaeological Assessment of Geophysical Data and Hydrographic Data** (Document Reference 5.2.15.1) and **15.2 Seismic Data Review** (Document Reference 5.2.15.2) of **Chapter 15 Marine Archaeology and Cultural Heritage** of the Project ES.

23. In order to provide site-specific and up-to-date information on which to base the impact assessment, a geophysical site characterisation survey was conducted across the Project Agreement for Lease (AfL) area (the geophysical survey area). This survey area encompasses the windfarm site assessed within the ES. The survey was conducted by the marine survey company MMT between October and November 2021, and consisted of Sidescan Sonar (SSS), Multibeam Beam Echo Sounder (MBES), Magnetometer, and Sub-bottom Profiler (SBP) (**Appendix 7.1 Offshore Geophysical Survey** of the ES; Document Reference 5.2.7.1).

24. Data were acquired with a line spacing of 85m for the main lines, and 5km for the cross lines. The spacing ensured 100% coverage of the surveyable area with SSS data was achieved. Data could not be collected within a 500m radius of the oil and gas platforms located within the windfarm site, due to exclusion zones, but these areas would be outside of the development footprint.

25. SBP data were collected to a pre-determined line plan, providing suitable coverage and penetration for the interpretation of the palaeoenvironment. The magnetometer data were collected to pre-determined line plans suitable for the identification of ferrous material >50kg along the tracklines, with the minimum detection size increasing with distance from the tracklines.

26. MSDS Marine were appointed to undertake the archaeological assessment of the acquired geophysical survey data (**Appendix 15.1** of **Chapter 15 Marine Archaeology and Cultural Heritage** of the Project ES). MSDS Marine are a specialist marine and coastal contractor and are a CIfA registered organisation.

27. The data was assessed by MSDS Marine as being of an appropriate specification, coverage, and quality, to undertake a robust archaeological assessment to inform the EIA process.

28. In addition to the assessment of site-specific marine geophysical data, a desk-based assessment was undertaken for the ES. This was informed by the sources listed in **Table 3.1** and incorporated the results of the archaeological assessment of the site-specific survey data.

Table 3.1 Other available data and information sources

Data set	Spatial coverage	Notes
The United Kingdom Hydrographic Office (UKHO) data for charted wrecks and obstructions	UK	Data for all known charted wrecks and obstructions
The National Heritage List for England (NHLE) maintained by Historic England	England	Official, up to date, register of all nationally protected historic buildings and sites in England - listed buildings, scheduled monuments, protected wrecks, registered parks and gardens, and battlefields (including sites protected under the Protection of Military Remains Act 1986 and the Protection of Wrecks Act 1973)
Records held by Historic England, formally part of the National Record of the Historic Environment (NRHE) dataset	England (to 12nm limit)	Records of heritage assets and documented losses of wrecks and aircraft.
The Coastal and Intertidal Zone Archaeology Network (CITiZAN)	UK	CITiZAN, the Coastal and Intertidal Zone Archaeological Network, highlights the threat of coastal erosion to a wealth of foreshore and intertidal sites. These archaeological features encompass a huge time span, many are of considerable local or national significance
Relevant mapping including Admiralty Charts, historic maps and Ordnance Survey	UK	Information relation to previously charted wrecks, seabed topography and topography
Existing archaeological studies and published sources	Irish Sea/Celtic Sea	Background information on the archaeology of the Celtic Sea, including the results of nearby offshore windfarm projects including the Atlantic Array offshore wind farm.
WCPS	West Coast of England	Study mapping submerged landscapes contained within an area of the Irish Sea and Bristol Channel using wide variety of seismic data

Data set	Spatial coverage	Notes
		sources. of the Irish Sea using wide variety of seismic data sources.

3.1.2 Marine geotechnical investigations

29. Gardline Limited (Gardline) were commissioned by the Applicant to acquire geotechnical data to inform wind turbine foundation design and installation methodology (Gardline Limited, 2023).

30. Mobilisation of Gardline's drilling vessel, the M.V. Horizon Geodiscovery, was carried out in the port of Barrow-In-Furness, UK, on 13th July 2023. Operations were commenced at location CPT128 and were completed at location BH112. Demobilisation was completed in the port of Liverpool, England on 22nd October 2023.

31. The geotechnical survey consisted of two types of boreholes. The first consisted of CPTU boreholes utilising a downhole WISON system with oversampling on client request. The second comprised sampling boreholes.

32. The original scope of the Project comprised of 38 CPT and 15 sampling boreholes to a termination depth of 50m or upon the acquisition of 5m of 'competent' bedrock, whichever was achieved first. A wide range of Shelby tubes were available during the site investigation. Shelby tubes were selected to optimise sample quality and recovery depending on soil conditions; due to presence of soft clays, stiff clays, and sands throughout the boreholes, a mixture of thin and medium wall Shelby tubes of varying lengths were utilised during sampling operations.

33. In total 16 CPTU borehole locations (+3 bump overs) were completed, along with 11 Sampling Boreholes (+5 Bump overs) during the site investigation on the M.V. Horizon Geodiscovery. Not all of the planned boreholes could be completed due to bad weather.

34. Following the acquisition of the data, the logs were provided to Royal HaskoningDHV's geoarchaeologist in accordance with the Archaeological Method Statement (Offshore) – Assessment of Geotechnical Survey Data. Doc Code: FLO-MOR-MS-0014. This was shared with Historic England on the 28th April 2023.

35. Two boreholes were identified which contained sediments of possible archaeological interest. These are summarised in **Table 3.2**.

Table 3.2 Boreholes containing sediments of possible archaeological interest

ID	Depth (m below seafloor)	Description	Archaeological objective
BH109	6.65-9.65	Sand with rare pockets of organic matter	Confirm presence/absence of organic matter and potentially request sub samples
	16.30-18.51	Silty sand with thin beds of low strength clay	Possible alluvium, potentially request sub samples
BH118	12.50-14.50	Sand with rare pockets of organic matter	Confirm presence/absence of organic matter and potentially request sub samples
	14.50-18.84	Low strength clay with closely spaced lamination of brown sand	Possible alluvium, potentially request sub samples

36. Following the review of the logs, Royal HaskoningDHV's geoarchaeologist reviewed the core samples photographs for both logs and determined that no subsamples would be required. The reasoning is provided in **Table 3.3**.

Table 3.3 Borehole photograph review

ID	Photograph Review	Sub-sample
BH109	Black staining in core photographs but appears minerogenic and faded boundaries suggest possibly geochemical rather than in-situ or detrital organic matter. Sand described as slightly calcareous, and photographs indicate fine fragments of white, possible shell material. Deposit likely marine sand. Archaeological potential = low.	No
	Core photographs show similar colour to underlying glacial clay and whilst it has clear sand/clay beds, considered to be glacial in origin, potentially glaciomarine to deltaic. Archaeological potential = low.	No
BH118	Comprises marine shell visible at depth in the core photographs. Black staining is similar to in BH109 and considered to be minerogenic/geochemical rather than organic. Archaeological potential = low.	No
	Core photograph shows similar colour to underlying glacial clay and beds/laminations are very small. Interpreted to have formed in glaciomarine environment. Archaeological potential = low.	No

37. Further geotechnical investigations are due to be undertaken in 2024 to acquire data from the locations that could not be completed in 2023.

3.2 Seabed prehistory

38. There are no known seabed prehistory sites within the study area.

39. As outlined in **Section 3.1**, an archaeological review of the geophysical survey data and ground model covering the windfarm site was conducted by MSDS Marine. This was done to inform the undertaking of the palaeolandscape assessment and identifying potential for previously undiscovered submerged prehistoric sites to be present (**Appendix 15.1** of **Chapter 15 Marine Archaeology and Cultural Heritage** of the Project ES). This included a review of geophysical survey data reports, select seismic profiles and ground model outputs, including mapped horizons and grids. These sources were reviewed to establish an understanding of the geological make-up of the site, formations present and their palaeoenvironmental and archaeological potential.

40. As part of the MSDS Marine assessment, information about the wider area was also used from a 2km buffer around the geophysical survey area to better contextualise the various data sources to provide context of a wider area (Figure 6 of **Appendix 15.1** of **Chapter 15 Marine Archaeology and Cultural Heritage** of the Project ES). For the assessment of the geophysical data a 500m buffer was applied as some of the survey data extended beyond the AfL boundary.

41. A total of one borehole and six cores have been taken within the 2km buffer of the geophysical survey area by the British Geological Survey (BGS), the data for which was available for review as part of the MSDS Marine assessment. Seismic surveys of the area were also undertaken by the BGS in order to Front-end engineering design (FEED) into the Offshore Regional Report (ORR) for the area (Jackson *et al*., 1995). The findings of the ORR have been included within the assessment.

42. A number of other studies have taken place which cover an area including the windfarm site, including the WCPS (Fitch and Gaffney, 2011) which focused in part on the Upper Palaeolithic and Mesolithic landscapes of the Liverpool Bay area.

43. The locations and extents of these previous investigations are detailed in Figure 7 of **Appendix 15.1** of **Chapter 15 Marine Archaeology and Cultural Heritage** of the Project ES. Full details of MSDS Marine's assessment are presented within **Appendix 15.1**.

44. A sequence of five geological units were identified within the survey area, as summarised in **Table 3.4**.

45. A subsequent archaeological assessment of SBP data was undertaken to identify palaeolandscape features and deposits of archaeological and

geoarchaeological potential (**Appendix 15.2** of **Chapter 15 Marine Archaeology and Cultural Heritage** of the Project ES). The assessment identified a sequence of glacial, glaciomarine and marine deposits that were characterised as having low archaeological potential due to their age and depositional history.

46. The results of the assessment were also reviewed relative to recent advances in understanding of glacial retreat and sea-level history which indicated the site was initially overridden by ice and, as sea-level rose, became an ice shelf which then deglaciated in a marine environment. There is therefore limited potential for the site to have been subaerially exposed and suitable for human occupation.

47. A series of channelised features were identified in the data in Units 1 and 2, along with localised high amplitude reflectors that may be indicative of shallow gas or organic deposits (see Table 4 of **Appendix 15.2** of **Chapter 15 Marine Archaeology and Cultural Heritage** of the Project ES), although it was noted that reverse polarity, a common signature of organic deposits in seismic data, was not observed.

48. A review of borehole logs acquired in 2023 identified a series of sediments of potential archaeological interest in two boreholes. However, as discussed in **Section 3.1.2** these were determined not to be of archaeological interest.

Table 3.4 Quaternary sequence within the AfL area

Unit	Base	Lithology	Correlated formation	Correlated member	Age	Depositional environment	Archaeological potential
1	H17	Marine silty sand	Western Irish Sea (A)	Mud Facies	Devensian to early Holocene	May be deep water glaciomarine to shallow marine, though other interpretations are possible	Some potential identified though further investigation required
2	H40	Sand	Western Irish Sea (A)	Prograded Facies	Devensian	Deltaic to glaciomarine	Limited but potential cannot be ruled out
3	H45	Silty sand	Western Irish Sea (A)	Mud Facies	Devensian	Deep water glaciomarine to shallow marine	Limited due to adverse conditions
			Western Irish Sea (B)	Mud Facies (Upper Tabular Stratified Member)	Devensian	Glaciomarine to marine	
4	H50	Till	Cardigan Bay Formation	Upper Till Member	Devensian	Glacial	Limited due to adverse conditions
				Lower Till Member	Wolstonian	Glacial	
5	N/A	Mudstone and halite	Triassic Bedrock	N/A	Triassic	N/A	N/A

3.3 Maritime and aviation archaeology

49. There are no known sites within the study area that are subject to statutory protection from the Protection of Wrecks Act 1973, the Protection of Military Remains Act 1986 or the Ancient Monuments and Archaeological Areas Act 1979.

3.3.1 Seabed features

50. SSS, MBES, and magnetometer data interpreted by MSDS Marine has demonstrated the presence of several seabed features which have been identified to have varying levels of archaeological potential. Seabed features are discriminated by MSDS Marine in accordance with the definitions set out in **Table 3.5**. Anomalies of archaeological potential in the windfarm site are presented in a gazetteer included as **Annex 1**.

Table 3.5 MSDS Marine Criteria for discriminating the relevance of identified seabed features with the study area

Potential	Criteria
Low	An anomaly potentially of anthropogenic origin but that is unlikely to be of archaeological significance. Examples may include discarded modern debris such as rope, cable, chain, or fishing gear; small, isolated anomalies with no wider context; or small boulder-like features with associated magnetometer readings.
Medium	An anomaly believed to be of anthropogenic origin but that would require further investigation to establish its archaeological significance. Examples may include larger unidentifiable debris or clusters of debris, unidentifiable structures, or significant magnetic anomalies.
High	An anomaly almost certainly of anthropogenic origin and with a high potential of being of archaeological significance. High potential anomalies tend to be the remains of wrecks, the suspected remains of wrecks, or known structures of archaeological significance.

51. In total, 21 anomalies of potential archaeological interest were identified within the windfarm site. These are distributed across the windfarm site as show in **Table 3.6** and in **Figure 3.1**.

Table 3.6 Distribution of seabed features of archaeological potential

Potential	Windfarm site
Low	17
Medium	4
High	0
Total	**21**

52. Four anomalies interpreted as of medium archaeological potential were identified within the windfarm site. These anomalies are presented in **Table 3.7** and in **Figure 3.1**.

Table 3.7 Medium potential anomaly categories

Anomaly category	Windfarm site
Potential debris	(MC22_0020)
Unidentified debris	(MC22_0013, MC22_0014, & MC22_0039)
Total	4

53. The anomalies interpreted as being of medium archaeological potential have characteristics that indicate a likelihood of representing anthropogenic debris that has the potential to be of archaeological interest.

3.3.2 Magnetic anomalies

54. There are 45 magnetic anomalies that do not correlate with known features or infrastructure within the windfarm site. These are presented in **Table 3.8** and in **Figure 3.2**.

Table 3.8 Magnetic anomalies

Intensity (nano Tesla (nT))	Windfarm Site
5 to 50	42
50 to 100	2
100 to 200	0
200 +	1
Total	**45**

55. One large magnetic anomaly (>100nT) was identified within the magnetometer dataset, MC22_MAG_0254, a complex anomaly of 739.4nT. The anomaly is isolated with no corresponding seabed anomaly identified within the other datasets possibly because it is buried. The anomaly is not visible on the adjacent lines of data, which are approximately 75.0m each side (see Figure 18 of **Appendix 15.1** of **Chapter 15 Marine Archaeology and Cultural Heritage** of the Project ES).

56. Two anomalies within the windfarm site measure between 50 and 100nT. These are MC22_MAG_0266 and MC22_MAG_0105. Neither anomaly was related to any UKHO or NRHE records, however, MC22_MAG_0266 is located c.85m southeast of NRHE record 1027264 (fishermen's fastener). As such, the two may be related.

57. All the remaining magnetic anomalies measure <50nT so are considered to be of limited archaeological potential and likely represent items of metallic debris.

3.3.3 Historic Environment Records (HER)

58. In addition to the geophysical anomalies identified by MSDS Marine, there are additional records charted by the UKHO and the NRHE within the windfarm site. These are presented on **Figure 3.3** and **Figure 3.4**.

3.3.3.1 UKHO records

59. There are two UKHO records (8069 and 8293) within the windfarm site which are identified as foul ground originating from fisherman's fasteners. Both the records are within the windfarm site to the southeast and are considered dead. No evidence of any anthropogenic material, or geological material, that may have resulted in a net snag is visible in the geophysical data at either location, or within the vicinity.

3.3.3.2 Historic England maritime records

60. Within the windfarm site there are 39 maritime records, all of which derive from fisherman's fasteners, with the following description: '*Unidentified seabed obstruction reported by fishermen. Possibly indicative of wreckage or a submerged feature'*. All the records were created in 1999. None of the Historic England maritime records correlate with any archaeological anomalies, or UKHO records.

3.4 Aviation remains

61. There are no known sites within the windfarm site that are subject to statutory protection from the Protection of Wrecks Act 1973, the Protection of Military Remains Act 1986 or the Ancient Monuments and Archaeological Areas Act 1979.

62. In addition, there are no HERs which relate to any aviation remains. Should aviation remains be located within the windfarm site these would likely be associated with World War I (WWI) and World War II (WWII) and would be afforded protection under the Protection of Military Remains Act 1986. However, as little airborne fighting occurred over the Irish Sea, the chance of finding such remains is limited.

63. No anomalies characteristic of aviation remains were identified by MSDS Marine.

4 Impact assessment

4.1 Potential impacts

64. Sections 15.6 and 15.7 of ES **Chapter 15 Marine Archaeology and Cultural Heritage** identify the potential for direct and indirect impacts upon marine archaeology and cultural heritage. These include both direct and indirect physical changes and non-physical changes to the setting of heritage assets or historic seascape character.

65. Direct impacts to heritage assets within the windfarm site, either proud of the seabed or buried within it, may result in damage to, or destruction of, archaeological material.

66. Impacts may also damage the relationship between the material and the wider environment. Direct impacts may occur where heritage assets are located within the footprint of the Project where construction activities would take place. These include:

- Seabed preparation (including UXO) and boulder clearance, where required, but noting potential impacts on heritage features would be assessed in a separate UXO clearance marine licence application, if deemed necessary following detailed post-consent surveys)
- Installation of foundations for WTGs and OSP(s)
- Installation of offshore cabling (inter-array and platform link)
- Seabed contact by vessel anchors and/or legs of jack-up vessels

67. Indirect impacts may occur where the Project:

- Causes changes to the hydrodynamic and sedimentary process regimes
- Affects heritage assets by altering erosion and accretion patterns

- Alters tidal currents which in turn may affect the stability of nearby morphological and archaeological features.

68. Such impacts may occur if buried heritage assets become exposed to marine processes, due to increased wave or tidal action, for example. This would result in a faster rate of deterioration than heritage assets afforded protection by sediment cover. Conversely, increased sedimentation could result in an exposed site becoming buried thus affording it protection and may be considered a beneficial impact.

69. The setting of a heritage asset is described as the surroundings in which a heritage asset is experienced (Historic England, 2017). Elements of setting may make a positive or negative contribution to the significance of an asset, may affect the ability to appreciate that significance, or may be neutral. Historic England's guidance on setting highlights that the setting of buried heritage assets may not be readily appreciated by a casual observer, but still retain a presence in the landscape.

70. For offshore assets, for the most part, submerged archaeological sites are not 'readily appreciated by a casual observer' and their 'setting' does not form a key part of their significance. However, offshore heritage assets may still be located physically within a 'setting' of relevance to their historical and archaeological interest. This may be of relevance to the historic seascape character of a study area. It is, therefore, essential that this character is considered in terms of ability to accommodate change and how perception of character might be changes by a proposed project.

4.2 Summary of mitigation

71. This section outlines the embedded mitigation relevant to the Marine Archaeology and Cultural Heritage assessment, which has been incorporated into the design of the Project. A summary of embedded mitigation is presented in **Table 4.1**.

Table 4.1 Embedded mitigation measures for marine archaeology and cultural heritage

Parameter	Mitigation measure	Description
Known heritage assets	AEZs (**Section 7.1**)	For archaeologically significant anomalies that are clearly identifiable in the survey data and where the extents are largely known, AEZs would be employed. AEZs would remain for the lifetime of the Project or until ground truthing or higher resolution data determines a reduction in potential, significance, or extents.
	Temporary Exclusion Zones (TEZs) (see **Section 7.1**)	Where an anomaly is not visible in the survey data but likely to exist on the seabed at a known position or where the extents of an anomaly are not fully identifiable, TEZs would be employed. TEZs have been identified as highly likely to be altered following higher resolution or full coverage data assessment, however, they would remain in place until alterations have been formally agreed.
Potential heritage assets (maritime or aviation)	Avoidance by micro-siting of design following the acquisition of high-resolution geophysical data, to be acquired post-consent.	Avoidance where possible of identified anomalies.
		Avoidance by micro-siting where possible of previously recorded sites that have not been seen in the geophysical data and at which the presence of surviving material is considered unlikely
		Further investigation of any identified anomalies and previously recorded sites that cannot be avoided by micro-siting of design and the application of either embedded mitigation (avoidance) or additional mitigation
	Implementation of a protocol for archaeological discoveries to address unexpected discoveries which might be encountered during planned activities	In order to account for unexpected discoveries of archaeological material during construction, operation and decommissioning, a formal protocol would be required. It is recommended that if any objects of possible archaeological interest are encountered, that they would be reported using a PAD (**Section 7.4**).

72. Additional mitigation measures set out in this the WSI are as follows:

- Watching briefs where seabed material is brought to the surface (**Section 7.2**)
- Archaeological assessment of further geophysical data to be acquired post-consent (**Section 6.1**)
- Geoarchaeological assessment of further geotechnical data acquired for the Project (**Section 6.2**).

4.3 Impact assessment summary

73. With due consideration of the mitigation and investigation outlined above, potential impacts to marine archaeology and cultural heritage within the windfarm site have been assessed as part of the EIA for the Project. A summary of the impacts and additional mitigation is provided in **Table 4.2**.

Table 4.2 Summary of potential impacts on marine archaeology and cultural heritage

Potential impact	Receptor	Cultural heritage importance	Magnitude	Significance of effect	Additional mitigation measures proposed	Residual effect	Cumulative residual effect
Construction phase							
Impact 1: Direct impact to known heritage assets	Wrecks and anomalies of archaeological interest (seabed features identified as medium archaeological potential)	High	No change due to application of AEZs			No Change	No Change
	Historic wrecks for which remains have yet been to be identified	High	No change due to application of AEZs			No Change	
Impact 2: Direct impact to potential heritage assets	In situ prehistoric, maritime or aviation sites	High	High	Significant (Major adverse)	Further assessment and investigation and additional mitigation to avoid, reduce or offset impacts.	Not Significant (Minor adverse)	Potential beneficial effect through regional mapping of accessible data and provision of publicly accessible data post-consent (described but
	Isolated finds	Medium	Low	Not Significant	Protocol for archaeological discoveries	Not Significant	

Potential impact	Receptor	Cultural heritage importance	Magnitude	Significance of effect	Additional mitigation measures proposed	Residual effect	Cumulative residual effect
				(Minor adverse)		(Minor adverse)	currently not quantifiable)
Impact 3: Indirect impact to heritage assets from changes to physical processes	Known and potential heritage assets	Medium to High	No pathway of change. **Chapter 7 Marine Geology, Oceanography and Physical Processes** of the Project ES concludes there would be no significant effect resulting from the Project.			No Change	No Change
Impact 4: Impacts to the setting of heritage assets	Known and potential heritage assets	Medium to High	Negligible	Not Significant (Negligible adverse)	N/A	Not Significant (Negligible adverse)	Not Significant (Negligible adverse)

Potential impact	Receptor	Cultural heritage importance	Magnitude	Significance of effect	Additional mitigation measures proposed	Residual effect	Cumulative residual effect
Operation and maintenance phase							
Impact 1: Direct impact to known heritage assets	Known heritage assets	Medium to High	No Change due to application of AEZs			No Change	No Change
Impact 2: Direct impact to potential heritage assets	In situ prehistoric, maritime or aviation sites	High	High	Significant (Major adverse)	Further assessment of geophysical and geotechnical data if required.	Not Significant (Minor adverse)	Potential beneficial effect through regional mapping of accessible data and provision of publicly accessible data post-consent (described but currently not quantifiable)
	Isolated finds	Medium	Low	Not Significant (Minor adverse)	Protocol for archaeological discoveries.	Not Significant (Minor adverse)	
Impact 3: Indirect impact to heritage assets from changes to physical processes	Known and potential heritage assets	Medium to High	No pathway of change. **Chapter 7 Marine Geology, Oceanography and Physical Processes** of the Project ES concluded there would be no significant effect resulting from the Project.			No Change	No Change

Potential impact	Receptor	Cultural heritage importance	Magnitude	Significance of effect	Additional mitigation measures proposed	Residual effect	Cumulative residual effect
Impact 4: Impacts to the setting of heritage assets	Known and potential heritage assets	Medium to High	Negligible	Not Significant (Minor adverse)	N/A	Not Significant (Minor adverse)	Further assessment to be undertaken as part of the ES.
Impact 5: Changes to the setting of coastal (terrestrial) designated heritage assets	Coastal designated heritage assets	High	No Change (see **Appendix 15.3 Settings Assessment** (Document Reference 15.2.15.3) of **Chapter 15 Marine Archaeology and Cultural Heritage** of the Project ES)		N/A	No Change	No Change
Decommissioning phase							
Impact 1: Direct impact to known heritage assets	Known heritage assets	Medium to High	No Change due to application of AEZs			No Change	No Change
Impact 2: Direct impact to potential heritage assets	In situ prehistoric, maritime or aviation sites	High	High	Significant (Major adverse)	Further assessment of geophysical and geotechnical data.	Not Significant (Minor adverse)	Potential beneficial effect through regional mapping of accessible data and provision of publicly accessible data post-consent
	Isolated finds	Medium	Low	Not Significant (Minor adverse)	Protocol for archaeological discoveries.	Not Significant (Minor adverse)	

Potential impact	Receptor	Cultural heritage importance	Magnitude	Significance of effect	Additional mitigation measures proposed	Residual effect	Cumulative residual effect
							(described but currently not quantifiable)
Impact 3: Indirect impact to heritage assets from changes to physical processes	Known and potential heritage assets	Medium to High	No Change. Effects comparable to those assessed for Construction Impact 1.			No Change	No Change
Impact 4: Impacts to the setting of heritage assets	Known and potential heritage assets	Medium to High	Negligible	Not Significant (Negligible adverse)	N/A	Not Significant (Negligible adverse)	Not Significant (Negligible adverse)

5 Roles, responsibilities and communications

74. The overall responsibility for the implementation of the final Offshore WSI would be with the Project team (or subsequent Project owner). The Project team would ensure that its agents, contractors and supply chain partners are contractually bound to adhere to the terms of the final agreed Offshore WSI, including the implementation of the PAD (**Section 7.4**).

75. For each phase of archaeological works the Project team or their agents would obtain the services of specialised archaeological contractors with the required expertise and experience to undertake the necessary archaeological works as and when required.

76. The Project team would also retain the services of a suitably qualified and experienced archaeological contractor as the 'retained archaeologist'. The retained archaeologist would oversee and ensure the successful implementation of the final Offshore WSI and contractual commitments relating to archaeology.

77. The responsibilities of the retained archaeologist are as follows:

- Producing, reviewing, and updating this WSI after consultation with the Project team, regulators MMO and the curators (Historic England) to produce and agree a final Offshore WSI
- Advising the Project team of their responsibilities in the implementation of the final Offshore WSI and the PAD
- Compiling, agreeing, and issuing method statements to archaeological contractors to adhere to, after consultation with the Project team and curators
- Advising the Project team on necessary interactions with the regulators, curators and other third parties
- Procuring and liaising with specialist archaeological contractors and monitoring the works undertaken by them
- Monitoring the preparation and submission of archaeological reports as required and making them available to the regulators and curators for review and approval
- Advising the Project team on any final requirements and arrangements for further analysis, archive deposition, publication, and popular dissemination.

78. All agents and contractors engaged by the Project team would:

- Familiarise themselves with the requirements of the final Offshore WSI and make it available to their staff

- Explaining the requirements of the final Offshore WSI and the need for strict adherence to it
- Familiarise themselves with the PAD (**Section 7.4**) and ensure its implementation
- Ensure adherence to the protocol by staff, ensuring staff awareness protocol and making staff available for training through toolbox talks, as necessary
- Assist and afford access to archaeological contractors as advised by the Project team and the retained archaeologist
- Inform the retained archaeologist and the archaeological contractors of any environmental or health and safety constraints which they may be aware that relate to the archaeologist's activities on site.

79. The specific responsibilities of the specialist archaeological contractors during subsequent phases of work would be set out in separate specific method statements relevant to each package of works. The regulatory body responsible for enforcing conditions is the MMO. The regulatory body responsible for enforcing the implementation of requirements is Historic England.

80. The archaeological curator for heritage matters offshore (below MHWS) is Historic England. Prior to and during any geoarchaeological recording, assessment and analysis, consultation with the Historic England Regional Science Advisor for the West of England is also recommended to agree on the suitability of the approach.

6 Methodology for further site investigation

6.1 Marine geophysical investigations

81. The geophysical data assessed by MSDS Marine to inform **Chapter 15 Marine Archaeology and Cultural Heritage** of the Project ES has been summarised in **Section 3.1**. The geophysical data assessment carried out in support of the ES is considered to be an accurate and proportionate characterisation of the archaeological potential of the offshore project areas, appropriate to the purposes of EIA.

82. Prior to the acquisition of pre-construction geophysical data, it is recommended that a review of previous assessments is undertaken by a suitably qualified and experienced archaeological contractor if data gaps are identified.

83. As part of the review, the archaeological contractor would identify specific objectives to inform the scope of further survey work based on previous work undertaken for the Project.

84. As stated in The Crown Estate (2021) guidance 'Archaeological Written Schemes of Investigation for Offshore Wind Farm Projects', archaeological input would take the form of advice on the following points:

- Available details of sites, features and/or anomalies identified in previous studies
- Archaeological potential of areas where no existing sites, features and/or anomalies are yet known
- Geophysical survey specification including design, geophysical sources, and acquisition methodology
- Requirements for processing and interpreting of resulting data.

85. The specification of any proposed marine geophysical surveys whose primary aim is non-archaeological would be subject to advice from the retained archaeologist. This would ensure that archaeological input is provided at the planning stage and would enable archaeological considerations to be accounted for without compromising the primary objective of the survey. This is likely to include the acquisition of SSS, magnetometer, MBES and SBP data. The data would also be sufficiently robust to enable professional archaeological interpretation and analysis.

86. A series of archaeological objectives would be established by the retained archaeologist for the acquisition of pre-construction data. The overarching objectives of the assessment of marine geophysical survey data are to:

- Identify known heritage assets and provide additional detail on the nature and extent of those assets
- Identify previously unidentified seabed features
- Identify buried palaeolandscape features that help to clarify the nature of the submerged prehistoric landscape
- Monitor construction and post-construction effects

87. Before any geophysical survey takes place, Historic England would be consulted to ensure the suitability of any data to meet the archaeological objectives discussed above and to answer any question which may have arisen through consultation. This would usually be in the form of a method statement (or alternative format for pre-consent surveys undertaken before the creation of the WSI or the pre-commencement WSI) and would reference existing guidance (i.e., Plets *et al*. 2013), where appropriate. The method statement would be issued by the Project team in advance of any further geophysical survey campaigns that incorporate archaeological objectives. The Project team would be responsible for ensuring that all surveys proceed in line with any planned method statement as agreed with Historic England.

88. It should be noted that not all archaeological remains can be identified through geophysical survey, particularly non-ferrous buried remains such as wooden vessels. Specific consideration would, therefore, need to be given to the scope of geophysical surveys which incorporate archaeological objectives. The limitations of geophysical equipment to penetrate deep into mobile sediment where archaeological material, particularly non-ferrous material, could be buried must also be considered.

89. On completion of the geophysical surveys the data would be processed, assessed, and interpreted by an experienced and qualified archaeological contractor. Geophysical survey data, supplied to an agreed technical standard and specification, at the same level of fidelity as recorded, would be interpreted by an archaeological geophysicist with an appropriate level of expertise.

90. Survey data, together with operational reports and trackplots, would be made available in digital formats to the archaeological geophysicist. Where possible full-fidelity data unreduced in range, frequency, sampling, and dimensionality from that recorded must be used as the input for archaeological interpretation. Full detail on the provision of data for assessment is provided in The Crown Estate guidance (The Crown Estate, 2021: 20).

91. The results of further geophysical interpretation would be compiled as an archaeological technical report consistent with the methodologies for reporting set out in The Crown Estate (2021) guidance and would form part of the Project archive as set out in **Section 10**. The resulting spatial interpretation data, such as the locations and extents of identified features and/or deposits of archaeological potential, would be provided alongside the compiled report in a suitable digital format. These would include Geographic Information System (GIS) shapefiles or CAD (Computer Aided Design) drawing files as agreed with the Project team and, where appropriate, the archaeological curator(s).

92. All reports and digital deliverables relating to the assessment would be available for subsequent data interpretations within the life cycle of the Project.

6.2 Marine geoarchaeological investigations

93. The geoarchaeological assessment of all further geotechnical data acquired for the Project forms part of the commitment by the Project team to additional mitigation and investigations. It should be noted that, based on the archaeological assessment of SBP data, the potential for deposits of geoarchaeological interest is considered to be low.

94. Detail on the key tasks and aims associated with marine geoarchaeological investigation and assessment has been set out in The Crown Estate guidance (2021: 24, Table 4). In summary, these tasks include:

- Geoarchaeological input into geotechnical survey planning (to ensure

archaeological objectives are considered in the planning stage of the geotechnical survey)

- Review of geotechnical logs (to establish the likely presence and depth of deposits of archaeological interest and provide a broad characterisation of the site)
- Recording of geotechnical cores (to preserve by record individual core or borehole samples of potential archaeological interest)
- Archaeological sampling (to retain adequate samples (quantity and quality) for palaeoenvironmental assessment and analysis and dating)
- Assessment and analysis (to provide a chronostratigraphic and palaeoenvironmental understanding of the area, to inform interpretation of geophysical datasets and ground model)

95. Geotechnical data was acquired for the Project between July and October 2023 as summarised in **Section 3.1.2**. This informed the assessment of Seabed Prehistory undertaken for **Chapter 15 Marine Archaeology and Cultural Heritage** of the ES, as summarised in **Section 3.2**.

96. Following the review of 11 borehole logs and 16 CPT logs a Stage 1 Geoarchaeological Assessment (Morecambe Offshore Windfarm Ltd, 2024a; Document Reference MOR001-FLO-CON-ENV-TEC-0006) was undertaken. The deposits recovered document the transition from a glacial, to glaciomarine and finally marine environment during the Weichselian and Holocene. There is no evidence in the boreholes or CPTs of deposits that formed in a sub-aerial, temperate environment that would have been suitable for inhabitation.

97. Therefore, further stage(s) of geoarchaeological assessment are not recommended for the borehole samples recovered from the windfarm site during the 2023 geotechnical survey campaign. Further geotechnical data acquired from the site can be used to test this hypothesis.

98. An additional campaign of geotechnical investigation is planned to be undertaken in 2024 for which a Method Statement (Morecambe Offshore Windfarm Ltd, 2024b; Document Reference MOR001-RHD-01-CON-ENV-RPT-0042) was provided to Historic England. The surveys are likely to involve:

- Deep geotechnical: A mix of up to 35 boreholes and Piezocone Penetration Test (PCPT)
- Shallow geotechnical: Up to 24 vibrocores and PCPTs

99. The archaeological aim of the 2024 will be to test the hypothesis of the Stage 1 geoarchaeological assessment.

100. For all other future surveys, where geotechnical surveys are undertaken for primarily non-archaeological purposes, advice would be obtained from the retained archaeologist, to ensure that archaeological considerations are

accounted for. These surveys, and subsequent geoarchaeological assessment, would be undertaken in accordance with The Crown Estate (2021) guidance and with industry best practice as set out in but not limited to:

- Offshore Geotechnical Investigations and Historic Environment Analysis: Guidance for the Renewable Energy Sector (Gribble and Leather, 2011)
- Environmental Archaeology: A Guide to the theory and practice of methods, from sampling and recovery to post-excavation (Historic England, 2011)
- Geoarchaeology: using earth sciences to understand the archaeological record (Historic England, 2007).

101. The geotechnical specification would also be informed by any previous stages of work, for example archaeological interpretation of geophysical data. This would allow for previous and additional objectives to be achieved.

102. Borehole/vibrocore locations would avoid AEZs embedded into the Project design and anomalies of possible archaeological interest, as set out in **Section 7.1**. Proposed borehole/vibrocore locations would be compared to the positions of previously identified paleogeographic features and deposits of archaeological interest. Comparing obtained samples would inform archaeological interpretation. Provisions would be made for archaeology specific boreholes to be acquired where deposits of archaeological or palaeoenvironmental potential have been identified.

103. During all geotechnical surveys, all operatives would observe the PAD, as set out in **Section 7.4**. Archaeological briefings for survey staff would be carried out prior to the commencement of surveys if required and the Project team would be responsible for ensuring that surveys proceed in accordance with any planned method statement agreed with Historic England.

104. The Project team would procure the services of a specialist geoarchaeological contractor to undertake assessment, and, if required, palaeoenvironmental analysis and dating. The primary aim of any geoarchaeological investigations would be the development of a Quaternary (sedimentary) deposit model for the study area. This would be developed with reference to *Deposit Modelling and Archaeology: Guidance for Mapping Buried Deposits* (Historic England, 2020).

105. Geotechnical cores, or a representative sample of cores agreed with the archaeological contractor, would be retained undisturbed until a selection of cores for archaeological recording has been made. If the cores cannot be retained then further steps would be taken, such as having an archaeologist present during sampling operations.

106. Geoarchaeological assessment would be carried out in accordance with existing interpretations of SBP data assessed for the Project. As set out above in **Section 6.1**, any further SBP data acquired for the Project would be assessed by a suitably qualified and experienced archaeological contractor. This would allow for the results of the geotechnical surveys to be incorporated with subsequent geoarchaeological assessment.

107. Prior to the commencement of any site investigation campaign, a method statement would be prepared and issued to Historic England by the retained archaeologist detailing the scope and proposed locations of geotechnical work. Historic England would also be consulted on subsequent geoarchaeological assessments commissioned by the Project team.

108. As stated in The Crown Estate (2021) guidance, it is also recommended that the method statement includes a timetable and policy for the storage, retention and disposal of offshore samples including access to the geotechnical material, agreed at the outset of the geotechnical investigation, between the Project team, Historic England, and any receiving institutions (e.g., the geotechnical testing laboratory).

109. The results of further marine geoarchaeological assessment would be compiled as an archaeological technical report consistent with the methodologies for reporting set out in The Crown Estate (2021) guidance and would form part of the Project archive as set out in **Section 10.6**. The final report would integrate the results of review, recording, assessment, analysis, and dating.

110. The report would address the palaeoenvironment and prehistory of the area affected by the Project, including relevant data generated by desk-based assessment and other field investigations, including geophysical surveys. Where necessary, the geophysical data interpretation may need to be re-assessed depending on the findings of the geotechnical assessment. If warranted, publication of the findings would need to be considered depending on the results of the assessment.

6.3 Archaeological investigation using divers and/or Remotely Operated Vehicles (ROVs)

111. During detailed post-consent design of the Project and following the acquisition and assessment of pre-construction geophysical data, it may be possible to micro-site components of the development to avoid geophysical anomalies of archaeological potential. All AEZs would be avoided.

112. As stated in The Crown Estate (2021) guidance, this would apply to:

- The WTG foundations
- The foundations of associated infrastructure (such as the OSP(s))

- Cables
- Legs of jack-up crane vessels and/or anchors of other vessels.

113. These footprints would likely correspond to areas which would require As Low as Reasonably Possible (ALARP) certification for risks associated with UXO.

114. However, if it is not possible to avoid geophysical anomalies of archaeological potential, further assessment would need to be undertaken to confirm their character. To this end, diver and/or ROV investigation would be implemented to further establish the archaeological interest of any seabed features seen in the geophysical data which haven't been previously identified. Ground-truthing may also be required to clarify the extent of a site to alter (enlarge, reduce, move, or remove) AEZs as set out in **Section 7.1**.

115. All ground-truthing that may be required to inform the construction of the Project would be carried out in accordance with good practice as set out in The Crown Estate (2021) guidance.

116. Diver or ROV-based investigations would take place as required. Where the primary objectives are archaeological, operations would be led by archaeologists. However, it may also be possible to combine such surveys with non-archaeological objectives, such as for the identification of UXO.

117. For any diver and/or ROV survey, a method statement would be produced by the retained archaeologist (or the archaeological contractor, if appointed). This would be prepared in consultation with the Project team and Historic England.

118. To maximise the potential benefits and objectives of any proposed diver or ROV surveys, the Project team would seek archaeological input at the planning stage of any such works. Any such survey specification would be informed by previous stages of the Project, so that archaeological considerations can be considered.

119. The selection of geophysical anomalies requiring ground-truthing/assessment would require consideration of a multitude of factors. There may be a limited number of geophysical anomalies to assess which can easily be incorporated into the scope of planned ROV surveys for UXO. Several geophysical anomalies identified as being of possible archaeological interest may also correspond to anomalies interpreted as potential UXO.

120. There is also potential for a large number of anomalies to be present within the footprint of potential impact, necessitating additional consideration to select an appropriate proportion of anomalies. These may be based on the size of the features or on their location within an area of archaeological potential.

121. The specific approach to the selection of anomalies for ground-truthing would be discussed as part of planning for diver and/or ROV surveys by the Project

team and retained archaeologist in consultation with Historic England. This would then be captured in the associated method statement.

122. Where the primary objectives of ROV or diver survey are non-archaeological, but may also contribute to archaeological objectives, consideration would be given to having the retained archaeologist (or the archaeological contractor, if appointed), present during the surveys. For example, when surveying sites of archaeological interest or in areas of high archaeological potential, the presence of an archaeological specialist would help to optimise archaeological results and thereby reduce the need for repeat survey. However, their inclusion would only occur when their input has been considered appropriate and proportionate. This would be agreed through consultation with Historic England.

123. For surveys without an archaeologist on-board, training would be provided (i.e., through a briefing note supported by attendance at planned kick off meetings) to ensure that all operatives are fully informed of the archaeological objectives and requirements for acquiring and delivering data as necessary to understand the archaeological interest of investigated features.

124. All data, including the list of targets, target investigation reports and video footage, would be made available for review by the retained archaeologist (or an archaeological contractor with appropriate expertise). It is recommended that the daily reports and target investigation reports are also provided regularly during survey operations, to ensure timely archaeological advice.

125. If remains of archaeological interest are identified during diver/ROV surveys, where possible, they would be avoided through the implementation of AEZs (see **Section 7.1**). Where archaeological remains can't be avoided, if remains are small enough (e.g., anchors and other isolated finds) it may be possible to move these outside the area of impact. However, if large remains such as a wreck are identified, the Project design may need to be altered.

126. If this is not possible, consultation with Historic England would be undertaken to determine whether an archaeological diver/ROV-based assessment or further mitigation is required. Any further work would require detailed methodologies to be set out in a method statement. This would be agreed with Historic England. Discussions may also need to include the Receiver of Wreck and if aircraft, the Ministry of Defence dependent on what is identified.

127. The results of diver/ROV assessment would be compiled as an archaeological technical report consistent with the methodologies for reporting set out in The Crown Estate (2021) guidance and would form part of the Project archive as set out in **Section 10.6**. The report would identify those sites and/or geophysical anomalies that are potentially of archaeological interest and significance which may warrant further investigation. It would also identify and characterise those sites that are no longer of archaeological interest. These

may be removed from the list of AEZs or geophysical anomalies of possible archaeological interest, following consultation with Historic England. The applicable digital data, including gazetteers and GIS shapefiles, would be updated by the retained archaeologist, and reissued to the Project team and relevant contractors.

7 Delivery of mitigation

7.1 AEZs and TEZS

128. AEZs agreed between the Project team and Historic England would be the primary means to preserve features or remains of archaeological interest or potential archaeological interest in-situ.

129. The principal objective of an AEZ is to prevent damage to or disturbance of a wreck, aircraft or features of potential archaeological interest on the seafloor during activities that may cause damage or disturbance. A requirement for provisions to be made, where feasible, for the in-situ conservation of heritage assets has been established through the European Convention on the Protection of the Archaeological Heritage (revised) (Valletta, 1992) (Article 4).

130. The implementation, monitoring, and modification of AEZs would take place in accordance with the measures specified in The Crown Estate (2021) guidance.

131. AEZs comprise a boundary placed around a heritage asset or potential assets where no development activities can be undertaken. The AEZ would extend from the boundary of the assets and would include a buffer to ensure that all material associated with that asset is encapsulated inside the boundary to reduce the risk of unintentional impacts.

132. The position, extent, and design of any AEZs would consider all available information including geology, hydrology, and sediment transport. As most AEZs would not be a standard shape (i.e., they comprise a buffer around the known extents of the site rather than a circle consisting of a centre-point with a radius distance), the AEZs agreed during the EIA process must be supplied as a GIS shapefile.

133. The list of AEZs is ‘live’ and would be held in the Project GIS maintained by the retained archaeologist. At all stages of the Project development, the Project team would supply the retained archaeologist (if changes to AEZ have been made) and all contractors with the agreed AEZs as shapefile data. In addition, all documentation required for project delivery provided to contractors would include the lists and illustrated locations of AEZs.

134. TEZs by their nature are more likely to be subject to change. TEZs may be removed following further investigation and in consultation with Historic

England if the feature proves to be non-archaeological. However, TEZ may become an AEZ if further investigation identifies an important heritage asset.

135. Subject to approval by Historic England, AEZs would be implemented around all high and medium seabed features, while TEZs would be implemented around a selection of high amplitude magnetic anomalies. These are presented in **Figure 7.1** and in **Table 7.1** and **Table 7.2**.

Table 7.1 AEZs within the windfarm site

Anomaly ID	Description	Potential	WGS84 Z30N		AEZ (m)
			X	Y	
MC22_0013	Unidentified debris	Medium	460388.2	5958939.3	30m radius
MC22_0014	Unidentified debris	Medium	461851.3	5958082.3	15m radius
MC22_0020	Potential debris	Medium	466231.1	5956833.2	15m radius
MC22_0039	Unidentified debris	Medium	460876.8	5962642.2	15m radius

Table 7.2 TEZs within the windfarm site

Anomaly ID	Description	Amplitude (nT)	WGS84 Z30N		AEZ (m)
			X	Y	
MC22_MAG_0254	Magnetic	739.4	458129.8	5957731.9	50m radius

7.2 Archaeological watching briefs

136. As defined in The Crown Estate (2021) guidance, a watching brief is:

"a formal programme of archaeological monitoring that involves attendance by a suitably qualified and experienced archaeologist during groundworks or other site activities/interventions associated with the scheme in the terrestrial or inter-tidal zone, and/ or marine activities such as during offshore obstruction clearance (where considered appropriate)".

137. Offshore, should activities be undertaken which could lead to disturbance to archaeological remains or remains being brought to the surface (e.g., clearance operations and pre-lay grapnel runs), an archaeological watching brief may be required. This would comprise on board supervision by a suitably qualified and experienced archaeologist. If areas subject to clearance are considered to be of medium or high archaeological potential, on board monitoring may be required to ensure consideration is given to any archaeological material brought to the surface. In areas of low archaeological potential any material brought to the surface would be dealt with through the PAD set out in **Section 7.4**.

138. It is anticipated that the archaeological assessment of high-resolution pre-construction geophysical data (**Section 6.1**) would allow for the spatial identification of locations where the risk of encountering unexpected archaeological material is higher. Areas with greater depths of sand, have greater potential for concealing archaeological remains. The same applies where areas of greater concentrations of geophysical anomalies of archaeological potential have been recorded. Watching briefs may also be required if micro-siting to avoid seabed and sub-seabed features of potential archaeological interest is not possible.

139. Should an on-board watching brief be required, the approach would be in accordance with The Crown Estate (2021) guidance. This would be set out in a method statement prepared by the retained archaeologist in consultation with Historic England. If significant archaeological material or palaeoenvironmental deposits are encountered then the Project team, in consultation with Historic England, would make provision for the retained archaeologist (or the archaeological contractor, if appointed), to undertake a programme of investigation commensurate with the evidence discovered.

140. Recording and reporting for any watching briefs, should these be required, would be undertaken in line with the approaches set out in The Crown Estate (2021) guidance.

7.3 Archaeological recording, samples and artefacts

141. As required by The Crown Estate (2021) guidance, archaeological recording and assessment of samples and artefacts would be undertaken with the goal of addressing objectives set out in published local and regional research

frameworks (such as those listed in **Section 2.3**).

142. The Crown Estate (2021) guidance sets out high-level methodologies for:

- Indexing and recording systems
- Position-fixing and levelling
- Environmental sampling strategies
- Environmental samples: handling, labelling, packaging, and storage
- Artefacts: handling, labelling, packaging, and storage
- Discovering and recording ordnance
- The reporting, recording and deposition of human remains
- The reporting and recording of aircraft wrecks
- The reporting and recording of Wreck
- The recovery of materials and their conservation and storage

143. Any archaeological remains or environmental samples that are found during activities associated with the Project would be treated in accordance with this guidance and best practice as set out in:

- Standards and guidance for the collection, documentation, conservation, and research of archaeological materials (CIfA, 2020a)
- First Aid for Underwater Finds (Robinson, 1998)

144. Isolated discoveries of artefacts that may come to light during the development would be dealt with through the PAD as set out in **Section 7.4**.

145. For activities where archaeological materials might be encountered, each method statement would set out the approach to recording and dealing with samples and artefacts where relevant. These would be based on all relevant and specific guidance and best practice. A general summary of key requirements is included below.

146. Any finds recovered or exposed during archaeological works would, at the point of discovery, be held by the archaeological contractor in appropriate conditions pending further recording, investigation, study, or conservation. All finds would be recorded and labelled appropriately. Where it is impracticable to recover finds these would need to be recorded.

147. Contingency would be made for specialist conservation advice from an appropriately qualified and experienced archaeological conservator should unexpected, unusual, or extremely fragile and delicate objects be recovered. All retained finds would be processed in accordance with the CIfA's Standard and guidance for the collection, documentation, conservation and research of archaeological material (CIfA, 2020c).

148. Recovered objects would be selected, retained, or disposed of in accordance with the policy agreed with the institution receiving the archive, and in

consultation with the archaeological contractors.

149. Should ordnance be discovered, it would be treated with extreme care as it may still be active. Guidelines on addressing UXO discoveries provided to contractors by the Project team must be followed prior to any recording of items for archaeological purposes.

150. If human remains are identified, they would be treated with due care and respect. For each situation, the following actions are to be undertaken, and the retained archaeologist would inform the Project team and the archaeological curators.

151. For human remains within territorial waters where the remains have been intentionally buried, applications would be made to the Ministry of Justice for an exhumation licence. In all other cases, the retained archaeologist would immediately inform the Coroner and the Police.

152. Human remains would be left in-situ, covered, and protected. In the unlikely event that human remains have been found and development would unavoidably disturb them, the remains would be fully recorded, excavated, and removed from the site once the appropriate licence has been obtained.

153. An appropriately experienced and qualified human skeletal biologist would, if required, be appointed to advise on and assist with the recovery and storage of human remains. The excavation, recording, analysis, and storage of any human remains would be undertaken in line with the Guidelines to the Standards for Recording Human Remains (Mitchell and Brickley, 2017) and follow best practice as appropriate (British Association of Biological Anthropology and Osteoarchaeology (BABAO) 2010; Mays, 2004; Mays *et al.,* 2013; McKinley and Roberts 1993).

154. Regarding the remains of crashed aircraft, most aircraft wrecks are military and so fall under the legal protection of the Protection of Military Remains Act 1986. These would have to be avoided unless further investigation under licence is deemed necessary following advice from the relevant archaeological curators. Any finds that are suspected of being military aircraft would be reported immediately to the retained archaeologist.

155. In the case of a military aircraft being investigated under licence, any human remains would be reported immediately. Isolated finds of aircraft material would be reported through the protocol for archaeological discoveries, with advice sought from Historic England as set out in **Section 7.4**.

156. All archaeological artefacts that have come from a ship are wreck for the purposes of the Merchant Shipping Act 1995. The Project team, via their archaeological contractors, would ensure that the Receiver of Wreck is notified within 28 days of recovery, by the Project team or their agents, for all items of wreck that have been recovered.

157. All recovered materials would be subject to a conservation assessment to

determine whether special measures are required while the material is being held. This conservation assessment would be carried out by the retained archaeologist or an archaeological contractor with an appropriate level of expertise, with advice from appropriate specialists.

158. The retained archaeologist or an archaeological contractor with appropriate expertise would implement recommendations arising from the conservation assessment. Where no special measures are recommended, finds would be conserved, bagged, boxed, and stored in accordance with industry guidelines.

7.4 Protocol for Archaeological Discoveries (PAD)

159. In order to account for unexpected discoveries of archaeological material during Project construction, operation and maintenance and decommissioning, a formal protocol would be required. It is recommended that if any objects of possible archaeological interest are encountered, that they would be reported using a protocol based on the Offshore Renewables Protocol for Archaeological Discoveries (The Crown Estate, 2014) (ORPAD). This would establish whether the objects are of archaeological interest and allow for appropriate mitigation measures to be recommended where necessary.

160. Activities during which previously unidentified sites or unexpected discoveries of material may be encountered include:

- Pre-construction surveys, for example:
  - Obstructions on the seabed encountered during geotechnical surveys or grab sampling
  - Archaeological material within cores or grab samples
  - Seabed features identified during diver or ROV surveys
- Seabed clearance, pre-lay grapnel runs (e.g. finds brought to the surface)
- Vessel anchoring (e.g. anchor caught on obstruction)
- Installation of OSP(s), WTGs or their foundations (e.g. placement/spudding of jack-up barge)

161. This protocol would apply to pre-construction, construction and installation and operation and maintenance activities in developing offshore renewable energy schemes where an archaeologist is not present on site.

162. A protocol allows for the effective reporting of discoveries of archaeological material to ensure that advice concerning measures to address discoveries is received, and implemented, in a timely and efficient manner.

163. Under the PAD, each vessel or worksite team has a Site Champion, a single person who is responsible for reporting discoveries to a Nominated Contact within the Developer's organisation. The Nominated Contact would report any new discoveries to the retained archaeologist, or an archaeological contractor

engaged to implement the protocol.

164. Individual Site Champions for specific activities would be identified in work package method statements and the identity of the Site Champion would be clearly communicated to work teams, via pre-commencement briefings.

165. The Project team would be responsible for ensuring that teams are provided with appropriate training in the application of the protocol and that all staff and contractors are aware of their responsibilities under the protocol. The protocol documentation, including a full description of the methodology and requirements for implementing the protocol would mirror that of the ORPAD which can be found via the following web link:

- https://www.wessexarch.co.uk/sites/default/files/field_file/2_Protocol%20For%20Archaeological%20Discoveries.pdf.

166. Training would be provided to construction staff, site crews and work teams on the practical application of the protocol in their day-to-day work by a sufficiently experienced and qualified archaeological contractor. Copies of the protocol document would be made available for use on board the construction vessels.

167. Provision would be made by the Project team, in accordance with the protocol, for the prompt reporting/recording to Historic England of archaeological remains encountered or suspected during works.

168. If the find is a wreck within the meaning of the Merchant Shipping Act (1996), then a report would also be made to the Receiver of Wreck. If the find is treasure within the meaning of the Treasure Act (1996), then a report would also be made to the Coroner. All military shipwreck discoveries would be reported to the MoD, Third Sector Team, Command Secretary while all military aircraft discoveries would be reported to Defence Business Services, Joint Casualty & Compassionate Centre.

169. Following completion of the construction phase, a report would be prepared presenting the results of the protocol implementation during activities and submitted to the MMO in a timely manner. If no discoveries are made, a nil discoveries report would be compiled to demonstrate adherence to the scheme.

8 Requirements for monitoring

170. Archaeological monitoring requirements are anticipated to comprise:

- Monitoring of the final Offshore WSI by the retained archaeologist to ensure that the scheme of investigation is appropriate to the Project design
- Monitoring of archaeological works by the archaeological curators, including monitoring of the effectiveness of AEZs
- Monitoring during and post-construction, including a conservation

programme for finds as set out in **Section 8**

171. The performance of this WSI would be monitored over the course of the Project. If changes are made either to the Project or if archaeological issues come to the fore, revisions would be made to the WSI after agreement with the MMO in consultation with Historic England. Any changes would be made through method statements submitted for approval by the Project team or their agents.

172. The reports prepared for each archaeological work package would be distributed to the MMO and Historic England by the Project team or their agents. This would allow for results to be reviewed and any archaeological concerns to be addressed.

173. All survey reports undertaken for the purposes of archaeological evaluation would be submitted to the MMO and Historic England within a specified timescale of the survey being completed to be agreed with the regulator.

174. Prior to the start of any work timetables or work on site that may impact archaeology, Historic England and the MMO would be notified. They would be informed at this time of the name and contact details of the retained archaeologist.

175. During any site evaluation, investigations, or construction work with the potential to impact archaeology, the retained archaeologist, with notification to the Project team, would liaise directly with Historic England about monitoring and reporting. The Project team would be kept informed of all contact between the retained archaeologist and the archaeological curators.

176. As required by The Crown Estate (2021) guidance, provision for monitoring AEZs would be set out in a method statement agreed between the Project team, Historic England and the MMO with reference to any relevant regulatory consent. Monitoring would take place relative to the baseline data used to establish the AEZ and continue for the duration agreed between the Project team and Historic England, as set out in the WSI and subsequent method statements.

177. This may include, for example, periodic archaeological reports prepared by the retained archaeologist, to monitor the effectiveness of the AEZs. These reports would review whether any incursions have been made into any of the AEZs and whether there is still an archaeological need for maintaining them. The frequency of the reports would be agreed with the MMO through consultation with Historic England but would likely include reports at key phases of construction and a post-construction report. This would include an assessment of pre-construction geophysical data. If it becomes clear that activities have encroached upon an AEZ, the Project team would seek advice from the retained archaeologist.

178. A post-construction monitoring report including the archaeological assessment of post-construction geophysical survey data relative to the baseline data would also assess the effects of any indirect impacts that may

have occurred to heritage assets resulting from the construction of the Project.

179. Based on the results of the initial post-construction review, any further requirements during the Project operation and maintenance phase would be agreed in consultation with Historic England. Further monitoring may only be necessary if significant changes to coastal and/or offshore processes are identified or if new information relevant to the integrity of archaeologically important items comes to light.

9 Operation and maintenance, and decommissioning activities

180. During the operations and maintenance, and decommissioning, activities which may have the potential to impact offshore archaeology include the anchoring of service or repair vessels, the placement of jack-up legs in areas not previously impacted by construction activities, or changes to the cable route during maintenance or repair.

181. The approach to mitigation during these phases would be set out in method statements as relevant to that phase, prepared by the retained archaeologist and taking account of best practice and industry standard guidance at that time. It is anticipated that the primary form of mitigation would be through the retention of agreed AEZs (**Section 7.1**) throughout the Project lifetime. The PAD (**Section 7.4**) would also continue to apply during operations and maintenance and decommissioning to deal with any unexcepted discoveries. In addition, as stated in The Crown Estate (2021) guidance, during the operations and maintenance and decommissioning phase, monitoring of AEZs would be undertaken if it becomes apparent that O&M activities that could impact the seabed have taken place within any AEZ.

182. The construction Project team would ensure that the operations and maintenance project team and any contractors have received the latest data regarding AEZs and features of archaeological potential. Where AEZs or TEZs have not been recommended for features interpreted as being of low archaeological potential, and which were not investigated as part of planned ROV investigations, continued avoidance of these features by micro-siting is recommended if they are proposed to be directly impacted by operations and maintenance activities (i.e., anchoring or placement of jack-up legs). Following review of the post-construction monitoring data, an updated gazetteer of anomalies would be provided to contractors to inform this continued avoidance throughout the operations and maintenance phase.

183. Any specific requirements for decommissioning would be established with the regulator and archaeological curator as relevant and in accordance with best practice and industry standard guidance at that time.

10 Archaeological recording, reporting, data management and archiving

10.1 Method statements

184. As noted above, the WSI provides a framework for archaeological investigations. As such, detailed archaeological method statements would be produced prior to survey or construction work, to provide a detailed methodology for each package of development or survey works, as required.

185. Each method statement would be consistent with the WSI, applicable guidance and would reflect the recommended methodologies set out by The Crown Estate (2021). The objectives for each work package would be detailed in the method statement and would take account of applicable objectives from the relevant research frameworks (such as those listed in **Section 2.3**) that would be addressed through the delivery of the work.

186. Each method statement would be prepared by the retained archaeologist in consultation with the Project team and Historic England. If the retained archaeologist does not have a sufficient level of experience with regard to the archaeological work required for a specific package of project works, they would appoint a suitably qualified and experienced archaeological contractor to contribute to or prepare the document and undertake the work. Formal approval for each method statement would be required from Historic England prior to works commencing and in accordance with agreed timescales.

187. As set out in The Crown Estate (2021) guidance, method statements would cover the following key matters, as relevant to each work package:

- Specific objectives of archaeological works
- Extent of investigation
- Investigation methodology, to cover:
  - Intrusive methods
  - Non-intrusive methods
  - Recording system
  - Finds, including the policy for selection, retention and disposal and provision for immediate conservation and storage
- Environmental sampling strategy
- Form of commission and contractual relationship with the Project team
- Relation between licence condition(s), WSI and the method statement
- Context in terms of relevant construction works
- Summary results of previous archaeological investigations in the vicinity
- Archaeological potential

- Anticipated post-investigation actions, including processing, assessment, and analysis of finds and samples
- Reporting, including Intellectual Property Rights in the report and associated data, confidentiality, and timescale for deposition of the report in a publicly accessible archive
- Timetable, to include investigation and post-investigation actions
- Monitoring arrangements, including monitoring by archaeological curator(s)
- Health, safety, and welfare

10.2 Data management

188. All data management would take place in accordance with the approaches set out in The Crown Estate (2021) guidance and guidance on digital archives developed by DigVentures: *Dig Digital - A guide to managing digital data generated from archaeological investigations* (DigVentures, 2019).

189. The retained archaeologist has overall responsibility for all matters related to archaeological data management. Issues regarding data storage and management, such as how long, and in what format data should be stored, would be confirmed through discussions between the retained archaeologist and the Project team.

190. Should a different retained archaeologist be appointed for different stages of a project, the Project team would ensure that there is a handover of all relevant data to the new retained archaeologist (for example, shapefiles of AEZs, geophysical anomalies of archaeological potential, areas of high archaeological potential, etc.).

191. After construction of the Project has been completed, the retained archaeologist would produce an OASIS (Online Access to the Index of Archaeological Investigations) form for the whole Project, and copies of all archaeological reports would be attached. When the OASIS form is submitted, it is automatically sent to the relevant HER, and notification is also sent to Historic England, so that they may advise the respective competent authority on compliance with relevant consent conditions.

10.3 Reports

192. Each package of work outlined in the final Outline OWSI would give rise to one or more archaeological reports, as set out in the method statement relating to the work.

193. Each archaeological report would be consistent with the final Outline WSI, and The Crown Estate (2021) guidance on reporting, and would demonstrate sufficient planning, recording and data management, with a commitment to archiving and the public dissemination of results. The report would satisfy the method statement for the investigation and would present the Project

information in sufficient detail to allow interpretation without recourse to the Project archive.

194. Archaeological reports would be prepared in accordance with the guidance given in the relevant CIfA's Standards and Guidance documents. Reports would typically include:

- A non-technical summary
- The aims and methods of the work
- The results of the work including finds and environmental remains
- A statement of the potential of the results
- Proposals for further analysis and publication
- Illustrations and appendices to support the report

195. Each archaeological report would be submitted in draft to the retained archaeologist for submission to the Project team. If the report is prepared by the retained archaeologist, it would be submitted directly to the Project team. Arrangements and timescales for submitting draft Archaeological Reports by the Project team to Historic England would be set out in the final WSI or method statement relating to the work. The timescales would ensure that Historic England have sufficient time to comment on findings prior to the next stage of archaeological work commencing.

196. On completion of archaeological works relating to construction of the Project and to a timetable agreed with the Project team and Historic England, an overarching report on the archaeology of the Project would be prepared in draft and final copies in accordance with the methods set out above. The overarching report would serve as an index to, and summary of, the archaeological investigations.

10.4 Post-fieldwork assessment

197. Provisions would be made for post-fieldwork assessment. This would address where possible, the character, extent, date, integrity, state of preservation and relative quality of any archaeological features or remains that are recorded. If required, costs for any further research, analysis, publication, and archiving would be detailed in the in the post-fieldwork assessment report.

198. Decisions regarding the scope of post-fieldwork assessment would be made by agreement between the Project team and Historic England following submission of investigation reports, based on the possible importance of the results in terms of their contribution to archaeological knowledge, understanding or methodological development and the availability of funding for further investigation.

199. As a minimum, a single assessment may be carried out after the works associated with the Project have been completed. Such an assessment may

be carried out by expanding the overarching archaeological report to include proposals in respect of analysis, publication, and archiving.

200. As set out in The Crown Estate (2021) guidance, an assessment of the potential of the archive for further analysis may include (but is not limited to):

- The dating and dendrochronological assessment of timbers
- The conservation of appropriate materials, including the X-raying of metalwork
- The spot-dating of all pottery from any investigation. This would be corroborated by scanning of other categories of material
- The preparation of site matrices with supporting lists of contexts by type, by spot-dated phase and by structural grouping supported by appropriate scaled plans
- An assessment statement would be prepared for each category of material, including reference to quantity, provenance, range and variety, condition, and existence of other primary sources
    - A statement of potential for each material category and for the data set would be prepared, including specific questions that can be answered and the potential value of the data to local, regional, and national investigation priorities

10.5 Analysis and publication

201. Based on recommendations made by the post-fieldwork assessment, and as agreed with the relevant archaeological curators, mitigation requirements would be satisfied by carrying out analysis and reporting of the post-fieldwork assessment. If appropriate, this may include publication of important results in a recognised peer-reviewed journal or as a monograph.

202. In terms of mitigation measures relating to the cumulative effects from the Project with the projects listed in Table 15.26 of **Chapter 15 Marine Archaeology and Cultural Heritage** of the Project ES, these can be offset through a contribution to regional research initiatives (i.e., sharing of data and results of archaeological work) which provide the foundation for the creation of 'joined-up' objectives for post-consent investigation and mitigation. This could include links with academic and industry wide research initiatives such as the BRITICE-CHRONO project and the West Coast Palaeolandscape Survey (Fitch and Gaffney, 2011).

203. This approach would require discussion with Historic England, relevant stakeholders, the retained archaeologist, the Applicant, and the developers of the projects listed in the ES. It is recommended that this be undertaken post-consent once further data has been obtained for the Project and those listed in Table 15.26 of **Chapter 15 Marine Archaeology and Cultural Heritage** of the Project ES.

204. The retained archaeologist would confirm the timeframe for the distribution

and/or publishing of reports, in consultation with the Project team and Historic England. This would be included in the WSI or method statement, as appropriate.

10.6 Archive

205. It is accepted practice to keep project archives, including written, drawn, photographic and artefactual elements (along with a summary of the contents of the archive) together wherever possible and to deposit them in appropriate receiving institution once their contents are in the public domain. Archives would be developed in line with guidance including:

- Standard and guidance for the creation, compilation, transfer, and deposition of archaeological archives (CIfA, 2020a)
- Environmental Guidelines for the Permanent Storage of Excavated Material from Archaeological Sites (Institute of Conservation, 1984)
- Guidelines for the preparation of excavation archives for long-term storage (Walker, 1990)

206. The relevant archaeological curators and the archaeological contractor would agree with the receiving institution a policy for the selection, retention, and disposal of excavated material. They would confirm requirements in respect of the format, presentation and packaging of archive records and materials, and would notify the receiving institution in advance of any fieldwork.

207. The timetable for depositing archives with the receiving institution after completion of the post-fieldwork programme would be agreed based on a method statement prepared for the Project team by the retained archaeologist following fieldwork. In England, the National Marine Heritage Record (NMHR) would be the repository for maritime fieldwork records.

11 References

BABAO (2010). British Association of Biological Anthropology and Osteoarchaeology: Code of Practice. Available: http://www.babao.org.uk/assets/Uploads-to-Web/code-of-practice.pdf (Accessed January 2024)

Brennand (2007). The Archaeology of North West England. An Archaeological Research Framework for the North West Region. Volume 1 Resource Assessment.

CIfA (2020a). Standards and guidance for an archaeological watching brief. Available at: https://www.archaeologists.net/sites/default/files/CIfASGWatchingbrief.pdf.

CIfA (2020b). Standards and guidance for the creation, compilation, transfer and deposition of archaeological archives. Available at: https://www.archaeologists.net/sites/default/files/CIFAS%26GArchives_4.pdf (Accessed January 2024)

CIfA (2020c). Standards and guidance for the collection, documentation, conservation and research of archaeological materials. Available at: https://www.archaeologists.net/sites/default/files/CIfAS%26GFinds_2.pdf (Accessed January 2024)

CIfA (2022). Code of conduct: professional ethics in archaeology. Available at: https://www.archaeologists.net/sites/default/files/Code%20of%20conduct%20revOct2022.pdf (Accessed January 2024)

DESNZ (2023). National Policy Statement for Renewable Energy Infrastructure (EN-3).

DigVentures (2019). Dig Digital - A guide to managing digital data generated from archaeological investigations. Available at: https://www.archaeologists.net/sites/default/files/downloads/selection-toolkit/digdigital_full_guidance.pdf (Accessed January 2024)

English Heritage (1998). Identifying and Protecting Palaeolithic Remains: Archaeological Guidance for Planning Authorities and Developers. English Heritage, London.

Fitch, S and Gaffney, V. (2011). West Coast Palaeolandscapes Survey. University of Birmingham. Available at: https://www.dyfedarchaeology.org.uk/lostlandscapes/WCPStechnical.pdf (Accessed November 2023)

Gribble, J. and Leather, S. (2011). Offshore Geotechnical Investigations and Historic Environment Analysis: Guidance for the Renewable Energy Sector. Guidance prepared by Emu and issued by COWRIE. Available: https://www.historicenvironment.scot/media/2376/2011-01-offshore-geotechnical-investigations-and-historic-environment-analysis-guidance-for-the-renewable-energy-sector.pdf (Accessed November 2023)

Historic England (2007). Geoarchaeology: using earth sciences to understand the archaeological record. Guidance prepared for Historic England. Available:

https://content.historicengland.org.uk/images-books/publications/geoarchaeologyearth-sciences-to-understand-archaeological-record/heag067-geoarchaeology.pdf/ (Accessed November 2023)

Historic England (2011). Environmental Archaeology: A Guide to the theory and practice of methods, from sampling and recovery to post-excavation. Guidance prepared for Historic England. Available: https://historicengland.org.uk/images-books/publications/environmental-archaeology-2nd/environmental_archaeology/ (Accessed December 2023)

Historic England (2017). The Setting of Heritage Assets. Historic Environment Good Practice Advice in Planning Note 3 (Second Edition), Available at: https://historicengland.org.uk/images-books/publications/gpa3-setting-of-heritage-assets/heag180-gpa3-setting-heritage-assets/ (Accessed December 2023)

Historic England (2020). Deposit Modelling and Archaeology. Guidance for Mapping Buried Deposits. Published 31 January 2020.

Institute of Conservation (1984). Environmental Guidelines for the Permanent Storage of Excavated Material from Archaeological Sites, Conservation Guidelines No. 3, ICON.

JNAPC (2006). Code for Practice for Seabed Development. Available: http://www.jnapc.org.uk/jnapc_brochure_may_2006.pdf (Accessed December 2023)

Mays, S. (2004). Human Bones from Archaeological Sites: Guidelines for producing assessment documents and analytical reports. Guidance prepared for Historic England (English Heritage). Available: https://www.babao.org.uk/assets/Uploads-to-Web/eh-humanbones-assessments.pdf (Accessed January 2024)

Mays, S., Elders, J., Humphrey, L., White, W. and Marshall, P. (2013). Science and the Dead: A guideline for the destructive sampling of archaeological human remains for scientific analysis. Guidance prepared for Historic England (English Heritage) in association with the Advisory Panel on the Archaeology of Burials in England. Available: http://www.archaeologyuk.org/apabe/pdf/Science_and_the_Dead.pdf (Accessed January 2024)

McKinley and Roberts (1993). Excavation and post-excavation treatment of cremated and inhumed human remains. Volume 13.

Mitchell, P.D. and Brickley, M. eds. (2017). Updated guidelines to the standards for recording human remains. Guidance prepared for Chartered Institute for Archaeologists and BABAO. Available: https://www.archaeologists.net/sites/default/files/14_Updated%20Guidelines%20to%20the%20Standards%20for%20Recording%20Human%20Remains%20digital.pdf (Accessed February 2024)

Morecambe Offshore Windfarm Ltd (2024a). MOR001-FLO-CON-ENV-TEC-0006. Stage 1 Geoarchaeological Assessment of Geotechnical Data.

Morecambe Offshore Windfarm Ltd (2024b). MOR001-RHD-01-CON-ENV-RPT-0042 Morecambe Offshore Windfarm: Generation Assets Archaeological Method Statement (Offshore) – Assessment of Phase 3 Geotechnical Survey Data.

Plets R., Dix J. and Bates R. (2013). Marine Geophysical Data Acquisition, Processing and Interpretation – guidance notes. Guidance prepared for Historic England (English Heritage). Available: https://historicengland.org.uk/images-books/publications/marine-geophysics-data-acquisition-processing-interpretation/mgdapai-guidance-notes/ (Accessed February 2024)

Ransley, J, Sturt, F, Dix, J, Adams, J and Blue, L (eds.) (2013). People and the Sea: A Maritime Archaeological Research Agenda for England, York, GB. Council for British Archaeology, 272pp. (Research Reports, 171)

Robinson, W. (1998). First Aid for Underwater Finds. Archetype Publications Ltd.

The Crown Estate (2014). Protocol for Archaeological Discoveries: Offshore Renewables Projects. Prepared by Wessex Archaeology for The Crown Estate. Available: https://www.wessexarch.co.uk/sites/default/files/field_file/2_Protocol%20For%20Archaeological%20Discoveries.pdf (Accessed October 2023)

The Crown Estate (2021). Archaeological Written Schemes of Investigation for Offshore Wind Farm Projects. Guidance prepared by Wessex Archaeology and issued by The Crown Estate. Available: https://www.thecrownestate.co.uk/media/3917/guide-to-archaeological-requirements-for-offshore-wind.pdf (Accessed October 2023)

Valletta (1992). European Convention on the Protection of the Archaeological Heritage (Revised). Available https://rm.coe.int/CoERMPublicCommonSearchServices/DisplayDCTMContent?documentId=090000168007bd25 (Accessed October 2023)

Walker, K. (1990). Guidelines for the preparation of excavation archives for long-term storage, ICON.

Wessex Archaeology (2007). Historic Environment Guidance for the Offshore Renewable Energy Sector. Guidance prepared by Wessex Archaeology and issued by COWRIE. Available at: https://www.wessexarch.co.uk/sites/default/files/field_file/COWRIE_2007_Wessex_%20-%20archaeo_%20guidance_Final_1-2-07.pdf (Accessed October 2023)

Annex 1 Gazetteer of anomalies of archaeological potential within the windfarm site

Name	Potential	Description	Mag (nT)	Length (m)	Width (m)	Height (m)	AEZ (m)	AEZ type	X	Y
MC22_0007	Low	Chain, cable, or rope		4.47	0.37	0			459110.9551	5957402.501
MC22_0008	Low	Likely geological		2.26	1.46	0.22			455668.2043	5959598.226
MC22_0009	Low	Potential debris		1.54	0.29	0.26			459700.8879	5957048.801
MC22_0011	Low	Potential debris		4.36	0.44	0.27			459271.6062	5958437.76
MC22_0013	Medium	Unidentified debris		7.28	12.39	0.15	30m radius	AEZ	460388.2777	5958939.326
MC22_0014	Medium	Unidentified debris		6.64	1.9	0.27	15m radius	AEZ	461851.3453	5958082.265
MC22_0015	Low	Likely geological		4.12	1.47	0.8			458699.515	5960213.931
MC22_0016	Low	Potential debris		2.39	0.97	0.2			462497.3486	5957889.855
MC22_0019	Low	Unidentified debris		4.26	0.3	0.29			461746.5041	5959673.347
MC22_0020	Medium	Potential debris		4.56	1.99	0.9	15m radius	AEZ	466231.124	5956833.227
MC22_0022	Low	Likely geological		7.42	3.78	0.48			462448.6347	5959733.179

Name	Potential	Description	Mag (nT)	Length (m)	Width (m)	Height (m)	AEZ (m)	AEZ type	X	Y
MC22_0023	Low	Likely geological		4.78	0.74	0			467069.2084	5957065.729
MC22_0029	Low	Unidentified debris		6.59	0.27	0.29			460989.2669	5963039.541
MC22_0031	Low	Chain, cable, or rope		8.07	0.11	0.09			463737.6072	5961959.485
MC22_0033	Low	Chain, cable, or rope		9.31	1.23	0.27			465312.2349	5961242.342
MC22_0034	Low	Chain, cable, or rope		53.52	0.2	0			463035.8551	5962777.858
MC22_0035	Low	Chain, cable, or rope		23.76	10.97	0			463463.722	5963189.824
MC22_0036	Low	Unidentified debris		5.14	4.05	0.37			463016.4611	5963581.473
MC22_0038	Low	Unidentified debris		2.42	2.31	0.15			463294.6158	5964457.487
MC22_0039	Medium	Unidentified debris	437.7	1.5	1.4	0.1	15m radius	AEZ	460876.753	5962642.231
MC22_0041	Low	Likely geological		4.72	2.05	0			465206.1058	5963514.953