




**F I V E**   
**ESTUARIES**  
OFFSHORE WIND FARM

**FIVE ESTUARIES**  
**OFFSHORE WIND FARM**  
PRELIMINARY ENVIRONMENTAL  
INFORMATION REPORT

VOLUME 2, CHAPTER 11: OFFSHORE  
ARCHAEOLOGY AND CULTURAL  
HERITAGE

Document Reference 004685501-01  
Revision A  
Date March 2023





Project	Five Estuaries Offshore Wind Farm
Sub-Project or Package	Preliminary Environmental Information Report
Document Title	Volume 2, Chapter 11: Offshore Archaeology and Cultural Heritage
Document Reference	004685501-01
Revision	A

COPYRIGHT © Five Estuaries Wind Farm Ltd

All pre-existing rights reserved.

This document is supplied on and subject to the terms and conditions of the Contractual Agreement relating to this work, under which this document has been supplied, in particular:

#### LIABILITY

In preparation of this document Five Estuaries Wind Farm Ltd has made reasonable efforts to ensure that the content is accurate, up to date and complete for the purpose for which it was contracted. Five Estuaries Wind Farm Ltd makes no warranty as to the accuracy or completeness of material supplied by the client or their agent.

Other than any liability on Five Estuaries Wind Farm Ltd detailed in the contracts between the parties for this work Five Estuaries Wind Farm Ltd shall have no liability for any loss, damage, injury, claim, expense, cost or other consequence arising as a result of use or reliance upon any information contained in or omitted from this document.

Any persons intending to use this document should satisfy themselves as to its applicability for their intended purpose.

The user of this document has the obligation to employ safe working practices for any activities referred to and to adopt specific practices appropriate to local conditions.

Revision	Date	Status/Reason for Issue	Originator	Checked	Approved
A	Mar-23	Final for PEIR	MA	GoBe	VE OWFL



11	Offshore archaeology and cultural heritage .....	14
11.1	Introduction .....	14
11.2	Statutory and policy context .....	14
11.3	Consultation .....	39
11.4	Scope and methodology.....	57
	Scope of the assessment .....	57
	Study area .....	58
	Potential marine heritage receptors.....	61
	Data sources .....	61
	Assessment methodology .....	64
11.5	Assessment criteria and assignment of significance .....	64
11.6	Uncertainty and technical difficulties encountered .....	68
11.7	Existing environment.....	70
	Overview .....	70
	The array areas .....	70
	The Onshore/ offshore export cable corridor.....	70
	Environmental context and maritime activity .....	74
	Known wrecks and obstructions .....	76
	Aviation remains.....	77
	Fishermen’s fasteners .....	78
	Designated sites.....	78
	Unlocated marine heritage receptors .....	78
	Historic seascape characterisation.....	80
	Evolution of the baseline .....	87
11.8	Archaeological assessment of geophysical data.....	88
11.9	Geoarchaeological assessment of geophysical data .....	105
11.10	Key parameters for assessment.....	108
11.11	Embedded mitigation.....	126
11.12	Environmental assessment: construction phase .....	129
	Impact 1: Direct impact of sediment removal containing undisturbed archaeological contexts during seabed preparation ahead of construction activities leading to the total or partial loss of the marine heritage receptors .....	130
	Impact 2: Direct impact by penetration, compression, and disturbance of piling foundations leading to the total or partial loss of marine heritage receptors.....	131
	Impact 3: Direct impact by penetration, compression, and disturbance of stratigraphic contexts containing archaeological material from the combined weight of the wind turbine generators (wtg) and associated foundations leading to total or partial loss of marine heritage receptors .....	132



Impact 4: Direct impact by penetration, compression, and disturbance of cable laying operations leading to total or partial loss of marine heritage receptors .....	133
Impact 5: Direct impact by penetration, compression, and disturbance effects of jack-up barges and anchoring of construction vessels during construction activities leading to total or partial loss of marine heritage receptors .....	134
Impact 6: Indirect impact causing disturbance of sediment containing potential marine heritage receptors (material and contexts) leading to the exposure of those marine heritage receptors to natural, chemical or biological processes and indirectly causing or accelerating their loss.....	135
Impact 7: Indirect impacts causing changes to the Historic Seascape Character as a result of construction and survey vessel activities and the addition of cables, foundations and turbines indirectly leading to changes to the perceived historic use of the seascape during construction activities .....	136
11.13 Environmental assessment: operational phase .....	143
Impact 8: Direct impact by penetration, compression and disturbance effects of maintenance activities at wtg substation foundations and along inter-array and export cables leading to total or partial loss of marine heritage receptors.....	144
Impact 9: Indirect impacts during the operation phase causing disturbance of sediment containing potential marine heritage receptors during maintenance activities leading to the exposure of those marine heritage receptors to natural, chemical or biological processes and indirectly causing or accelerating loss of the same .....	145
Impact 10: Direct impact by penetration, compression, and disturbance effects of jack-up barges and anchoring of operation and maintenance vessels during the operation and maintenance phase leading to total or partial loss of marine heritage receptors .....	146
Impact 11: Indirect impacts causing scour effects as a result of the presence of WTG substation foundations and the exposure of inter-array and export cables or the use of cable protection measures leading to the exposure of those marine heritage receptors to natural, chemical or biological processes and indirectly causing or accelerating their loss .....	147
Impact 12: Indirect impacts causing changes to the Historic Seascape Character as a result of operation and maintenance vessel activities and the presence of the completed wind farm indirectly leading to changes to the perceived historic use of the seascape during the operation phase.....	148
11.14 Environmental assessment: decommissioning phase .....	155
Impact 13: Direct impact by penetration, compression and disturbance effects of jack-up barges and anchoring of decommissioning vessels leading to total or partial loss of marine heritage receptors .....	156
Impact 14: Indirect impacts creating draw-down of sediment into voids left by removed wtg foundations leading to loss of sediment or destabilization of archaeological sites and contexts indirectly leading to exposing marine heritage receptors to natural, chemical, or biological processes and causing or accelerating loss of the same. ....	157
Impact 15: Indirect impacts causing changes to the historic seascape character as a result of decommissioning activities and the removal of wind farm components indirectly	



leading to changes to the perceived historic use of the seascape during the decommissioning phase.....	158
11.15 Environmental assessment: cumulative effects.....	165
11.16 Inter-relationships.....	182
11.17 Transboundary effects.....	182
11.18 Summary of effects .....	182
11.19 Next steps .....	186
11.20 References.....	187



## TABLES

Table 11.1: Legislation and policy context.....	15
Table 11.2: Summary of consultation relating to Offshore Archaeology and Cultural Heritage .....	40
Table 11.3 Data sources used for the marine archaeology baseline .....	61
Table 11.4: Impact magnitude definitions.....	65
Table 11.5: Sensitivity (value) of the marine environment.....	66
Table 11.6: Matrix to determine effect significance.....	67
Table 11.7 Summary of archaeological anomalies within the marine archaeology study area seen in the geophysical data .....	88
Table 11.8 High potential anomalies seen in geophysical data .....	89
Table 11.9 Medium potential anomalies seen in geophysical data.....	94
Table 11.10 Outline deposit model .....	106
Table 11.11: Maximum design scenario for the project alone.....	109
Table 11.12 Embedded mitigation relating to Offshore Archaeology and Cultural Heritage .....	126
Table 11.13 Receptor sensitivity (value): Construction phase.....	130
Table 11.14 Changes to the Historic Seascape Character (HSC) during construction.....	137
Table 11.15 Receptor sensitivity (value): Operational phase.....	144
Table 11.16 Changes to the Historic Seascape Characterisation (HSC) during operation.....	149
Table 11.17 Receptor sensitivity (value): Decommissioning phase.....	156
Table 11.18 Changes to the Historic Seascape Characterisation (HSC) during decommissioning.....	160
Table 11.19: Description of Tiers of other developments considered for cumulative effect assessment.....	166
Table 11.20 Projects considered within the Offshore Archaeology and Cultural Heritage cumulative effect assessment.....	167
Table 11.21 Cumulative MDS for Offshore Archaeology and Cultural Heritage .....	173
Table 11.22 Summary of effects for Offshore Archaeology and Cultural Heritage .....	183

## FIGURES

Figure 11.1 Marine archaeology study area and PEIR Red Line Boundary.....	60
Figure 11.2 Geophysical survey extent .....	69
Figure 11.3 Records and geoarchaeological features within the array areas .....	72
Figure 11.4 Records and geoarchaeological features within the ECC.....	73
Figure 11.5 Known wrecks and obstructions within the marine archaeology study area .....	79
Figure 11.6 Historic Seascape Characterisation of the sub seafloor level .....	82
Figure 11.7 Historic Seascape Characterisation of the seafloor level.....	83
Figure 11.8 Historic Seascape Characterisation of the water column level .....	84
Figure 11.9 Historic Seascape Characterisation of the sea surface level .....	85
Figure 11.10 Historic Seascape Characterisation of the coastal level .....	86
Figure 11.11 Anomalies of archaeological potential identified in the geophysical data .....	104
Figure 11.12 Valleys and channels of geoarchaeological potential .....	107



## DEFINITION OF ACRONYMS

Term	Definition
AEZ	Archaeological Exclusion Zone
BP	Before Present
DCO	Development Consent Order
dML	Deemed Marine Licence
ECC	Export Cable Corridor
EIA	Environmental Impact Assessment
ES	Environmental Statement
HLC	Historic Landscape Characterisation
HSC	Historic Seascape Characterisation
MAG	Magnetometer
MMO	Marine Management Organisation
MBES	Multi-Beam Echo Sounder
NRHE	National Record of the Historic Environment
nT	Nanotesla
PAD	Protocol for Archaeological Discoveries
PAS	Portable Antiquities Scheme
PEIR	Preliminary Environmental Information Report
RLB	Red Line Boundary
SSS	Side Scan Sonar
SBP	Sub-Bottom Profiler
UKHO	United Kingdom Hydrographic Office
UHRS	Ultra-High Resolution Seismic
VE	Five Estuaries Offshore Wind Farm (the Project)
VE OWFL	Five Estuaries Offshore Wind Farm Limited
WSI	Written Schemes of Investigation
WTG	Wind Turbine Generator



## GLOSSARY OF TERMS

Term	Definition
Archaeological Exclusion Zone	A spatially defined zone around a known marine heritage receptor that will be avoided during intrusive works. The avoidance of AEZs must also consider that the use of anchors and lines, which could impact upstanding features, are adequately taken into account in the planning of operations.
Before Present	Time scale referring to the years before 1950.
Bronze Age	Archaeological period lasting from 4,600-2,200 BP. This period follows on from the Neolithic and is characterised by the increasing use of bronze. It is subdivided into the Early, Middle and Late Bronze Age.
Development Consent Order	An order made under the Planning Act 2008 granting development consent for a Nationally Significant Infrastructure Project (NSIP) from the Secretary of State (SoS) for Business, Energy and Industrial Strategy (BEIS).
Decommissioning	The period during which a development and its associated processes are removed from active operation.
Deemed Marine Licence	If a Development Consent Order (DCO) is granted, this will include provision deeming a marine licence to have been issued under Part 4 of the Marine and Coastal Access Act 2009.
Early Medieval	Archaeological period lasting from AD 410 to 1066. This dates from the breakdown of Roman rule in Britain to the Norman invasion in 1066 and is to be used for monuments of post Roman, Saxon and Viking date.
Early Prehistoric	Archaeological period lasting from 52,000 to 6,000 BP. For monuments which are characteristic of the Palaeolithic to Mesolithic but cannot be specifically assigned.





Term	Definition
Export Cable Corridor	The area(s) where the export cables will be located. Refer to either the offshore or onshore ECC.
Environmental Impact Assessment	The process of evaluating the likely significant environmental effects of a proposed project or development over and above the existing circumstances (or 'baseline').
Environmental Statement	The documents that collate the processes and results of the EIA.
Geophysical	Relating to the physical properties of the Earth.
Heritage	The historic environment and especially valued assets and qualities such as historic buildings and cultural traditions.
Historic England	The public body that champions and protects England's historic places.
Historic Landscape Characterisation	Maps and describes historic cultural influences within an area looking beyond individual heritage assets and interpreting the patterns and connections within a landscape, spatially and through time.
Historic Seascape Characterisation	Maps and describes historic cultural influences which shape seascape perceptions across marine areas and coastal land.
Impact	The changes resulting from an action.
Intertidal	The area of the shoreline which is covered at high tide and uncovered at low tide.
Iron Age	Archaeological period lasting from 2,800 BP to AD 43. This period follows on from the Bronze Age and is characterised by the use of iron for making tools and monuments such as hillforts and oppida. The Iron Age is taken to end with the Roman invasion.
Last Glacial Maximum	Time during the last glacial period that the ice sheets were at their greatest extents, approximately 26,500-19,000 BP.



Term	Definition
Magnetometer	A device used to measure direction, strength, or relative change of a magnetic field at a particular location.
Marine archaeology study area	Defined as the PEIR Red Line Boundary up to MHWS and surrounded by a 1 km buffer.
Marine Heritage Receptors	Physical resources such as shipwrecks, remains of aircraft, archaeological sites, archaeological finds and material including prehistoric deposits as well as archival documents and oral accounts recognised as of historical/archaeological or cultural significance.
Marine Written Schemes of Investigation	The specific WSI formed to set out the agreement between client, the appointed archaeologists, contractors and relevant stakeholders which details the methods to mitigate the effects on all the known and potential marine heritage receptors within the development area. This will develop throughout the life of the project beginning with the Outline Marine WSI through to the Draft Marine WSI and final Agreed Marine WSI.
Medieval	Archaeological period lasting from AD 1066-1540. The Medieval period or Middle Ages begins with the Norman invasion and ends with the dissolution of the monasteries.
Mesolithic	Archaeological period lasting from 12,000-6,000 BP. The Middle Stone Age, falling between the Palaeolithic and the Neolithic; marks the beginning of a move from a hunter gatherer society towards food producing society.
Marine Management Organisation	MMO is an executive non-departmental public body, sponsored by the Department for Environment, Food & Rural Affairs. The MMO license, regulate and plan marine activities in the seas around England so that they are carried out in a sustainable way.
Multi-Beam Echo Sounder	A type of sonar used to map the seabed by emitting acoustic waves in a fan shape



Term	Definition
	beneath its transceiver. The time it takes for the sound waves to reflect off the seabed and return to the receiver is used to calculate the water depth and produce a visualisation of depths and shapes of underwater terrain.
National Record of the Historic Environment	National database of known wrecks, aircraft, obstructions, Fishermen's fasteners and reported losses held by Historic England. Currently (September 2022) being developed into the National Marine Heritage Record (NMHR).
Neolithic	Archaeological period lasting from 6,000-4,200 BP. This period follows on from the Palaeolithic and the Mesolithic and is succeeded by the Bronze Age. This period is characterised by the practice of a farming economy and extensive monumental constructions.
Nanotesla	Measurement describing the magnetic field (flux) of ferrous materials as measures by a magnetometer (one nanotesla equals 10 <sup>-9</sup> tesla).
Offshore	The sea further than two miles from the coast.
Offshore Wind Farm	An offshore wind farm is a group of wind turbines in the same location (offshore) in the sea which are used to produce electricity.
Outline Marine Written Schemes of Investigation	Outline Marine WSI, specific for the offshore area and developed during the EIA process to form frameworks for mitigation strategies that will be submitted with the DCO application. Followed by the Draft Marine WSI (based on the Outline Marine WSI) and the final Agreed Marine WSI (based on the Draft Marine WSI).
Protocol for Archaeological Discoveries	A document detailing how unexpected finds made during the lifetime of the proposed development should be reported.
Palaeolithic	Archaeological period lasting from 52,000-12,000 BP. The period is defined by the practice of hunting and gathering and the



Term	Definition
	use of knapped (chipped) flint tools. This period is usually divided up into the Lower, Middle and Upper Palaeolithic.
Portable Antiquities Scheme	The Portable Antiquities Scheme is run by the British Museum and Amgueddfa Cymru - National Museum Wales to encourage the recording of archaeological objects found by members of the public in England and Wales.
Preliminary Environmental Information Report	The PEIR is written in the style of a draft Environmental Statement (ES) and forms the basis of statutory consultation. Following that consultation, the PEIR documentation will be updated into the final ES that will accompany the application for the Development Consent Order (DCO).
Post-medieval	Archaeological period lasting from AD 1540-1901. Begins with the dissolution of the monasteries (AD 1536-1541) and ends with the death of Queen Victoria (AD 1901). A more specific period within this date range is used where known.
Receiver of Wreck	Official of the British Government whose main task is to administer the law in relation to Wreck and Salvage.
Red Line Boundary	The extent of development including all works, access routes, cable corridors, visibility splays and discharge points.
Roman period	Archaeological period lasting from AD 43-410. Traditionally begins with the Roman invasion in AD 43 and ends with the emperor Honorius directing Britain to look to its own defences in AD 410.
Seascape	Landscapes with views of the coast or seas, and coasts and adjacent marine environments with cultural, historical and archaeological links with each other.
Side Scan Sonar	A sonar system that provides high-resolution seafloor morphology from both sides of the vessel track to produce an image of the seafloor.
Sub-Bottom Profiler	An acoustic system used to determine physical properties of the sea floor and to



Term	Definition
	image and characterise geological information a few metres below the sea floor.
United Kingdom Hydrographic Office database	Database of known wrecks and obstructions held and maintained by the UKHO.
Ultra-High Resolution Seismic	An acoustic system used to image submerged and buried features in shallow water.
Written Schemes of Investigation	A document forming the agreement between the client, the appointed archaeologists, contractors, and the relevant stakeholders. The document sets out methods to mitigate the effects on all the known and potential marine heritage receptors within the development area. For Offshore Archaeology and Cultural Heritage, a Marine WSI will be developed.



## 11 OFFSHORE ARCHAEOLOGY AND CULTURAL HERITAGE

### 11.1 INTRODUCTION

- 11.1.1 This chapter identifies the offshore archaeology and cultural heritage of relevance to the Five Estuaries Offshore Wind Farm (VE) proposed development within the marine archaeology study area (as defined within Section 11.4).
- 11.1.2 This chapter further describes the potential impacts from the construction, operation and decommissioning of the offshore and intertidal components up to Mean High Water Springs (MHWS) of VE on marine heritage receptors and sets out the scope and methods of the Environmental Impact Assessment (EIA).
- 11.1.3 Potential impacts of the onshore components of VE on cultural heritage assets are described separately in Volume 3, Chapter 7: Onshore Archaeology and Cultural Heritage.
- 11.1.4 This chapter and the associated annexes should be read alongside the following chapters of the PEIR:
- > Volume 1, Chapter 3: EIA Methodology;
  - > Volume 2, Chapter 1: Offshore Project Description;
  - > Volume 2, Chapter 2: Marine Geology, Oceanography and Physical Processes;
  - > Volume 2, Chapter 10: Seascape, Landscape and Visual Impact Assessment; and
  - > Volume 3, Chapter 7: Onshore Archaeology and Cultural Heritage.
- 11.1.5 The annexes to this chapter include:
- > Volume 4, Annex 11.1: Offshore Archaeology Technical Report which comprises a desk-based study of the environmental baseline for offshore archaeology and cultural heritage within the marine archaeology study area, as well as an archaeological assessment of geophysical data; and
  - > Volume 4, Annex 11.2: Outline Marine Written Schemes of Investigation which forms an umbrella document for further surveys, investigations and assessments required throughout the life of the project and sets out archaeological actions and mitigation.

### 11.2 STATUTORY AND POLICY CONTEXT

- 11.2.1 This section was drafted by Maritime Archaeology which is a Registered Organisation with the Chartered Institute for Archaeologists (CIfA); all work conducted is in accordance with the guidance and principles set out in CIfA's Code of Conduct (2014a) and Code of Professional Conduct (2019).
- 11.2.2 Archaeology and cultural heritage fall under the jurisdiction of Historic England seaward of mean low water springs (MLWS), and Essex County Council landward of MLWS.
- 11.2.3 The following legislation, guidance and best practice has been consulted as part of this assessment. A more detailed explanation of the legislation and national policy relevant to VE can be found in Volume 1, Chapter 2: Policy and Legislation



**Table 11.1: Legislation and policy context**

Legislation/ Policy	Key Provisions	Section Where Comment Addressed
Marine and Coastal Access Act 2009	<p>The Act sets out a framework for the management of marine functions and activities for areas which include waters in or adjacent to England up to the seaward limits of the territorial sea. It provides for the preparation and adoption of marine plans and for the regulation of licensable activities in the marine environment through the granting and enforcement of conditions on marine licences.</p>	<p>VE will need to consider and comply with the requirements of the adopted Marine Policy Statement and East Inshore and East Offshore Marine Plans (HM Government, 2014) as they relate to the impact of the proposed development on marine heritage. The embedded mitigation will be secured through the deemed grant of a marine licence pursuant to the Act.</p> <p>The significance of marine heritage receptors within the marine archaeology study area is presented in Volume 4, Annex 11.1: Offshore Archaeology and Cultural Heritage Technical Report. The embedded mitigation is presented in Table 11.2.</p>
Merchant Shipping Act 1995	<p>The Receiver of Wreck administers the Merchant Shipping Act 1995, in the UK in relation to wreck and salvage. The Receiver is responsible for processing incoming reports of wreck and cargo.</p>	<p>VE may cause impact on objects associated with wrecks. If any material is recovered during works associated with VE which fall within the definition of 'wreck', the Receiver of Wreck must be notified and will seek to identify the original owner, as detailed in Volume 4, Annex 11.2: Outline Marine Written Scheme of Investigation.</p>
Protection of Wrecks Act 1973	<p>Act to secure the protection of wrecks within designated areas in territorial waters, and the sites of such wrecks, from interference by unauthorised persons.</p>	<p>Heritage features regarded as of special interest or significance may become designated within the VE area.</p>



Legislation/ Policy	Key Provisions	Section Where Comment Addressed
		<p>There are currently no protected wreck sites identified within the VE marine archaeology study area as presented in Section 3.2 of Volume 4, Annex 11.1: Offshore Archaeology and Cultural Heritage Technical Report.</p>
<p>The Protection of Military Remains Act 1986</p>	<p>Provides protection for the wreckage of military aircraft and certain military wrecks. Designations can be either as a Controlled Site or a Protected Place where access may be permitted but any operations which may disturb the site are illegal unless licensed by the Ministry of Defence.</p>	<p>If any material associated with a vessel or aircraft that was in military service when lost or wrecked is located, the area will be protected under this Act. All military aircraft are automatically protected under this legislation; however, vessels must be designated individually.</p> <p>There are several reported aircraft losses with unspecified locations within the VE marine archaeology study area. These must be considered in all pre-construction survey data analysis and investigations and will require a licence under this Act before any works that may impact them can commence.</p> <p>Geophysical anomaly MA0029 correlates with the location of one of these charted and reported aircraft losses, as detailed in Section 3.4 of Volume 4, Annex 11.1: Offshore Archaeology and Cultural Heritage Technical Report. This site is assumed to become an automatically</p>





Legislation/ Policy	Key Provisions	Section Where Comment Addressed
		protected place under this Act even if the physical remains have not been confirmed as an aircraft.
Burial Act 1857	The Act requires a licence to be granted prior to the removal of human remains from deliberately deposited contexts.	If human remains are discovered during works associated with VE, they will be protected under this Act. The actions required where human remains are found are further detailed in the Section 8.9 of Volume 4, Annex 11.2: Outline Marine Written Scheme of Investigation.
The Treasure Act 1996	The Act is supplemented by the Treasure (Designation) Order 2002. Finders of gold and silver objects (over 300 years old) and some base metal assemblages (prehistoric) as defined in the Act are required to report such finds by contacting the Coroner and delivering the items for handover as per the Coroner's instructions.	Should any relevant material be found during works associated with VE, advice from the Coroner must be sought and their instructions adhered to as detailed in Section 7.4 of Volume 4, Annex 11.2: Outline Marine Written Scheme of Investigation.
The Treasure (Designation) Order 2002	Finders of gold and silver objects (over 300 years old) and some base metal assemblages (prehistoric) as defined in the Act are required to report such finds by contacting the Coroner and delivering the items for handover as per the Coroner's instructions.	Should any relevant material be found during works associated with VE, advice from the Coroner must be sought and their instructions adhered to as detailed in Section 7.4 of Volume 4, Annex 11.2: Outline Marine Written Scheme of Investigation.
Ancient Monuments and Archaeological Areas Act 1979	Monuments that are of national importance within UK territorial waters can be protected by being designated within the schedule of monuments protected under this Act.	It is an offence to damage or conduct a range of specified activities on a 'scheduled monument' unless authorised to do so.
East Inshore and East Offshore Marine	Objective 5:	All known and unknown marine heritage receptors in



Legislation/ Policy	Key Provisions	Section Where Comment Addressed
<p>Plans (HM Government, 2014)</p>	<p><i>“To conserve heritage assets, nationally protected landscapes and ensure that decisions consider the seascape of the local area”</i></p> <p>Policy SOC2:</p> <p><i>“Proposals that may affect heritage assets should demonstrate, in order of preference:</i></p> <p><i>a) that they will not compromise or harm elements which contribute to the significance of the heritage asset</i></p> <p><i>b) how, if there is compromise or harm to a heritage asset, this will be minimised</i></p> <p><i>c) how, where compromise or harm to a heritage asset cannot be minimised it will be mitigated against or</i></p> <p><i>d) the public benefits for proceeding with the proposal if it is not possible to minimise or mitigate compromise or harm to the heritage asset”</i></p> <p>Policy SOC3:</p> <p><i>“Proposals that may affect the terrestrial and marine character of an area should demonstrate, in order of preference:</i></p> <p><i>a) that they will not adversely impact the terrestrial and marine character of an area</i></p> <p><i>b) how, if there are adverse impacts on the terrestrial and marine character of an area, they will minimise them</i></p> <p><i>c) how, where these adverse impacts on the terrestrial and marine character of an area</i></p>	<p>the marine zone that may be affected by the proposed VE development and their archaeological significance have been described in detail in Volume 4, Annex 11.1: Offshore Archaeology and Cultural Heritage Technical Report, and summarised in Section 11.11.</p> <p>Potential impact on the marine heritage receptors of the proposed development is discussed in Sections 11.12 to 11.18.</p> <p>Mitigation to avoid or offset any impacts as a result of VE is detailed in Volume 4, Annex 11.2: Outline Marine Written Scheme of Investigation and summarised in Section 11.11.</p>



Legislation/ Policy	Key Provisions	Section Where Comment Addressed
	<p><i>cannot be minimised, they will be mitigated against</i></p> <p><i>d) the case for proceeding with the proposal if it is not possible to minimise or mitigate the adverse impacts”</i></p>	
<p>South East Inshore Marine Plan (HM Government, 2021)</p>	<p>Objective 5:  <i>“People appreciate the diversity of the marine environment, its seascapes, its natural and cultural heritage and its resources and can act responsibly”</i></p> <p>SE-HER-1:  <i>“Proposals that demonstrate they will conserve and enhance the significance of heritage assets will be supported. Where proposals may cause harm to the significance of heritage assets, proponents must demonstrate that they will, in order of preference:</i></p> <p><i>a) avoid</i></p> <p><i>b) minimise</i></p> <p><i>c) mitigate</i></p> <p><i>- any harm to the significance of heritage assets. If it is not possible to mitigate, then public benefits for proceeding with the proposal must outweigh the harm to the significance of heritage assets”</i></p>	<p>All known and unknown marine heritage receptors in the marine zone that may be affected by the proposed VE development and their archaeological significance have been described in detail in Volume 4, Annex 11.1: Offshore Archaeology and Cultural Heritage Technical Report and summarised in Section 11.7. Potential impact on the marine heritage receptors of the proposed development is discussed in Sections 11.12 to 11.18. Mitigation to avoid or offset any impacts as a result of VE is detailed in Volume 4, Annex 11.2: Outline Marine Written Scheme of Investigation and summarised in Section 11.11.</p>
<p>UK Marine Policy Statement (HM Government, 2011)</p>	<p>Paragraph 2.6.6.  Historic environment  <i>“The historic environment includes all aspects of the environment resulting from the interaction between people and places through time, including</i></p>	<p>As marine activities have the potential to result in adverse effects on the historic environment both directly and indirectly, including damage to or destruction of heritage assets, all available evidence to identify the significance of</p>



Legislation/ Policy	Key Provisions	Section Where Comment Addressed
	<p><i>all surviving physical remains of past human activity, whether visible, buried or submerged</i></p>	<p>the heritage assets within the marine archaeology study area is presented in Volume 4, Annex 11.1: Offshore Archaeology and Cultural Heritage Technical Report. The recommended mitigation is presented in Section 11.11.</p>
<p>National Policy Statement (NPS) for Energy (EN-1). July 2011.</p>	<p>Paragraph 5.8.8</p> <p><i>“As part of the ES (see Section 4.2) the applicant should provide a description of the significance of the heritage assets affected by the proposed development and the contribution of their setting to that significance. The level of detail should be proportionate to the importance of the heritage assets and no more than is sufficient to understand the potential impact of the proposal on the significance of the heritage asset. As a minimum the applicant should have consulted the relevant Historic Environment Record (or, where the development is in English or Welsh waters, English Heritage or Cadw) and assessed the heritage assets themselves using expertise where necessary according to the proposed development’s impact”</i></p>	<p>All known and unknown marine heritage receptors in the marine zone that may be affected by the proposed VE development and their archaeological significance have been described in detail in Volume 4, Annex 11.1: Offshore Archaeology and Cultural Heritage Technical Report, and summarised in Section 11.7. Potential impact on the marine heritage receptors of the proposed development is discussed in Sections 11.12 to 11.18.</p>
<p>Draft Overarching National Policy Statement for Energy (EN-1). September 2021.</p>	<p>Paragraph 5.9.10</p> <p><i>“The applicant should undertake an assessment of any likely significant heritage impacts of the proposed development as part of the EIA and describe these in the ES (see Section 4.2). This should include consideration of heritage assets</i></p>	



Legislation/ Policy	Key Provisions	Section Where Comment Addressed
	<p><i>above, at, and below the surface of the ground”</i></p> <p>Paragraph 5.9.11</p> <p><i>“As part of the ES the applicant should provide a description of the significance of the heritage assets affected by the proposed development, including any contribution made by their setting. The level of detail should be proportionate to the importance of the heritage assets and no more than is sufficient to understand the potential impact of the proposal on their significance. As a minimum the applicant should have consulted the relevant Historic Environment Record (or, where the development is in English or Welsh waters, Historic England or Cadw) and assessed the heritage assets themselves using expertise where necessary according to the proposed development’s impact”</i></p>	
NPS EN-1, 2011	<p>Paragraph 5.8.9</p> <p><i>“Where a development site includes, or the available evidence suggests it has the potential to include, heritage assets with an archaeological interest, the applicant should carry out appropriate desk-based assessment and, where such desk-based research is insufficient to properly assess the interest, a field evaluation”</i></p>	Heritage assets (marine heritage receptors) and the archaeological potential within the marine archaeology study area have been considered and assessed in Volume 4, Annex 11.1: Offshore Archaeology and Cultural Heritage Technical Report, and summarised in Section 11.7.
Draft NPS EN-1, 2021	<p>Paragraph 5.9.12</p> <p><i>“Where a site on which development is proposed includes, or the available</i></p>	



Legislation/ Policy	Key Provisions	Section Where Comment Addressed
	<p><i>evidence suggests it has the potential to include, heritage assets with an archaeological interest, the applicant should carry out appropriate desk-based assessment and, where such desk-based research is insufficient to properly assess the interest, a field evaluation. Where proposed development will affect the setting of a heritage asset, accurate representative visualisations may be necessary to explain the impact”</i></p>	
NPS EN-1, 2011	<p>Paragraph 5.8.10  <i>“The applicant should ensure that the extent of the impact of the proposed development on the significance of any heritage assets affected can be adequately understood from the application and supporting documents”</i></p>	<p>The archaeological significance and potential impact on the marine heritage identified within the PEIR Red Line Boundary (RLB) was undertaken according to the methodology outlined in Section 11.10. Table 11.11 outlines the maximum design scenario and relevant activities that may impact marine archaeological heritage receptors. Sections 11.12 to 11.18 further details how marine archaeological heritage receptors may be affected.</p>
Draft NPS EN-1, 2021	<p>Paragraph 5.9.13  <i>“The applicant should ensure that the extent of the impact of the proposed development on the significance of any heritage assets affected can be adequately understood from the application and supporting documents. Studies will be required on those heritage assets affected by noise, vibration, light and indirect impacts, the extent and detail of these studies will be proportionate to the significance of the heritage asset affected”</i></p>	
NPS EN-1, 2011	<p>Paragraph 5.8.11  <i>“In considering applications, the IPC should seek to identify and</i></p>	<p>The significance of the known marine heritage receptors within the offshore zone and</p>



Legislation/ Policy	Key Provisions	Section Where Comment Addressed
	<p><i>assess the particular significance of any heritage asset that may be affected by the proposed development, including by development affecting the setting of a heritage asset, taking account of:</i></p> <ul style="list-style-type: none"> <li><i>&gt; evidence provided with the application;</i></li> <li><i>&gt; any designation records;</i></li> <li><i>&gt; the Historic Environment Record, and similar sources of information;</i></li> <li><i>&gt; the heritage assets themselves;</i></li> <li><i>&gt; the outcome of consultations with interested parties; and</i></li> <li><i>&gt; where appropriate and when the need to understand the significance of the heritage asset demands it, expert advice”</i></li> </ul>	<p>potential impact on known and unknown marine heritage receptors identified has been undertaken according to the methodology outlined in Section 11.10. The results of the assessments, including setting in the context of Historic Seascape Characterisation, are detailed in Volume 4, Annex 11.1: Offshore Archaeology and Cultural Heritage Technical Report and are summarised in Section 11.7.</p>
Draft NPS EN-1, 2021	<p>Paragraph 5.9.17</p> <p><i>“In determining applications, the Secretary of State should seek to identify and assess the particular significance of any heritage asset that may be affected by the proposed development, including by development affecting the setting of a heritage asset (including assets whose setting may be affected by the proposed development), taking account of:</i></p> <ul style="list-style-type: none"> <li><i>&gt; relevant information provided with the application and, where</i></li> </ul>	



Legislation/ Policy	Key Provisions	Section Where Comment Addressed
	<p><i>applicable, relevant information submitted during the examination of the application</i></p> <ul style="list-style-type: none"> <li>&gt; <i>any designation records, Including those on the National Heritage List for England</i></li> <li>&gt; <i>historic landscape character records</i></li> <li>&gt; <i>the relevant Historic Environment Record(s), and similar sources of information</i></li> <li>&gt; <i>representations made by interested parties during the examination process</i></li> <li>&gt; <i>expert advice, where appropriate, and when the need to understand the significance of the heritage asset demands it”</i></li> </ul>	
NPS EN-1, 2011	<p>Paragraph 5.8.12</p> <p><i>“In considering the impact of a proposed development on any heritage assets, the IPC should take into account the particular nature of the significance of the heritage assets and the value that they hold for this and future generations. This understanding should be used to avoid or minimise conflict between conservation of that significance and proposals for development”</i></p>	<p>The significance of the known marine heritage receptors within the offshore zone and potential impact on known and unknown marine heritage receptors identified has been undertaken according to the methodology outlined in Section 11.10. The results of the assessments, including the heritage significance of the known marine heritage receptors as well as the potential to locate marine heritage receptors of significance during works are detailed in Volume 4, Annex 11.1: Offshore Archaeology and Cultural Heritage</p>
Draft NPS EN-1, 2021	<p>Paragraph 5.9.19</p> <p><i>“In considering the impact of a proposed development on any heritage assets, the Secretary of State should take into account the particular nature of the</i></p>	





Legislation/ Policy	Key Provisions	Section Where Comment Addressed
	<p><i>significance of the heritage assets and the value that they hold for this and future generations. This understanding should be used to avoid or minimise conflict between their conservation and any aspect of the proposal”</i></p>	<p>Technical Report and summarised in Section 11.7.</p>
<p>NPS EN-1, 2011</p>	<p>Paragraph 5.8.13</p> <p><i>“The IPC should take into account the desirability of sustaining and, where appropriate, enhancing the significance of heritage assets, the contribution of their settings and the positive contribution they can make to sustainable communities and economic vitality. The IPC should take into account the desirability of new development making a positive contribution to the character and local distinctiveness of the historic environment. The consideration of design should include scale, height, massing, alignment, materials and use. The IPC should have regard to any relevant local authority development plans or local impact report on the proposed development in respect of the factors set out”</i></p>	<p>While this provision is not directly applicable to marine archaeology or marine heritage receptors, the embedded mitigation measures for the archaeological assessment of data as outlined in (Table 11.12) and Volume 4, Annex 11.2: Outline Marine Written Scheme of Investigation, is expected to be reflected in the DCO requirements or dML conditions. Positive contributions to knowledge and understanding of the historic environment can be realised through data gathering, interpretation and publication. The works will contribute to current research frameworks in the region and will be further detailed in forthcoming relevant Method Statements, which will consider relevant research frameworks to reflect and enhance the ongoing research in the area.</p>
<p>Draft NPS EN-1, 2021</p>	<p>Paragraph 5.9.20</p> <p><i>“The Secretary of State should take into account the desirability of sustaining and, where appropriate, enhancing the significance of heritage assets, the contribution of their settings and the positive contribution that their conservation can make to sustainable communities, including to their quality of life,</i></p>	



Legislation/ Policy	Key Provisions	Section Where Comment Addressed
	<p><i>their economic vitality, and to the public’s enjoyment of these assets. The Secretary of State should also take into account the desirability of the new development making a positive contribution to the character and local distinctiveness of the historic environment. The consideration of design should include scale, height, massing, alignment, materials, use and landscaping (for example, screen planting)”</i></p>	
NPS EN-1, 2011	<p>Paragraph 5.8.15</p> <p><i>“Any harmful impact on the significance of a designated heritage asset should be weighed against the public benefit of development, recognising that the greater the harm to the significance of the heritage asset the greater the justification will be needed for any loss. Where the application will lead to substantial harm to or total loss of significance of a designated heritage asset the IPC should refuse consent unless it can be demonstrated that the substantial harm to or loss of significance is necessary in order to deliver substantial public benefits that outweigh that loss or harm”</i></p>	<p>While generally no active conservation strategy is proposed, Archaeological Exclusion Zones (AEZ) (as per mitigation in Table 11.12) have been applied to all known wrecks and obstructions and anomalies of high and medium archaeological potential identified in the geophysical data.</p> <p>The commitment to avoid all known marine archaeology marine heritage receptors and to further investigate the area of impacts ensuring that unknown marine heritage receptors are located, and impact mitigated will ensure preservation <i>in situ</i>, as further detailed in Volume 4, Annex 11.2: Outline Marine Written Scheme of Investigation. Where known receptors require further intrusive investigation or where they cannot be preserved <i>in situ</i>, reporting and conservation strategies will be clearly outlined in the relevant</p>
Draft NPS EN-1, 2021	<p>Paragraph 5.9.21</p> <p><i>“When considering the impact of a proposed development on the significance of a designated heritage asset, the Secretary of State should give great weight to the asset’s conservation. The more important the asset, the greater the weight should be.</i></p>	



Legislation/ Policy	Key Provisions	Section Where Comment Addressed
	<p><i>This is irrespective of whether any potential harm amounts to substantial harm, total loss, or less than substantial harm to its significance”</i></p> <p>Paragraph 5.9.24</p> <p><i>“Where the proposed development will lead to substantial harm to (or total loss of significance of) a designated heritage asset the Secretary of State should refuse consent unless it can be demonstrated that the substantial harm to or loss of significance is necessary to achieve substantial public benefits that outweigh that harm or loss, or all of the following apply:</i></p> <p><i>the nature of the heritage asset prevents all reasonable uses of the site</i></p> <ul style="list-style-type: none"> <li><i>&gt; no viable use of the heritage asset itself can be found in the medium term through appropriate marketing that will enable its conservation</i></li> <li><i>&gt; conservation by grant-funding or some form of not for profit, charitable or public ownership is demonstrably not possible</i></li> </ul> <p><i>the harm or loss is outweighed by the benefit of bringing the site back into use”</i></p>	<p>Method Statements produced ahead of any such archaeological works.</p> <p>No impact on marine heritage receptors is expected to lead to harm or total loss of significance. AEZs (as per mitigation in Table 11.12 have been applied to all known wrecks and anomalies of high and medium archaeological potential.</p>
NPS EN-1, 2011	<p>Paragraph 5.8.17</p> <p><i>“Where loss of significance of any heritage asset is justified on the merits of the new</i></p>	<p>The commitment to avoid all known marine heritage receptors and to further investigate the area of</p>



Legislation/ Policy	Key Provisions	Section Where Comment Addressed
	<p><i>development, the IPC should consider imposing a condition on the consent or requiring the applicant to enter into an obligation that will prevent the loss occurring until it is reasonably certain that the relevant part of the development is to proceed”</i></p>	<p>impacts ensuring that unknown marine heritage receptors are located, and impact mitigated will ensure preservation <i>in situ</i>, as further detailed in Volume 4, Annex 11.2: Outline Marine Written Scheme of Investigation. Where marine heritage receptors are directly impacted or removed from the seabed, justification will be clearly outlined in the relevant Method Statements produced ahead of any archaeological works and following agreement with Historic England.</p>
<p>Draft NPS EN-1, 2021</p>	<p>Paragraph 5.9.22</p> <p><i>“Any harm or loss of significance of a designated heritage asset (from its alteration or destruction, or from development within its setting) should require clear and convincing justification. Substantial harm to or loss of significance of a grade II listed building park or garden should be exceptional. Substantial harm to or loss of significance of assets of the highest significance, including Scheduled Monuments; Protected Wreck Sites; Registered Battlefields; grade I and II Listed Buildings; grade I and II Registered Parks and Gardens; and World Heritage Sites, should be wholly exceptional”</i></p>	
<p>NPS EN-1, 2011</p>	<p>Paragraph 5.8.18</p> <p><i>“When considering applications for development affecting the setting of a designated heritage asset, the IPC should treat favourably applications that preserve those elements of the setting that make a positive contribution to, or better reveal the significance of, the asset. When considering applications that do not do this, the IPC</i></p>	



Legislation/ Policy	Key Provisions	Section Where Comment Addressed
	<p><i>should weigh any negative effects against the wider benefits of the application. The greater the negative impact on the significance of the designated heritage asset, the greater the benefits that will be needed to justify approval”</i></p>	
<p>Draft NPS EN-1, 2021</p>	<p>Paragraph 5.9.14</p> <p><i>“The applicant is encouraged, where opportunities exist, to prepare proposals which can make a positive contribution to the historic environment, and to consider how their scheme takes account of the significance of heritage assets affected. This can include, where possible: enhancing, through a range of measures such a sensitive design, the significance of heritage assets or setting affected considering measures that address those heritage assets which are at risk or which may become at risk, as a result of the scheme considering how visual or noise impacts can affect heritage assets, and whether there may be opportunities to enhance access to, or interpretation, understanding and appreciation of, the heritage assets affected by the scheme”</i></p> <p>Paragraph 5.9.16</p> <p><i>“Applicants should look for opportunities for new development within Conservation Areas and World Heritage Sites, and within the setting of heritage assets, to enhance or better reveal their significance. Proposals that</i></p>	<p>As outlined in the Outline Marine Written Schemes of Investigations (WSI) document Volume 4, Annex 11.2: Outline Marine Written Scheme of Investigation, which is secured through embedded mitigation (Table 11.12) and is expected to be reflected in the DCO requirements or dML conditions, positive contributions to knowledge and enhancement of understanding of the historic environment can be realised through data gathering, interpretation and publication. The works will contribute to current research frameworks in the region and will be further detailed in forthcoming Method Statements.</p>



Legislation/ Policy	Key Provisions	Section Where Comment Addressed
	<p><i>preserve those elements of the setting that make a positive contribution to the asset (or which better reveal its significance) should be treated favourably”</i></p> <p>Paragraph 5.9.23</p> <p><i>“The Secretary of State should give considerable importance and weight to the desirability of preserving all designated heritage assets. Any harmful impact on the significance of a designated heritage asset should be given significant weight when weighed against the public benefit of development, recognising that the greater the harm to the significance of the heritage asset the greater the justification will be needed for any loss”</i></p> <p>Paragraph 5.9.25</p> <p><i>“Where the proposed development will lead to less than substantial harm to the significance of the designated heritage asset, this harm should be weighed against the public benefits of the proposal, including, where appropriate securing its optimum viable use”</i></p>	
Draft NPS EN-1, 2021	<p>Paragraph 5.9.26</p> <p><i>“The effect of an application on the significance of a non-designated heritage asset should be taken into account in determining the application. In weighing applications that directly or indirectly affect non-designated heritage assets, a balanced judgement will be required having regard to the</i></p>	<p>No impact on marine heritage receptors is expected to lead to harm or total loss of significance. AEZs (as per Table 11.12) have been applied to all known wrecks and contacts of high and medium significance.</p> <p>The commitment to avoid all known marine archaeology</p>



Legislation/ Policy	Key Provisions	Section Where Comment Addressed
	<p><i>scale of any harm or loss and the significance of the heritage asset”</i></p>	<p>marine heritage receptors and to further investigate the area of impacts ensuring that unknown marine heritage receptors are located, and impact mitigated will ensure preservation in situ, as further detailed in Volume 4, Annex 11.2: Outline Marine Written Scheme of Investigation. Where known receptors require further intrusive investigation or where they cannot be preserved <i>in situ</i>, reporting and conservation strategies will be clearly outlined in the relevant Method Statements produced ahead of any archaeological works and following agreement with Historic England.</p>
<p>Draft NPS EN-1, 2021</p>	<p>Paragraph 5.9.27  <i>“Where there is evidence of deliberate neglect of, or damage to, a heritage asset, the Secretary of State should not take its deteriorated state into account in any decision”</i></p>	<p>All known wreck sites, their archaeological significance, condition, and vulnerability, where known, is described in Section 3.3 of Volume 4, Annex 11.1: Offshore Archaeology and Cultural Heritage Technical Report.</p>
<p>NPS EN-1, 2011</p>	<p>Paragraph 5.8.20  <i>“Where the loss of the whole or a material part of a heritage asset’s significance is justified, the IPC should require the developer to record and advance understanding of the significance of the heritage asset before it is lost. The extent of the requirement should be proportionate to the nature and level of the asset’s significance. Developers should be required to publish this evidence and</i></p>	<p>While not directly applicable to marine heritage receptors, as outlined in Volume 4, Annex 11.2: Outline Marine Written Scheme of Investigation, which will be secured through embedded mitigation (Table 11.12) and is expected to be reflected in the DCO requirements or dML conditions, positive contributions to knowledge and understanding of the historic environment can be</p>



Legislation/ Policy	Key Provisions	Section Where Comment Addressed
	<p><i>deposit copies of the reports with the relevant Historic Environment Record. They should also be required to deposit the archive generated in a local museum or other public depository willing to receive it”</i></p>	<p>realised through data gathering, interpretation and publication. The works will contribute to current research frameworks in the region and will be further detailed in forthcoming relevant Method Statements, which will consider relevant research frameworks to reflect and enhance ongoing research in the area.</p>
<p>Draft NPS EN-1, 2021</p>	<p>Paragraph 5.9.31</p> <p><i>“Where the loss of the whole or a material part of a heritage asset’s significance is justified, the Secretary of State should require the applicant to record and advance understanding of the significance of the heritage asset before it is lost wholly or in part. The extent of the requirement should be proportionate to the nature and level of the asset’s significance. Applicants should be required to publish this evidence and deposit copies of the reports with the relevant Historic Environment Record. They should also be required to deposit the archive generated in a local museum or other public depository willing to receive it”</i></p>	<p>realised through data gathering, interpretation and publication. The works will contribute to current research frameworks in the region and will be further detailed in forthcoming relevant Method Statements, which will consider relevant research frameworks to reflect and enhance ongoing research in the area.</p>
<p>NPS EN-1, 2011</p>	<p>Paragraph 5.8.21</p> <p><i>“Where appropriate, the IPC should impose requirements on a consent that such work is carried out in a timely manner in accordance with a written scheme of investigation that meets the requirements of this Section and has been agreed in writing with the relevant Local Authority (where the development is in English waters, the Marine Management Organisation and English Heritage, or where it is in Welsh</i></p>	<p>Volume 4, Annex 11.2: outlines all provisions made and standards expected for archaeological recording of marine heritage receptors. The document further details where archives and material will be deposited.</p> <p>The securement of the Outline Marine WSI document (Volume 4, Annex 11.2: Outline Marine Written Scheme of Investigation) is</p>





Legislation/ Policy	Key Provisions	Section Where Comment Addressed
Draft NPS EN-1, 2021	<p><i>waters, the MMO and Cadw)) and that the completion of the exercise is properly secured"</i></p> <p>Paragraph 5.9.32</p> <p><i>"The Secretary of State may add requirements to the development consent order to ensure that this is undertaken in a timely manner in accordance with a written scheme of investigation that meets the requirements of this Section and has been agreed in writing with the relevant Local Authority (or, where the development is in English waters, the MMO and Historic England, or where it is in Welsh waters, the MMO and Cadw) and that the completion of the exercise is properly secured"</i></p>	<p>detailed in Table 11.12 and is expected to be reflected in the DCO requirements or dML conditions.</p> <p>Consultation with Historic England undertaken as part of this project is outlined in Section 11.3.</p>
Draft NPS EN-1, 2021	<p>Paragraph 5.9.33</p> <p><i>"Where the loss of significance of any heritage asset has been justified by the applicant on the merits of the new development and the significance of the asset in question, the Secretary of State should consider:</i></p> <ul style="list-style-type: none"> <li><i>&gt; imposing a requirement in the development consent order</i></li> <li><i>&gt; requiring the applicant to enter into an obligation"</i></li> </ul>	<p>Embedded mitigations relevant to marine archaeology are set out in Table 11.12 and considers how the Outline Marine WSI (Volume 4, Annex 11.2: Outline Marine Written Scheme of Investigation) will be implemented. The embedded mitigations are expected to be reflected in the DCO requirements or dML conditions entering the applicant into the obligation to adhere.</p>
Draft NPS EN-1, 2021	<p>Paragraph 5.9.34</p> <p><i>"That will prevent the loss occurring until the relevant part of the development has commenced, or it is reasonably certain that the relevant part of the development is to proceed"</i></p>	<p>Should impact be unavoidable, justification will be clearly detailed in relevant Method Statements as outlined in Volume 4, Annex 11.2: Outline Marine Written Scheme of Investigation. These will be produced ahead</p>



Legislation/ Policy	Key Provisions	Section Where Comment Addressed
		of any intrusive works and only following agreement with Historic England.
NPS EN-1, 2011	<p>Paragraph 5.8.22</p> <p><i>“Where the IPC considers there to be a high probability that a development site may include as yet undiscovered heritage assets with archaeological interest, the IPC should consider requirements to ensure that appropriate procedures are in place for the identification and treatment of such asset discovered during construction”</i></p>	<p>Embedded mitigations relevant to marine archaeology are set out in Table 11.12 and detail how data will be collected and assessed to ensure that as yet undiscovered marine heritage receptors are identified. Should unidentified marine heritage receptors be located during project works, a Protocol for Archaeological Discoveries (PAD) is implemented as per embedded mitigation (Table 11.12). The embedded mitigations are expected to be reflected in the DCO requirements or dML conditions.</p>
Draft NPS EN-1, 2021	<p>Paragraph 5.9.35</p> <p><i>“Where there is a high probability that a development site may include as yet undiscovered heritage assets with archaeological interest, the Secretary of State should consider imposing requirements to ensure that appropriate procedures are in place for the identification and treatment of such assets discovered during construction”</i></p>	<p>implemented as per embedded mitigation (Table 11.12). The embedded mitigations are expected to be reflected in the DCO requirements or dML conditions.</p>
National Policy Statement for Renewable Energy Infrastructure (NPS EN-3). July 2011.	<p>Paragraph 2.6.140</p> <p><i>“Consultation with the relevant statutory consultees (including English Heritage...) should be undertaken by the applicants at an early stage of the development”</i></p>	<p>Consultations with Historic England and other stakeholders throughout the development are outlined in Section 11.3.</p>
Draft National Policy Statement for Renewable Energy Infrastructure (EN-3). September 2021.	<p>Paragraph 2.32.4</p> <p><i>“Consultation with the relevant statutory consultees on the potential impacts on the marine historic environment should be undertaken by applicants at an early stage of development,</i></p>	



Legislation/ Policy	Key Provisions	Section Where Comment Addressed
	<p><i>taking into account any applicable guidance (e.g., offshore renewables protocol for archaeological discoveries”</i></p>	
<p>NPS EN-3, 2011</p>	<p>Paragraph 2.6.141</p> <p><i>“Assessment should be undertaken as set out in Section 5.8 of EN-1. Desk-based studies should take into account any geotechnical or geophysical surveys that have been undertaken to aid the wind farm design”</i></p>	<p>Volume 4, Annex 11.1: Offshore Archaeology and Cultural Heritage Technical Report presents and details the archaeological desk-based assessments and the archaeological assessment of geophysical data collected to date. The results are further summarised in Section 11.7.</p>
<p>Draft NPS EN-3, 2021</p>	<p>Section 2.32.5</p> <p><i>“Assessment of potential impacts upon the historic environment should be considered as part of the Environmental Impact Assessment process undertaken to inform any application for consent. Desk based studies to characterise the features of the historic environment that may be affected by a proposed development and assess any likely significant effects should be undertaken by competent archaeological experts. These studies should take into account any geotechnical or geophysical surveys that have been undertaken to aid the wind farm design”</i></p>	
<p>NPS EN-3, 2011</p>	<p>Paragraph 2.6.142</p> <p><i>“Assessment should include the identification of any beneficial effects on the historic marine environment, for example through improved access or the contribution to new knowledge that arises from investigation”</i></p>	<p>Potential beneficial effects on marine heritage receptors as a result of the project activities are discussed in Table 11.12 and will ensure data and information collected is assessed for archaeological potential and significance and</p>



Legislation/ Policy	Key Provisions	Section Where Comment Addressed
Draft NPS EN-3, 2021	Section 2.32.6 <i>“Assessment may also include the identification of any beneficial effects on the marine historic environment, for example through improved access or the contribution to new knowledge that arises from investigation”</i>	reported, which will enhance our understanding by gathering, researching and presenting new information and will lead to a publication.
NPS EN-3, 2011	Paragraph 2.6.143 <i>“Where elements of an application (whether offshore or onshore) interact with features of historic maritime significance that are located onshore, the effects should be assessed in accordance with the policy at Section 5.8 in EN-1”</i>	The onshore and offshore archaeological resources have been cross-referenced and technical reports have been shared between archaeological contractors. The offshore and onshore archaeological assessments overlap at the intertidal zone as outlined in the respective technical reports.
Draft NPS EN-3, 2021	Section 2.32.7 <i>“Where elements of a proposed project (whether offshore or onshore) may interact with historic environment features that are located onshore, the effects should be assessed in accordance with the policy at Section 5.9 in EN-1”</i>	
NPS EN-3, 2011	Paragraph 2.6.144 <i>“The IPC should be satisfied that offshore wind farms and associated infrastructure have been designed sensitively taking into account known heritage assets and their status, for example features designated as Protected Wrecks”</i>	Volume 4, Annex 11.1: Offshore Archaeology and Cultural Heritage Technical Report presents and details the archaeological desk-based assessments and the archaeological assessment of geophysical data collected to date. The results are further summarised in Section 11.7.
Draft NPS EN-3, 2021	Section 2.32.10 <i>“The Secretary of State should be satisfied that any proposed offshore wind farm project has appropriately considered and</i>	AEZs (as per Table 11.12) have been applied to all known wrecks and anomalies of high and medium archaeological potential



Legislation/ Policy	Key Provisions	Section Where Comment Addressed
	<p><i>mitigated for any impacts to the historic environment, including both known heritage assets, and discoveries that may be made during the course of development”</i></p>	<p>identified in the geophysical data, as outlined Section 11.7. The embedded mitigations are further detailed in Table 11.12.</p>
<p>NPS EN-3, 2011</p>	<p>Paragraph 2.6.145</p> <p><i>“Avoidance of important heritage assets, including archaeological sites and historic wrecks, is the most effective form of protection and can be achieved through the implementation of exclusion zones around such heritage assets which preclude development activities within their boundaries”</i></p>	<p>AEZs as per Table 11.12 have been applied to all known wrecks and anomalies of high and medium archaeological potential identified in the geophysical data, as outlined Section 11.7. The embedded mitigations are further detailed Table 11.12.</p>
<p>Draft NPS EN-3, 2021</p>	<p>Section 2.32.8</p> <p><i>“The avoidance of important heritage assets to ensure their protection in situ, is the most effective form of protection. This can be achieved through the implementation of exclusion zones around known and potential heritage assets which preclude development activities within their boundaries. The boundaries can be drawn around either discrete sites or more extensive areas identified in the Environmental Statement produced to support an application for consent”</i></p>	
<p>NPS EN-3, 2011</p>	<p>Section 2.6.146</p> <p><i>“As set out in paragraphs 2.6.44 and 2.6.45 above, where requested by applicants, the IPC should consider granting consents that allow for micrositing to be undertaken within a specified tolerance.</i></p>	<p>All intrusive activities will be routed and microsited to avoid any identified marine heritage receptors with AEZs as per mitigation outlined in Section 11.11</p>



Legislation/ Policy	Key Provisions	Section Where Comment Addressed
	<i>This allows changes to be made to the precise location of infrastructure during the construction phase so that account can be taken of unforeseen circumstances such as the discovery of marine archaeological remains”</i>	
Draft NPS EN-3, 2021	Section 2.32.9 <i>“As set out in paragraphs 2.23.8 and 2.23.9 above, where requested by applicants, the Secretary of State should consider granting consents that allow for micrositing/microrouting to be undertaken within a specified tolerance. This allows changes to be made to the precise location of infrastructure during the construction phase so that account can be taken of unforeseen circumstances such as the discovery of marine archaeological remains”</i>	



### 11.3 CONSULTATION

- 11.3.1 Consultation has been undertaken between VE OWFL, Historic England, Essex County Council and the Marine Management Organisation (MMO) via the offshore archaeology and cultural heritage Expert Topic Group (ETG), discussing the offshore archaeology and cultural heritage and general approaches to the offshore assessment.
- 11.3.2 In addition, responses to scoping were received in November 2021 (Table 11.12). The key issues arising from the PINS Scoping Opinion were concerning the scope of the marine archaeology study area, incidental overlap of marine heritage receptors between the onshore and offshore archaeology chapters and whether transboundary impacts were to be assessed. Additionally, it was recommended that specific guidance should be referred to and an Outline Marine WSI should be developed at an early stage.
- 11.3.3 The key issues arising from consultation via the expert topic groups focused on similar points. Additionally, there was a focus on the assessment of Historic Seascape Characterisation (HSC), the correct implementation of both WSI and Protocol for Archaeological Discoveries (PAD) documents and the importance of inclusion of archaeological objectives when conducting survey campaigns.



**Table 11.2: Summary of consultation relating to Offshore Archaeology and Cultural Heritage**

Date and consultation phase/ type	Consultation and key issues raised	Section where comment addressed
<p>11/08/2021 Pre-Scoping ETG</p>	<ul style="list-style-type: none"> <li>&gt; Historic England raised the point in relation to embedded mitigation and recognising the difference between adaptive/ further mitigation.</li> <li>&gt; The importance of geotechnical surveys in the area to establish information about the palaeogeographic potential of the area was raised.</li> <li>&gt; The importance of specialist archaeological input in the identification of anomalies within the geophysical data and subsequent mitigation (including investigation) was raised.</li> </ul> <p>Updates to the HSC guidance had been made and should be incorporated into the assessment.</p>	<p>The EIA will take into account the embedded mitigation and apply further adaptive mitigation where required to minimise the risk to marine heritage receptors. The current mitigation proposed is outlined in Section 11.11 and further detailed in Section 6 of Volume 4, Annex 11.2: Outline Marine Written Scheme of Investigation.</p> <p>Geotechnical surveys are planned post consent and will be preceded by a Method Statement including archaeological objectives. This is outlined in the proposed mitigation (Section 11.11) and detailed in Section 8.4 of Volume 4, Annex 11.2: Outline Marine Written Scheme of Investigation.</p> <p>The identification of anomalies of possible archaeological interest in the survey data recommended to be protected by AEZs has been in addition to any confirmation of known (charted) wrecks. The assessment methodology is detailed in Section 11.4 of this chapter and Section 2.4 of Volume 4, Annex 11.1: Offshore Archaeology and Cultural</p>





Date and consultation phase/ type	Consultation and key issues raised	Section where comment addressed
		<p>Heritage Technical Report.</p> <p>Recommendations for further investigation are covered in Section 8.4 of Volume 4, Annex 11.2: Outline Marine Written Scheme of Investigation.</p> <p>The most recent relevant guidance has been used to inform the HSC assessment (detailed in Section 3.7 of Volume 4, Annex 11.1: Offshore Archaeology and Cultural Heritage Technical Report and summarised in Section 11.7 of this document).</p>
<p>22/08/21</p> <p>Geophysical Method Statement reply from Historic England</p>	<ul style="list-style-type: none"> <li>&gt; Historic England concurred with the aims and objectives set out in the Method Statement and that the archaeological assessments of these data will be included within the draft PEIR which should be made available for consultation in 2023.</li> <li>&gt; It was noted that the specifications for the surveys systems to be employed were not specified, but were to include:               <ul style="list-style-type: none"> <li>&gt; Echo Sounder (Multibeam system)</li> <li>&gt; Side scan sonar</li> <li>&gt; Magnetometer; and</li> <li>&gt; Sub-Bottom Profiler</li> </ul> <p>and that the data was to be suitable for archaeological assessment.</p> </li> <li>&gt; Historic England highlighted that readily identifiable wreck sites (e.g., UKHO charter wrecks) do not</li> </ul>	<p>The archaeological assessment of the geophysical data is outlined in Sections 11.8 and 11.9, and discussed in full in Volume 4, Annex 11.1: Offshore Archaeology and Cultural Heritage Technical Report.</p> <p>The specifications for the geophysical survey systems are described in Section 2.4 of Volume 4, Annex 11.1: Offshore Archaeology and Cultural Heritage Technical Report and its suitability for archaeological assessment was graded as 'good' as defined by the parameters set out in the same section.</p>



Date and consultation phase/ type	Consultation and key issues raised	Section where comment addressed
	<p>necessarily imply anomalies of ‘high’ archaeological potential, whereas other anomalies encountered which merit subsequent investigation may prove to be of very high archaeological potential.</p> <ul style="list-style-type: none"> <li>&gt; It was recommended that completed technical reports as a result of other consented developments, such as adjacent offshore wind farms, that are now held by national or local archives were utilised in the corroboration of desk-based sources of information and the interpretation of geophysical data.</li> <li>&gt; It was recommended that mitigation options should consider dedicated data capture that examines the palaeoenvironmental potential and data requirements to produce sedimentary deposit model(s). And that a geotechnical data method statement would determine whether AEZ present a viable mitigation strategy.</li> <li>&gt; It was noted that it was proposed that the archaeological assessment of geophysical data (a technical report) would be submitted to Historic England for ‘approval’, however the role of Historic England at this stage of the pre-application project development was to provide advice (as per the Evidence Plan Process), and that such information could be shared through an ETG and reporting could be used to inform the PEIR and accompanying Outline Marine WSI.</li> </ul>	<p>The archaeological potential of the identified geophysical anomalies (Table 11.7) refers to the likelihood that they may be of archaeological interest or significance. This is clarified further in Section 2.6 of Volume 4, Annex 11.1: Offshore Archaeology and Cultural Heritage Technical Report.</p> <p>The archaeological significance of recorded and identified wrecks is determined by the criteria for the assessment of archaeological significance, as set out by the Department for Culture Media and Sport (DCMS 2013) (Section 3.3 of Volume 4, Annex 11.1: Offshore Archaeology and Cultural Heritage Technical Report).</p> <p>Reports from adjacent offshore wind farms have been included in the marine archaeology baseline (Table 11.3) and to inform the archaeological assessment of geophysical data outlined in Sections 11.8 and 11.9, and further detailed in Volume 4, Annex 11.1: Offshore Archaeology and Cultural Heritage Technical Report.</p>



Date and consultation phase/ type	Consultation and key issues raised	Section where comment addressed
		<p>The archaeological assessment of available data is included in the proposed embedded mitigation measures (Section 11.11 and Table 11.12 of this document) and detailed in Sections 6.5 and 8.4 of Volume 4, Annex 11.2: Outline Marine Written Scheme of Investigation.</p> <p>Geotechnical surveys will occur pre-construction should consent be obtained. These will be informed by the geoarchaeological assessment of geophysical data and baseline data (see Section 11.9 of this document and Section 4.3 of Volume 4, Annex 11.1). Mitigation for deposits of geoarchaeological potential is defined in Section 5.5 of Volume 4, Annex 11.1: Offshore Archaeology and Cultural Heritage Technical Report and Section 8.4 of Volume 4, Annex 11.2: Outline Marine Written Scheme of Investigation.</p> <p>The archaeological assessment of the geophysical data collected has been compiled in Volume 4, Annex 11.1: Offshore Archaeology and Cultural Heritage Technical Report</p>



Date and consultation phase/ type	Consultation and key issues raised	Section where comment addressed
		<p>and used to inform this chapter and the mitigation set out in Volume 4, Annex 11.2: Outline Marine Written Scheme of Investigation. The information attained during the baseline assessment has been shared with Historic England during the ETG meetings listed below and all three of these documents will be shared with Historic England for their advice during the PEIR submission.</p>
<p>7/12/2021 Post-Scoping ETG</p>	<ul style="list-style-type: none"> <li>&gt; The question of whether the WSI and PAD would be included as part of the PEIR was raised.</li> <li>&gt; The importance of thorough archaeological assessment of the geophysical data as seemingly minor anomalies identified on/within the seabed could represent presently unknown archaeology sites was reiterated. Historic England also noted that a detailed WSI is required to explain the survey methodologies and techniques to identify heritage assets so that risks can be managed.</li> <li>&gt; Historic England emphasised the importance of the geoarchaeological potential and palaeolandscapes in this area and that field work would be essential to furthering this understanding.</li> </ul>	<p>An Outline Marine WSI and PAD are accompanying this PEIR chapter and can be found in Volume 4, Annex 11.2: Outline Marine Written Scheme of Investigation.</p> <p>All geophysical anomalies were cross-checked against known records to contribute to their interpretation. The methodology for archaeological assessment of geophysical data is detailed in Section 11.8 of this chapter and Section 2.4 of Volume 4, Annex 11.1: Offshore Archaeology and Cultural Heritage Technical Report.</p> <p>Recommendations for further investigation are</p>



Date and consultation phase/ type	Consultation and key issues raised	Section where comment addressed
		<p>covered in Section 8.4 of Volume 4, Annex 11.2: Outline Marine Written Scheme of Investigation.</p> <p>Geotechnical surveys are planned post consent and will be preceded by a Method Statement, including archaeological objectives, which will be submitted for review and agreement to Historic England prior to commencement. This is outlined in the proposed mitigation (Section 11.11) and detailed in Section 8.4 of Volume 4, Annex 11.2: Outline Marine Written Scheme of Investigation.</p>
<p>Scoping Opinion, 2021 - PINS on behalf of SoS</p>	<p>The Scoping Report states that the proposed study area represents an industry standard. The Inspectorate notes that many of the potential impacts from the proposed development result from changes to marine physical processes. It is not clear why the study area to be used for the assessment is different to that proposed for the assessments of physical processes in Chapter 7 of the Scoping Report. The ES should provide a justification for the extent of the study area used in the assessment which addresses this point.</p>	<p>The area defined as the marine archaeology study area is used for the baseline assessment and is a buffer of 1 km around the RLB. This is used because of the uncertainty of positions of historical ship losses during the baseline assessment. The RLB will be used for the impact assessment at PEIR. Is clarified in Section 11.4 and references to Volume 2, Chapter 2 (Marine Geology, Oceanography and Physical Processes) will be made where relevant.</p>
<p>Scoping Opinion, 2021</p>	<p>The marine archaeological and cultural heritage chapter of the Scoping Report</p>	<p>Continued liaison with the onshore cultural heritage</p>



Date and consultation phase/ type	Consultation and key issues raised	Section where comment addressed
- PINS on behalf of SoS	refers to a geographic scope within the intertidal zone up to Mean High Water Springs. The onshore cultural heritage chapter includes the intertidal zone down to Mean Low Water Springs. The Scoping Report states that this 'intertidal overlap' is to ensure there is total coverage of the offshore area of search between the two chapters. The ES should ensure that there is no 'double counting' of onshore heritage and marine heritage receptors and that there is consistency between the assessments.	authors will occur to ensure that no double counting will occur where there is an overlap of marine heritage receptors (most recently the pre-meet for the Pre-PEIR ETG, 18 October 2022)
Scoping Opinion, 2021 - PINS on behalf of SoS	<p>The assessment should consider the following additional data sources:</p> <ul style="list-style-type: none"> <li>&gt; National Historic Seascape Characterisation Consolidation (Land Use Consultants, 2018).</li> <li>&gt; Sturt, Fraser and Dix, Justin K., EMU Ltd (2009) The Outer Thames Estuary Regional Environmental Characterisation (09/J/1/06/1305/0870) London, GB. ALSF/MEPF (DEFRA) 145pp.</li> </ul>	These data sources have been included in Section 11.7 and Section 3.7 of Volume 4, Annex 11.1: Offshore Archaeology and Cultural Heritage Technical Report where the Historic Seascape Characterisation is assessed, and Section 11.9 of this chapter Section 4.3 of Volume 4, Annex 11.1: Offshore Archaeology and Cultural Heritage Technical Report where the geoarchaeological characterisation of the marine archaeological study area is considered.
Scoping Opinion, 2021 - PINS on behalf of SoS	The Scoping Report proposes to undertake archaeological assessments of available marine geophysical and geotechnical survey data, and based on known marine heritage receptors, establish Archaeological Exclusion Zones. No new surveys are explicitly proposed within the scope of the ES. The production of an Outline Marine Written Scheme of Investigation (WSI) is proposed to outline the methodological approach to the post-consent mitigation	Volume 4, Annex 11.2: Outline Marine Written Scheme of Investigation (the Outline Marine WSI) has been produced to accompany this Offshore Archaeology and Cultural Heritage Chapter and made available for comment to ensure appropriate survey and



Date and consultation phase/ type	Consultation and key issues raised	Section where comment addressed
	<p>measures. The baseline environment should be established with agreement from relevant stakeholders. Desk-based sources of information should be corroborated with survey work. The Inspectorate recommends that a WSI is developed at the early stage of survey commissioning to set out methodological approaches for survey data analysis, such as geophysical, geotechnical and visual inspection techniques. Following the analysis, any proposed mitigation measures should be outlined in an archaeological mitigation strategy.</p>	<p>mitigation can be established and agreed. The methodological approach and mitigation measures outlined in Section 11.10 and Section 11.11 (respectively) of this chapter are further detailed in the Outline Marine WSI.</p>
<p>Scoping Opinion, 2021 - PINS on behalf of SoS</p>	<p>The ES should take into consideration the following additional guidance:</p> <ul style="list-style-type: none"> <li>&gt; Gribble, J. and Leather, S. for EMU Ltd. (2011) Offshore Geotechnical Investigations and Historic Environment Analysis: Guidance for the Renewable Energy Sector. Commissioned by COWRIE Ltd (project reference GEOARCH-09).</li> </ul>	<p>This guidance has been referred to in the planned phased approach undertaken for the geoarchaeological assessment of geophysical data and in the specification of the geophysical survey Method Statement. At this stage no geotechnical surveys have been undertaken; however, this guidance will be included when these data assessments occur.</p>
<p>Scoping Opinion, 2021 - PINS on behalf of SoS</p>	<p>The Inspectorate notes that an initial study area of 50 km around the array areas and offshore AoS has been proposed which may be subject to revision as the proposed development progresses. The ES must clearly describe the final extent of the study area and explain how it reflects the zone of influence for the proposed development.</p>	<p>The marine archaeology study area is defined within Section 11.4, the 50 km zone of influence applied in the cumulative impact assessment is detailed in Section 11.15.</p>
<p>Scoping Opinion, 2021 - PINS on behalf of SoS</p>	<p>It is not clear from the wording in the Scoping Report if the ES will deal with transboundary impacts on marine archaeology or not. The ES should either include an assessment of transboundary</p>	<p>Transboundary effects are discussed in Section 11.17 of this chapter.</p>



Date and consultation phase/ type	Consultation and key issues raised	Section where comment addressed
	effects or provide a justification as to why these would not arise.	
Scoping Opinion, 2021 - Historic England	We confirm that historic environment represents a potentially significant issue in EIA terms, for both onshore and offshore elements, and confirm our view the historic environment should be 'scoped in' to the assessment. We agree that 'marine archaeological and cultural heritage' receptors are fully scoped into the EIA exercise, including any Preliminary Environmental Information Report (PEIR), for this proposed project.	As agreed, all impacts are 'scoped in' for assessment. These are detailed in Sections 11.12 to 11.18 of this chapter.
Scoping Opinion, 2021 - Historic England	To assist any further planning of the proposed NFOW project we offer the following link to the Historic England Advice Note 15 Commercial Renewable Energy Development and the Historic Environment (2021): <a href="https://historicengland.org.uk/images-books/publications/commercial-renewableenergy-development-historic-environment-advice-note-15/">https://historicengland.org.uk/images-books/publications/commercial-renewableenergy-development-historic-environment-advice-note-15/</a>	This guidance has been referred to as part of the assessment methodology for this chapter and Volume 4, Annex 11.1: Offshore Archaeology and Cultural Heritage Technical Report.
Scoping Opinion, 2021 - Historic England	We note that para. 16.4.7 mentions the seascape character assessment published by the MMO and we add that the MMO seascape data does include Historic Seascape Characterisation (HSC) data as a means to derive a sense of character. It is important to add that the effectiveness of HSC as a means to understand how seascape can accommodate change will depend on how the available methodology is used.	The HSC baseline and its ability to accommodate change has been outlined in Section 11.7 of this chapter and further detailed with reference to the narrative of examples of character types within the region surrounding VE, perceptions of these characters and their vulnerability to change in Section 3.7 of Volume 4, Annex 11.1: Offshore Archaeology and Cultural Heritage Technical Report.
Scoping Opinion, 2021	We note Chapter 17 relating to marine archaeology and cultural heritage that has been submitted in the Scoping Report. On	As agreed, all impacts are 'scoped in' for assessment. These are





Date and consultation phase/ type	Consultation and key issues raised	Section where comment addressed
- Historic England	the basis of the information presented in the Scoping Report, we concur with the statement made in para. 17.5.3 that no impacts have been scoped out for the assessment of marine archaeology and cultural heritage.	detailed in Section 11.12 to Section 11.18 of this chapter.
Scoping Opinion, 2021 - Historic England	We note Table 17.1 includes 'England's Historic Seascapes Marine HLC Pilot Study: Southwold to Clacton', which was produced in 2007 with a summary that states it is a 'Description of palaeolandscape and marine archaeological potential.' The appropriate Historic Seascape Characterisation (HSC) reference to be used, however, is the National Historic Seascape Characterisation Consolidation (Land Use Consultants, 2018). This provides the methodological approach to be used for HSC in any PEIR subsequently produced (as mentioned in 17.6.1).	This has been updated and the relevant guidance has been used to complete the HSC assessment in Section 3.7 of Volume 4, Annex 11.1: Offshore Archaeology and Cultural Heritage Technical Report, and Section 11.7 of this chapter.
Scoping Opinion, 2021 – Historic England	It is also important that the applicant is aware that HSC is not a means to describe per se. HSC is a means to derive a perception of historic character based on disparate spatial data in different spatial dimensions as relevant to the marine environment. Consequently, a key aspect of its inclusion within an Environmental Statement is to determine how perceptions of historic character may accommodate change as proposed by the development project in question.	The HSC baseline and its ability to accommodate change has been outlined in Section 11.7 of this chapter and further detailed with reference to the narrative of examples of character types within the region surrounding VE, perceptions of these characters and their vulnerability to change in Section 3.7 of Volume 4, Annex 11.1: Offshore Archaeology and Cultural Heritage Technical Report.
Scoping Opinion, 2021 - Historic England	We also recommend that the following reference is used and added: <ul style="list-style-type: none"> <li>&gt; Sturt, Fraser and Dix, Justin K., EMU Ltd (2009) The Outer Thames Estuary Regional Environmental Characterisation</li> </ul>	This is referred to in the description of the baseline in Section 11.7 and Section 3.2 of Volume 4, Annex 11.1 and where the geoarchaeological data is



Date and consultation phase/ type	Consultation and key issues raised	Section where comment addressed
	(09/J/1/06/1305/0870) London, GB. ALSF/MEPF (DEFRA) 145pp.	assessed in Section 11.9 and Section 4.3 of Volume 4, Annex 11.1: Offshore Archaeology and Cultural Heritage Technical Report.
Scoping Opinion, 2021 - Historic England	Table 17.2 contains useful information regarding the possibility of encountering known and unknown elements of the historic environment, which is particularly relevant for the location of this proposed development. For example, archaeological materials associated with merchant trade conducted over centuries; periods of warfare, such as mentioned in para. 17.4.14 regarding a battle in the Second Anglo-Dutch Wars in July 1666; and aviation losses (allied and enemy), especially from the Second World War. Paragraph 17.5.1 should be expanded to include Gribble, J. and Leather, S. for EMU Ltd. (2011) Offshore Geotechnical Investigations and Historic Environment Analysis: Guidance for the Renewable Energy Sector. Commissioned by COWRIE Ltd (project reference GEOARCH-09).	Reference to the examples of known losses and sites has been included in the baseline review (Section 3 of Volume 4, Annex 11.1: Offshore Archaeology and Cultural Heritage Technical Report). Reference to the 2011 COWRIE guidance has also been included in both this chapter and Volume 4, Annex 11.1: Offshore Archaeology and Cultural Heritage Technical Report and will be utilised when it comes to the geoarchaeological assessment of geotechnical data.
Scoping Opinion, 2021 - Historic England	We note para. 17.4.10 states that, although there are no recorded peats at the landfall site, peat has been recorded in adjacent areas. There is, therefore, the potential for peat to be present which is of archaeological interest, and this will need to be assessed.	The potential for peat within the marine archaeology study area is detailed in Section 4.3 of Volume 4, Annex 11.1: Offshore Archaeology and Cultural Heritage Technical Report and outlined in Section 11.9 this chapter.
Scoping Opinion, 2021 - Historic England	We note the detail provided in Table 17.5 regarding the direct and indirect impacts that may occur during the construction, operation and decommissioning of the proposed development. We are pleased this has included the potential for physical damage,	The impacts scoped into the assessment for offshore archaeology and cultural heritage are further detailed in Section



Date and consultation phase/ type	Consultation and key issues raised	Section where comment addressed
	compression and scour of archaeological deposits.	11.12 to Section 11.18 of this chapter.
Scoping Opinion, 2021 - Historic England	Paragraph 17.5.6 states that the mitigation measures adopted will focus on the implementation of Archaeological Exclusion Zones (AEZs), the development of a Written Scheme of Investigation (WSI) and Protocol for Archaeological Discoveries (PAD) and the commitment to undertake a full archaeological review of geophysical and geotechnical data, which is welcomed. Regarding the proposed approach to assessment, however, we consider it important that the following matters are clarified, below.	These mitigation measures are further detailed in Section 11.11 of this chapter.
Scoping Opinion, 2021 - Historic England	The Scoping Report implies that marine archaeological materials ('marine heritage receptors') '...will be identified during the archaeological assessment of geophysical and geotechnical data ahead of PEIR...' (Table 17.5). The use of AEZs or 'appropriate buffer areas' are identified as a mitigation mechanism to inform the project design stage (17.5.6 and Table 17.5). It is important to note that the primary purpose of a marine archaeological WSI is to set out methodological approaches for survey data analysis, such as geophysical, geotechnical and visual inspection techniques. The use of the WSI is most effectively employed at the early stage of survey commissioning to maximise the potential for data acquisition that supports archaeological analysis and interpretation.	Volume 4, Annex 11.2: Outline Marine Written Scheme of Investigation has been produced to accompany this chapter and will be developed throughout the project in accordance with The Crown Estate's 2021 guidance and in consultation with Historic England. Further data acquisition, such as post-consent geotechnical surveys will be preceded by a specific Method Statement presented to the Archaeological Curators for agreement.
Scoping Opinion, 2021 - Historic England	Subject to any agreed programme of analysis (supported by detailed Method Statements), it may be that sites, features and/ or other anomalies of possible or known archaeological interest should be protected <i>in situ</i> by adopting an avoidance strategy. In this case, it will be necessary to identify AEZs. The extent to which it is possible to inform any subsequent PEIR is	Any programme of analysis will be preceded by a programme specific Method Statement. Archaeological analysis of these programmes will also include reference to desk-based resources and will then inform



Date and consultation phase/ type	Consultation and key issues raised	Section where comment addressed
	dependent on what survey work is conducted to corroborate desk-based sources of information, e.g., UK Hydrographic Office and Historic England records (as listed in Appendix B and C).	recommended AEZs and any further survey work (also to be preceded by Method Statements).
Scoping Opinion, 2021 – Historic England	Furthermore, the use of a PAD is solely a means to deal with a situation when consented works are being conducted and previously unknown marine archaeological marine heritage receptors are discovered, so that key stakeholders take the necessary action with minimum of delay. The cross-reference to a marine WSI should be to ensure that agreed methodologies for examination are conducted to assist determination of archaeological interest.	The supplementary role of the PAD as a ‘safety net’ which enables unexpected or incidental finds to be reported and further investigated or avoided through a Temporary Exclusion Zone (TEZ) has been further detailed in Section 11.11 of this chapter and throughout Volume 4, Annex 11.2: Outline Marine Written Scheme of Investigation.
Scoping Opinion, 2021 - Historic England	We note the reference to ‘designed-in measures’ (17.5.4). We would recommend that the EIA explains how an ‘Outline Marine WSI’ will be designed to inform any and all programmes of survey investigation, as may occur after consent (should permission be obtained) and prior to any defined phase of ‘construction’ as may require the production of a ‘final’ WSI (as mentioned in para. 17.5.6).	Volume 4, Annex 11.2: Outline Marine Written Scheme of Investigation has been produced to accompany this chapter and will be developed throughout the project in accordance with The Crown Estate 2021 guidance and in consultation with Historic England. Further data acquisition, such as the forthcoming geotechnical surveys will be preceded by a specific Method Statement presented to the Archaeological Curators for agreement.
Scoping Opinion, 2021 - Historic England	It is essential that the commissioning of any pre-construction surveys is informed by the methodological approach contained within a WSI. It is insufficient if the Outline WSI is	The role of the WSI as an embedded mitigation is included in Section 11.11 of this chapter.



Date and consultation phase/ type	Consultation and key issues raised	Section where comment addressed
	<p>only used to indicate the presence of AEZs, especially if primarily based on low-resolution geophysical survey data and/ or other pre-existing survey data and reports. In this regard, we welcome the statement made in para. 17.5.7 and the agreement of a methodological approach with advisors, such as Historic England.</p>	<p>Clarifications have been made to demonstrate that the Outline Marine WSI does not only indicate the presence of AEZ's but outlines general methodologies for further archaeological works which will be detailed in any associated Method Statements. This approach is demonstrated in Volume 4, Annex 11.2: Outline Marine Written Scheme of Investigation.</p>
<p>Scoping Opinion, 2021 - Historic England</p>	<p>We note para. 17.5.12 regarding determination of cumulative impacts (e.g., other offshore wind farms as shown in Figure 14.7), and we look forward to receiving further details about this aspect of the assessment exercise during pre-application.</p>	<p>The environmental assessment of the cumulative impacts is outlined in Section 11.15.</p>
<p>Scoping Opinion, 2021 - Historic England</p>	<p>In reference to 'potential transboundary impacts', para. 17.5.20 mentions the possibility that '...paleochannels and palaeolandscapes...stretch beyond international boundaries.' Although we appreciate the logic that impact is expected to be within the proposed VE OWFL project area, we are interested in the remark regarding mitigation based on '...archaeological assessments of available geophysical and geotechnical data.' It is important that the EIA explains the methodological approach which underpins an effective mitigation programme based on geoarchaeological processing of survey data. We recommend this is clarified.</p>	<p>Any forthcoming geotechnical surveys will be informed by the geoarchaeological assessment of geophysical data (Section 11.9 of this chapter and Section 4.3 of Volume 4, Annex 11.1: Offshore Archaeology and Cultural Heritage Technical Report) with targeted cores for archaeological assessment to be included in the sampling. Section 11.11 describes the embedded mitigation which will ensure full archaeological review of geotechnical data where relevant in consultation with Historic England.</p>



Date and consultation phase/ type	Consultation and key issues raised	Section where comment addressed
Scoping Opinion, 2021 - Historic England	It is also important that research questions are included in the EIA as demonstrated by the following references: North Sea Prehistory Research and Management Framework (H. Peeters <i>et al.</i> , 2009) and People and the Sea: a maritime archaeological research agenda for England (J. Ransley <i>et al.</i> , 2013).	Relevant research frameworks have been included in Section 5.8 of Volume 4, Annex 11.2: Outline Marine Written Scheme of Investigation which will inform the research questions including in the forthcoming Method Statements for geotechnical campaigns.
Scoping Opinion, 2021 - Historic England	Paragraph 17.6.1 states, 'archaeological assessments of available marine geophysical and geotechnical survey data'. We consider it important to explain that the maximum benefit is for survey campaigns to be commissioned inclusive of archaeological objectives, especially to inform early-stage planning. We are aware that developers are keen to maximise benefits from survey campaigns and that it is good practice for engineers, geo-scientists and archaeological consultants to coordinate accordingly.	<p>Future surveys will be subject to full archaeological review where relevant in consultation with Historic England. Archaeological objectives will be included in geotechnical sampling campaigns and any other survey works where this is deemed beneficial. These objectives and the role of the ongoing geophysical and geotechnical campaigns throughout the lifetime of the project as an embedded mitigation is included in Section 11.11 of this chapter.</p> <p>Geophysical surveys undertaken to date were completed in consultation with Historic England (Maritime Archaeology, 2021)</p>
Scoping Opinion, 2021 - Historic England	We would recommend a joined-up approach to the assessment so that the geoarchaeologists and geophysicists can be included in the design of these elements of the assessment to maximise opportunities, reduce the need for duplication of effort, and	All future geophysical and geotechnical works will be preceded by a Method Statement which will include archaeological objectives.



Date and consultation phase/ type	Consultation and key issues raised	Section where comment addressed
	<p>to ensure that the information obtained is also suitable for archaeological assessments. In particular, we would recommend that the line spacings used in the different geophysical campaigns are revised so that they are in accordance with that recommended in Historic England document 'Marine Geophysics' (2013).</p>	
<p>Scoping Opinion, 2021 - Historic England</p>	<p>We would also recommend that the geoarchaeologist is given direct access to the core sequences rather than just the core logs. For example, providing isolated physical samples are likely to be of limited use compared with having direct access to geotechnical core material on extraction and at time of cutting and prior to any destructive testing. It is essential that maximum value is obtained from any such analysis and, therefore, we recommend that geo-archaeological considerations and requirements are built into the planning of any geotechnical survey campaign. A continuous sequence of deposits is needed to examine deposit characteristics and interfaces between them, i.e., to record and assess continuous core sequences rather than isolated deposits, as this allows for greater reliability and confidence in the resulting conclusions. We look forward to seeing the WSIs for the proposed mitigation strategies in due course.</p>	<p>The post-consent geotechnical campaign will include cores collected specifically for archaeological assessments which will be detailed in a specific Method Statement. The commitment to including archaeological objectives in geophysical and geotechnical campaigns is detailed in Section 8.4 of Volume 4, Annex 11.2: Outline Marine Written Scheme of Investigation.</p>
<p>03/08/2022 PEIR phase Topic specific meeting</p>	<p>Topic specific meeting with Historic England to outline data gaps in the archaeological assessment of geophysical data.</p>	<p>Section 11.6 details the areas where data is currently yet to be assessed.</p>
<p>02/11/2022 Pre-PEIR ETG</p>	<p>Presented how the key comments from the Scoping Opinion were addressed through the Chapter, technical report and Outline Marine WSI documents produced for PEIR. It was highlighted that identified anomalies which correspond to records would benefit</p>	<p>Further archaeological works are detailed in Section 6.8 of Volume 4, Annex 11.2: Outline Marine Written Scheme of Investigation. All recorded wreck and obstructions</p>



<b>Date and consultation phase/ type</b>	<b>Consultation and key issues raised</b>	<b>Section where comment addressed</b>
	from further investigation to increase the confidence in their identification.	will be avoided through AEZs, and further investigations will occur through pre-construction surveys and continued archaeological interpretation of relevant data.





## 11.4 SCOPE AND METHODOLOGY

### SCOPE OF THE ASSESSMENT

- 11.4.1 The array areas of VE will cover approximately 156 km<sup>2</sup> (inclusive of the inter-array cable route). The offshore ECC runs west from the southern array area and covers approximately 295 km<sup>2</sup>, up to and including the intertidal zone as defined as ending at MHWS. The grid connection will be made between Frinton-on-Sea and Holland-on-Sea.
- 11.4.2 The study area is defined below and includes a 1 km buffer around the offshore ECC and array areas up to MHWS (Figure 11.1).

### IMPACTS SCOPED IN FOR ASSESSMENT

- 11.4.3 The following impacts have been scoped into this assessment:
- > Construction:
    - > Impact 1: Direct impact of sediment removal containing undisturbed archaeological contexts during seabed preparation ahead of construction activities leading to the total or partial loss of marine heritage receptors;
    - > Impact 2: Direct impact by penetration, compression, and disturbance of piling foundations leading to the total or partial loss of marine heritage receptors;
    - > Impact 3: Direct impact by penetration, compression, and disturbance of stratigraphic contexts containing archaeological material from the combined weight of the Wind Turbine Generators (WTG) and associated foundations leading to total or partial loss of marine heritage receptors;
    - > Impact 4: Direct impact by penetration, compression, and disturbance of cable laying operations leading to total or partial loss of marine heritage receptors;
    - > Impact 5: Direct impact by penetration, compression, and disturbance effects of jack-up barges and anchoring of construction vessels during construction activities leading to total or partial loss of marine heritage receptors;
    - > Impact 6: Indirect impact causing disturbance of sediment containing potential marine heritage receptors (material and contexts) leading to the exposure of those marine heritage receptors to natural, chemical or biological processes and indirectly causing or accelerating their loss; and
    - > Impact 7: Indirect impacts causing changes to the Historic Seascape Character as a result of construction and survey vessel activities and the addition of cables, foundations and turbines indirectly leading to changes to the perceived historic use of the seascape during construction activities.
  - > Operation and maintenance:



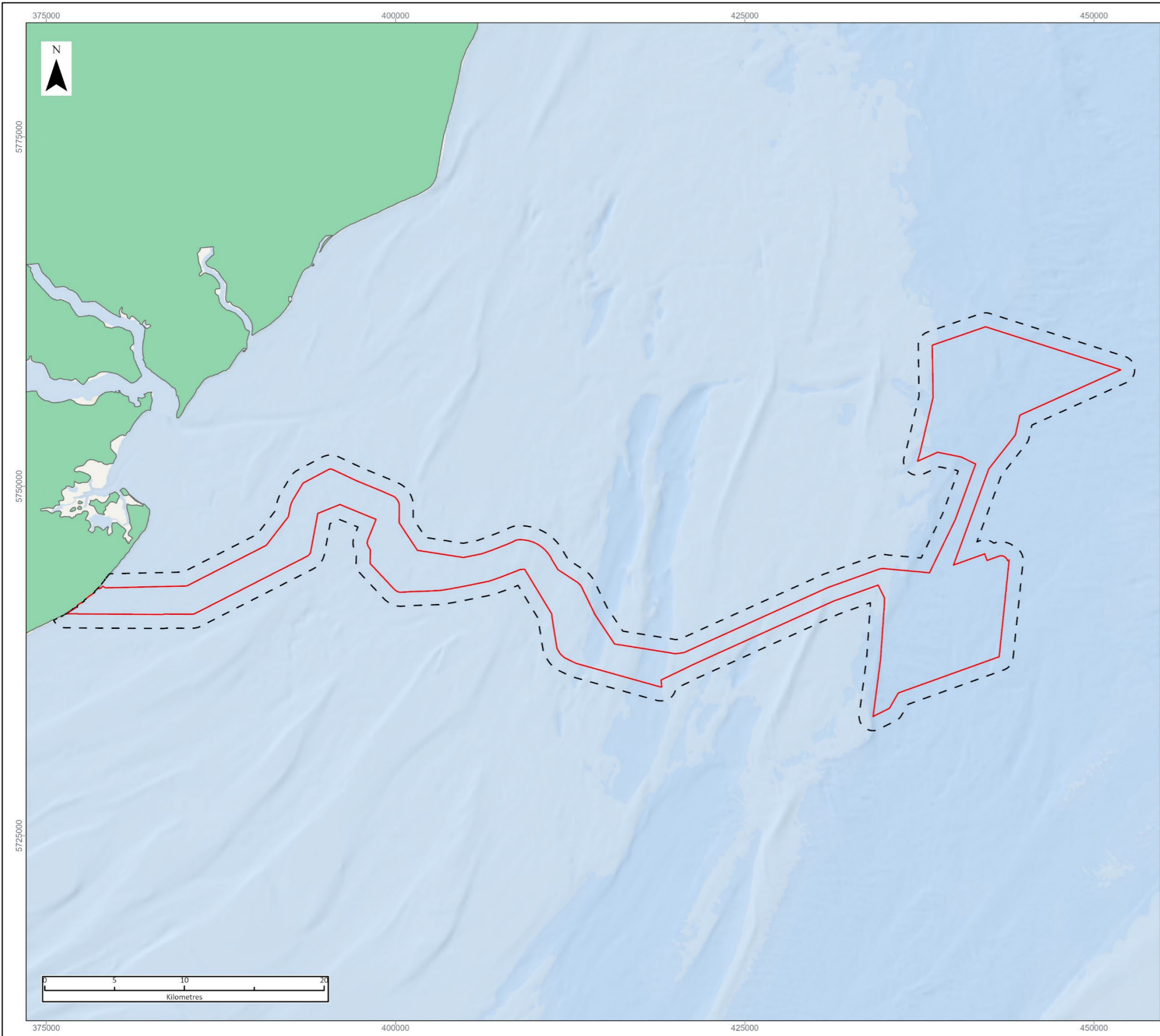
- > Impact 8: Direct impact by penetration, compression and disturbance effects of maintenance activities at WTG substation foundations and along inter-array and export cables leading to total or partial loss of marine heritage receptors;
- > Impact 9: Indirect impacts causing disturbance of sediment containing potential marine heritage receptors during maintenance activities leading to the exposure of those marine heritage receptors to natural, chemical or biological processes and indirectly causing or accelerating their loss;
- > Impact 10: Direct impact by penetration, compression, and disturbance effects of jack-up barges and anchoring of operation and maintenance vessels during the operation and maintenance phase leading to total or partial loss of marine heritage receptors;
- > Impact 11: Indirect impacts causing scour effects as a result of the presence of WTG substation foundations and the exposure of inter-array and export cables or the use of cable protection measures leading to the exposure of those marine heritage receptors to natural, chemical or biological processes and indirectly causing or accelerating their loss; and
- > Impact 12: Indirect impacts causing changes to the Historic Seascape Character as a result of operation and maintenance vessel activities and the presence of the completed wind farm indirectly leading to changes to the perceived historic use of the seascape during the operation phase.
- > Decommissioning:
  - > Impact 13: Direct impact by penetration, compression and disturbance effects of jack-up barges and anchoring of decommissioning vessels leading to total or partial loss of marine heritage receptors;
  - > Impact 14: Indirect impacts creating draw-down of sediment into voids left by removed WTG foundations leading to loss of sediment or destabilization of archaeological sites and contexts indirectly leading to exposing marine heritage receptors to natural, chemical, or biological processes and causing or accelerating loss of the same; and
  - > Impact 15: Indirect impacts causing changes to the Historic Seascape Character as a result of decommissioning activities and the removal of wind farm components indirectly leading to changes to the perceived historic use of the seascape during the decommissioning phase.

## STUDY AREA

11.4.4 A marine archaeology study area has been established for the purposes of collating and characterising baseline data as part of this PEIR. The marine archaeology study area encompasses the PEIR Red RLB plus a 1 km buffer up to MHWS (Figure 11.1).



- 11.4.5 The extended marine archaeology study area is industry standard and allows for the consideration of direct and indirect effects on marine archaeological and cultural heritage receptors and is designed to accommodate the potential imprecision of historic marine positioning.
- 11.4.6 It is important to note that the marine archaeology study area may be reviewed and amended for ES in response to such matters as refinement of the RLB, feedback from consultees, and/ or the identification of additional constraints (environmental and/ or engineering).
- 11.4.7 There is an intertidal overlap between the onshore and offshore archaeology study areas up to MHWS to ensure that there is total coverage of the PEIR RLB between the two chapters. Liaison between the two topics has been ongoing to avoid repetition of sites and marine heritage receptors. A detailed account of onshore archaeology can be found in Volume 3, Chapter 7: Onshore Archaeology and Cultural Heritage.



**LEGEND**  
 PEIR Red Line Boundary  
 Marine archaeology study area

Data Source:  
 Basemap: World Ocean Base: OceanWise, Eri, DeLorme, NaturalVue  
 World Ocean Reference: Esri UK, Esri, HERE, Garmin, Foursquare, METI/HASA, USGS

**PROJECT TITLE:**  
*FIVE ESTUARIES OFFSHORE WINDFARM*

**DRAWING TITLE:**  
**Marine archaeology study area and  
 PEIR Red Line Boundary**

VER	DATE	REMARKS	Drawn	Checked
1	28/02/2023	DRAFT	HA	CH

**DRAWING NUMBER:**  
 11.1

SCALE: 1:280,000	PLOT SIZE: A3	DATUM: WGS84	PROJECTION: UTM31N
------------------	---------------	--------------	--------------------





## POTENTIAL MARINE HERITAGE RECEPTORS

11.4.8 The scope of the assessment has enabled the identification of marine heritage receptors potentially being affected by the proposed development. The marine heritage receptors are defined as remains or resources of heritage significance and include:

- > Physical resources such as shipwrecks, aviation remains, archaeological sites, archaeological finds and material including prehistoric deposits;
- > Archival documents and oral accounts recognised as of historical/archaeological or cultural significance; and
- > Historic seascape character and the changes perceived through historic use of this seascape.

## DATA SOURCES

11.4.9 The key data sources used to inform the assessment of the existing environment are described below.

**Table 11.3 Data sources used for the marine archaeology baseline**

Source	Summary	Spatial Coverage of VE
United Kingdom Hydrographic Office (UKHO) wrecks and obstructions	Records of known wrecks and obstructions held by the United Kingdom Hydrographic Office (UKHO) and available via emapsite.com.	Coverage of the marine archaeology study area up to MLWS.
UKHO Admiralty Charts	Admiralty charts and historic mapping relevant to the defined marine archaeology study area.	Full coverage of the marine archaeology study area.
National Record of the Historic Environment (NRHE)	Point and polygon data in relation to wrecks and palaeoenvironmental evidence via Archaeology Data Service (ADS) ArchSearch.	Full coverage of the marine archaeology study area.
Essex Historic Environment Record (HER)	Point data derived from Historic Environment Record held by Essex HER Office.	Coverage of the marine archaeology study area to MLWS.
Suffolk Historic Environment Record (HER)	The online Historic Environment Record for Suffolk.	No coverage of the marine archaeology study area, though the records provide useful characterisation of the historic use of the region.



Source	Summary	Spatial Coverage of VE
North Sea Palaeolandscape Project (NSPP)	Palaeolithic and Mesolithic landscape mapping of the North Sea.	No coverage of the marine archaeology study area, though the detailed study provides useful characterisation of the directly adjacent subzone.
North Sea Prehistory Research and Management Framework (NSPRMF)	Provides a large-scale systematic and interdisciplinary study of the sedimentary and archaeological record now submerged beneath the shallow waters of the North Sea and English Channel (ongoing consultation).	Full coverage of the marine archaeology study area.
Lost Frontiers Project (LFP)	A continuation of the NSPP. Building on the mapping of Palaeolithic and Mesolithic landscapes of the North Sea, using paleoenvironmental data and ancient DNA. Potential submerged Neolithic landscapes will also be explored.	Data is not yet published for this project but will be considered when this data becomes available.
Coastal and Intertidal Zone Archaeological Network (CITiZAN)	Interactive mapping of intertidal heritage in England.	Limited coverage of the marine archaeology study area, though the detailed study provides useful characterisation of the directly adjacent subzone.
Historic England Peat Database	Database of all intertidal and coastal peats containing location, nature, age and related archaeology.	No data within the marine archaeology study area although peats have been located along the Essex coast.
British Geological Survey (BGS)	Database of a range of marine geoscience data held within the National Geoscience Data Centre (NGDC). Primarily shallow geology and geophysics data collected as either part of regional or local	Full coverage of the marine archaeology study area. No peat recorded within the marine archaeology study area, with the closest core containing peat located approximately 100 km north of the marine archaeology study area.



Source	Summary	Spatial Coverage of VE
	mapping work or provided by third parties.	
<i>Technical Report for Strategic Environmental Assessment (SEA) Area 3</i> (Flemming, 2002)	Description of palaeolandscape potential of the North Sea basin.	Broadscale data with regional coverage.
<i>Galloper Wind Farm Project-Environmental Statement – Chapter 19: Archaeology and Cultural Heritage</i> (Wessex Archaeology, 2011)	Review of archaeological potential of the subzone.	Some overlap with the marine archaeology study area. The detailed study also provides useful characterisation of the directly adjacent subzone.
<i>England's Historic Seascapes Marine HLC Pilot Study: Southwold to Clacton</i> (Oxford Archaeology, 2007)	Description of palaeolandscape and marine archaeological potential in the offshore zone from Southwold to Clacton.	Broadscale data with regional coverage.
<i>Greater Gabbard Windfarm – Phase One: Offshore Turbine Area – Archaeological Desk Based Assessment</i> (Maritime Archaeology Ltd, 2005a)	Review of archaeological potential of the subzone.	No coverage of the marine archaeology study area although the detailed study provides useful characterisation of the directly adjacent subzone.
<i>Greater Gabbard Windfarm – Phase Two: Export Cable Route and Onshore Works – Archaeological Desk Based Assessment</i> (Maritime Archaeology Ltd, 2005b)	Review of archaeological potential of the subzone.	Minor overlap with the marine archaeology study area. The detailed study also provides useful characterisation of the directly adjacent subzone.
Geophysical surveys conducted by Fugro on behalf of RWE Renewables UK Ltd (August and October 2021)	Side Scan Sonar (SSS), Multi-beam Bathymetry (MBES), Magnetometer (MAG), Ultra-High Resolution Seismic (UHRS) and Sub-Bottom Profiler (SBP) surveys of the proposed development area.	Full coverage of the array areas and the preferred ECC. Where full data coverage is not included in the assessment, other available data has been relied on. (see Section 11.6 and Figure 11.2).



## ASSESSMENT METHODOLOGY

11.4.10 The assessment methodology for marine archaeology takes into consideration the following guidance documents for marine archaeological developments:

- > Standard and Guidance for Historic Environment Desk-Based Assessment, Chartered Institute for Archaeologists (CIfA) (2014b and 2014c);
- > Historic Environment Guidance for Offshore Renewable Energy Sector, Collaborative Offshore Wind Research into the Environment (COWRIE) (2007);
- > Guidance for Assessment of Cumulative Impacts on the Historic Environment from Offshore Renewable Energy, COWRIE (2008);
- > Our Seas – A shared resource: High level marine objectives, Department for Environment, Food and Rural Affairs (DEFRA) (2009);
- > Code of Practice for Seabed Development, Joint Nautical Archaeology Policy Committee (JNAPC) (2006);
- > Commercial Renewable Energy Development and the Historic Environment, Historic England Advice Note 15 (2021);
- > Historic Seascape Characterisation (HSC): Demonstrating the Method, SeaZone (2011);
- > Deposit Modelling and Archaeology: Guidance for Mapping Buried Deposits, Historic England (2020);
- > Environmental Archaeology: A guide to the theory and practice of methods from sampling and recovery to post-excavation, English Heritage (2011);
- > Marine Geophysical Data Acquisition, Processing and Interpretation, Historic England (2013);
- > Archaeological Written Schemes of Investigation for Offshore Wind Farm Projects, The Crown Estate (2021); and
- > Protocol for Archaeological Discoveries: Offshore Renewables Projects, The Crown Estate (2014).

## 11.5 ASSESSMENT CRITERIA AND ASSIGNMENT OF SIGNIFICANCE

11.5.1 This section outlines the method used to assess the significance of effect on marine heritage receptors up to MHWS.

11.5.2 The criteria for determining this significance is based on both the impact of magnitude (Table 11.4) and the sensitivity (value) of those receptors as a result of potential impacts. Professional judgement based on the guidance set out by the Department for Culture, Media and Sport (2013) has also been applied. Section 11.13 to 11.18 outlines the significance of effect on marine heritage receptors of each identified potential impact.

11.5.3 Sensitivity (value) of the environment is defined in Table 11.14





**Table 11.4: Impact magnitude definitions.**

<b>Magnitude</b>	<b>Description/ reason</b>
High	<p>Adverse, major and substantial or irreversible change to archaeological sites, materials or the context of archaeological materials or features.</p> <p>High magnitude impact would result in long term, permanent and significant alteration of the archaeological site, feature, or materials, inhibiting interpretation of characteristics, sub-features, or components.</p> <p>While major impact is likely to be on a local level, loss of archaeological data may have implications on an international level.</p>
	<p>Beneficial impacts of High magnitude include large-scale enhanced understanding of the archaeological resource inversely proportional to the scale of the adverse effect, for example benefit through large area geophysical/geotechnical survey data released to public domain.</p>
Medium	<p>Adverse and moderate level changes to archaeological sites, materials or the context of archaeological materials or features.</p> <p>May result in long term, permanent and clear alteration, inhibiting interpretation of several key characteristics, sub-features, or components.</p> <p>While moderate impact is likely to be on a local level, loss of archaeological data may have implications on an international level.</p>
	<p>Beneficial impacts of Medium magnitude include the addition of, key characteristics, features or elements, deriving from site-specific survey and investigations such as diver/ROV or ground-truthing of anomalies leading to an enhancement of disseminated knowledge.</p>
Low	<p>Adverse, minor level of change to archaeological sites, material or the context of archaeological materials or features resulting in long term, permanent alteration, inhibiting interpretation of some key characteristics, sub-features or components.</p> <p>While minor impact is likely to be on a local level, loss of archaeological data may have implications on an international level.</p>



Magnitude	Description/ reason
	Beneficial impacts of Low magnitude can include minor benefit to, or addition of, one or more key characteristics, features or elements through enhanced knowledge and understanding of marine heritage receptors not disseminated or made publicly available.
Negligible	Negligible level of change and indistinguishable from natural variation, do not change archaeological sites or materials, and do not affect key characteristics, sub-features, or components or their environment or context.
	Beneficial impacts of Negligible magnitude, does not contribute with enhanced knowledge

11.5.4 Sensitivity (value) of the marine heritage receptors is defined in Table 11.5.

**Table 11.5: Sensitivity (value) of the marine environment.**

Receptor sensitivity (value)	Definition
High	<p>High importance and rarity of an international / national scale.</p> <p>Unique with regards to period, rarity, level of documentation, group value, condition, vulnerability, diversity, and/ or archaeological potential.</p> <p>Examples include; designated and non-designated heritage assets, protected wreck sites, aviation remains, palaeoenvironmental features or deposits with evidence of <i>in situ</i> finds.</p>
Medium	<p>Medium importance and rarity of a regional scale with limited potential for substitution.</p> <p>Regionally rare with regards to period, rarity, level of documentation, group value, condition, vulnerability, diversity, and/ or archaeological potential.</p> <p>Examples include; non-designated live wreck sites, geophysical anomalies of high and medium potential, recorded wrecks not confirmed by survey, palaeoenvironmental features or deposits.</p>
Low	<p>Low importance and rarity, local scale.</p> <p>Low or no recognised value with regards to period, rarity, level of documentation, group value, condition, vulnerability, diversity, and/ or archaeological potential.</p>



Receptor sensitivity (value)	Definition
	Examples include; fouls and obstructions, geophysical anomalies of low potential.
Negligible	Very low to no archaeological importance and rarity, local scale. The nature of the receptor is in very poor condition and survival and is therefore not considered a receptor. Examples include; dead wrecks, dead fouls or obstructions, geophysical anomalies of negligible potential such as cables.

11.5.5 The significance of the effect on marine heritage receptors is determined by comparing the impact of magnitude and the receptor sensitivity (value) as detailed in the Matrix below, Table 11.6.

**Table 11.6: Matrix to determine effect significance.**

		Sensitivity				
		High	Medium	Low	Negligible	
Magnitude	Negative	High	Major	Major	Moderate	Minor
		Medium	Major	Moderate	Minor	Negligible
		Low	Moderate	Minor	Minor	Negligible
	Neutral	Negligible	Minor	Minor	Negligible	Negligible
		Low	Moderate	Minor	Minor	Negligible
	Beneficial	Medium	Major	Moderate	Minor	Negligible
		High	Major	Major	Moderate	Minor

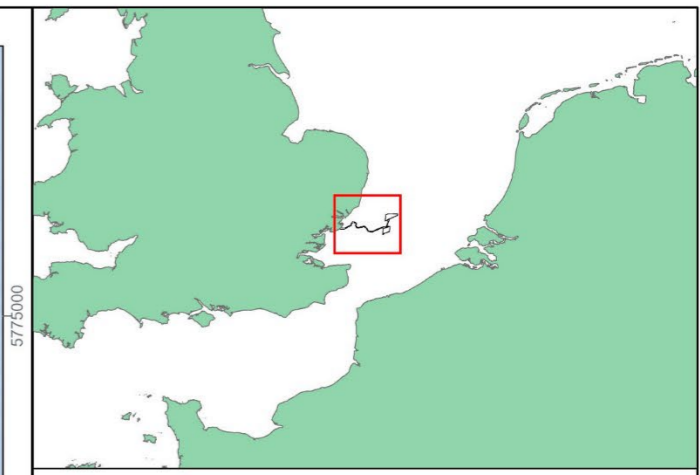
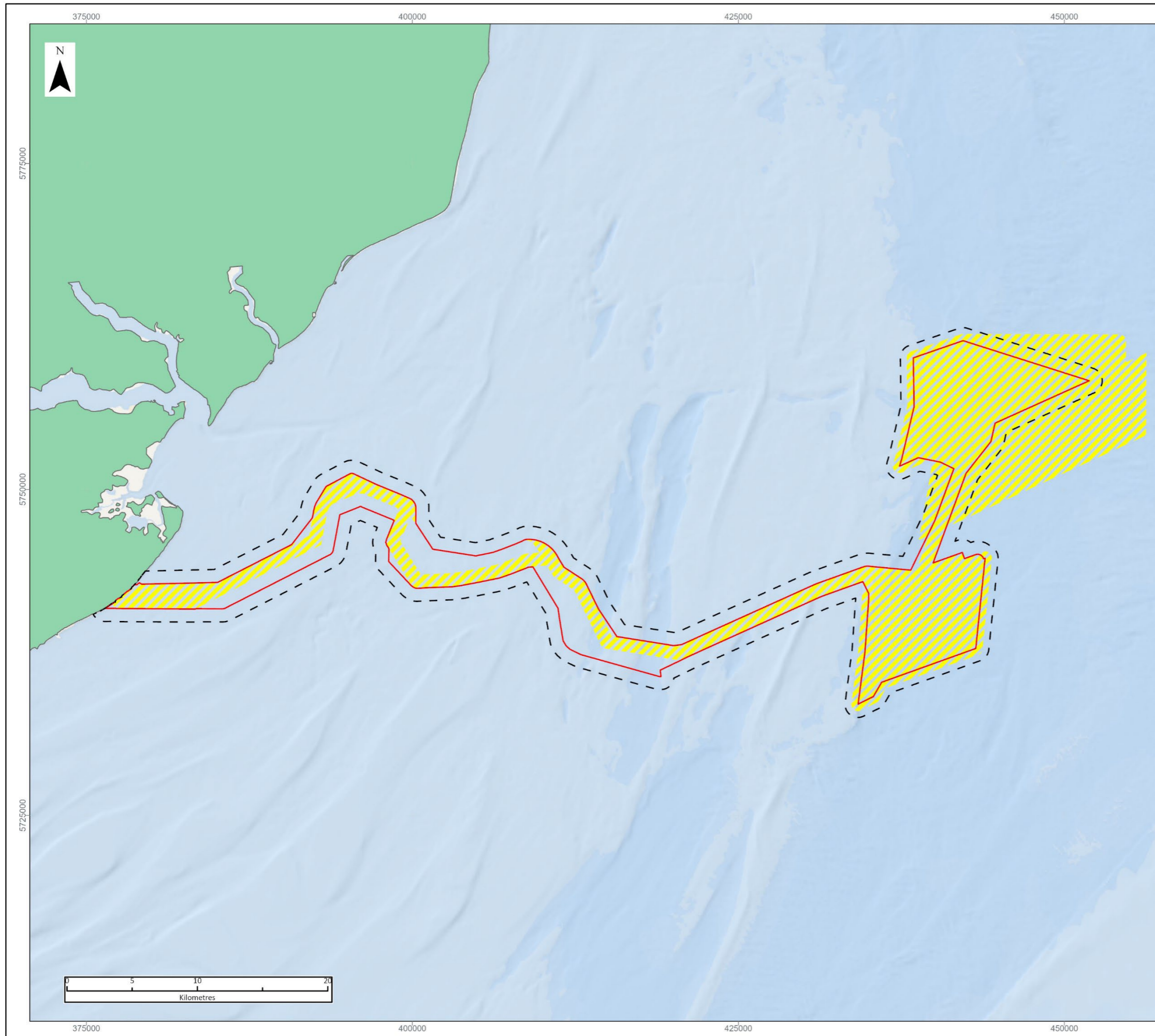
Note: shaded cells are defined as significant with regards to the EIA Regulations 2017<sup>1</sup>.

<sup>1</sup> The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017



## 11.6 UNCERTAINTY AND TECHNICAL DIFFICULTIES ENCOUNTERED

- 11.6.1 While the data received to date has been of good quality and suitable for archaeological interpretation (further defined in Section 2.4 of Volume 4, Annex 11.1: Offshore Archaeology and Cultural Heritage Technical Report), there are currently data gaps within the offshore cable corridor route. Geophysical data acquisition has been undertaken within the area described as the preferred offshore cable route corridor within the Scoping Report, (Figure 11.2).
- 11.6.2 In consideration of the high number of baseline records within the offshore cable corridor route and the marine archaeology study area around it, precautionary AEZs of 50 m will be applied around any records not seen in the VE geophysical data already assessed.
- 11.6.3 There is a likelihood that previously unidentified sites or features of archaeological interest or significance may be present in the areas where the data has not yet been obtained.
- 11.6.4 Where possible, the data gaps will be filled following PEIR and the VE project is aware of the importance in obtaining full data coverage in order to reduce uncertainties and the risk of later design modifications.
- 11.6.5 At this time there have been no offshore geotechnical surveys undertaken, however, these are planned post consent. Archaeology specific sampling will be included and informed by the results of the sub bottom data analysis.



**LEGEND**

- PEIR Red Line Boundary
- Marine archaeology study area
- Geophysical survey extent

Data Source:  
 Basemap: World Ocean Base: OceanWise, Esri, DeLorme, NaturalVue  
 World Ocean Reference: Esri UK, Esri, HERE, Garmin, Foursquare, FAO, METI/HASA, USGS

**PROJECT TITLE:**  
*FIVE ESTUARIES OFFSHORE WINDFARM*

**DRAWING TITLE:**  
**Geophysical survey extent**

VER	DATE	REMARKS	Drawn	Checked
1	28/02/2023	DRAFT	HA	CH

**DRAWING NUMBER:**  
 11.2

SCALE: 1:300,000	PLOT SIZE: A3	DATUM: WGS84	PROJECTION: UTM31N
------------------	---------------	--------------	--------------------





## 11.7 EXISTING ENVIRONMENT

### OVERVIEW

11.7.1 The marine archaeological resource can be characterised within the following five main categories of sites and features:

- > Landscape: submerged prehistoric landscapes related to fluctuations in past sea-level. Such landscapes may contain significant evidence of prehistoric human occupation and/ or environmental change.
- > Vessels: Archaeological remains of vessels deposited after a wrecking event at sea or abandoned in an intertidal context, including structural remains of the vessel and cargo or apparatus jettisoned during the wrecking.
- > Aircraft: Remains of aircraft crash sites, either coherent assemblages or scattered material, typically the result of Second World War military conflict or passenger casualties. This category includes aircraft, airships and other dirigibles dating to the First World War.
- > Structures: Structural remains including defensive structures, lighthouses, jetties, harbours, fish traps or sites lost to the sea as a result of coastal erosion may be found within the intertidal zone (between Mean Low Water Springs (MLWS) and MHWS).
- > Historic Seascape Character: The historic cultural influences which shape present perception of seascape, its use and its ability to accommodate change.

11.7.2 The marine archaeology study area has been assessed and described as a whole, however a summary of records, features and anomalies within the array areas and ECC can be seen below.

### THE ARRAY AREAS

11.7.3 Within the array areas there are six records for wrecks and obstructions (Figure 11.3). Of these, one (UKHO15865, MA0001) was seen in the geophysical data. Interpreted channel systems recorded by EMU *et al.* (2009) and valleys and channels of geoarchaeological potential identified in the SBP data can be seen across both array areas

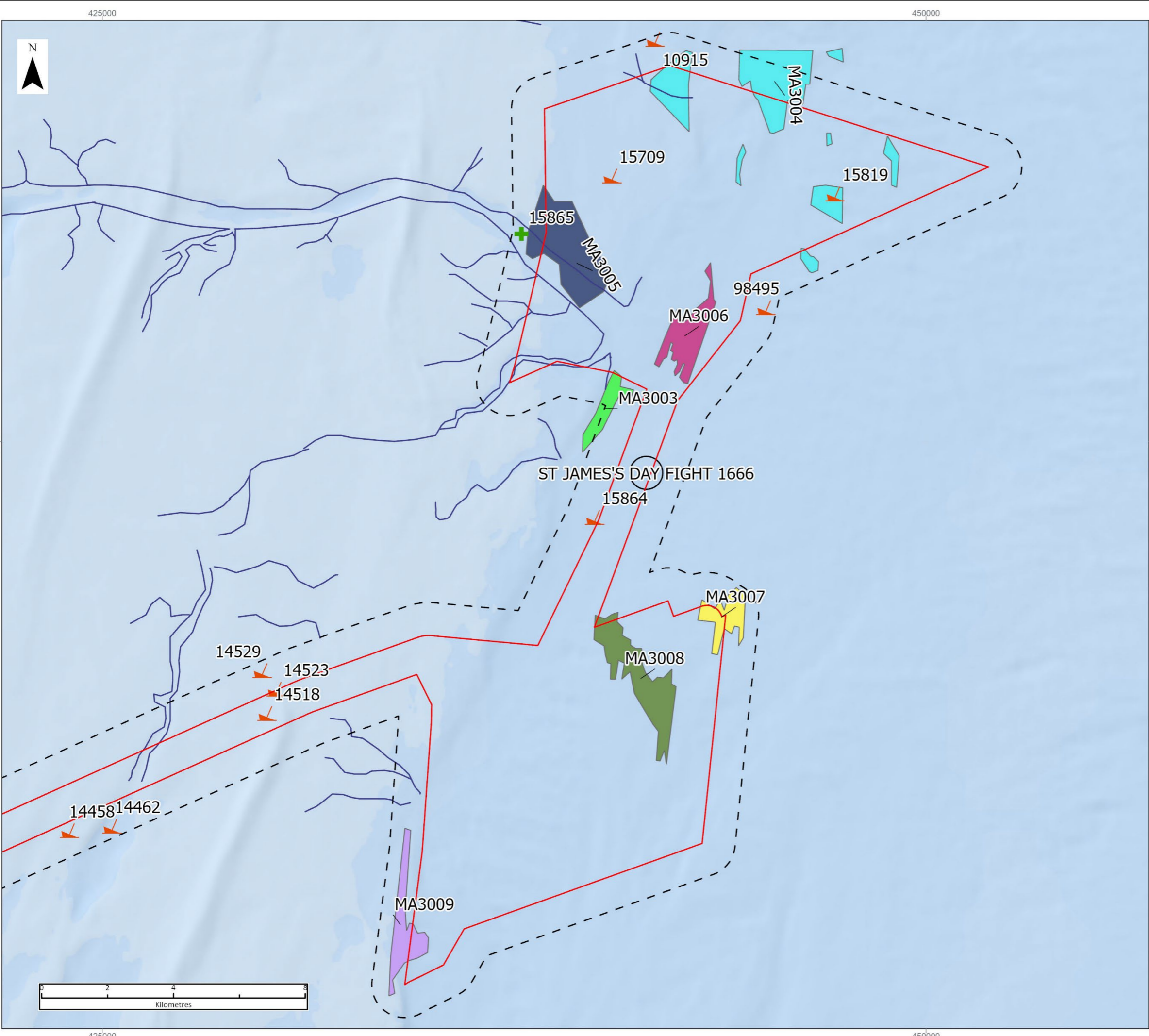
11.7.4 In addition to this PEIR chapter, a technical report and an Outline Marine WSI (Volume 4, Annex 11.1: Offshore Archaeology and Cultural Heritage Technical Report and Annex 11.2: Outline Marine Written Scheme of Investigation) were produced for the area of the array. A review of the key findings from that study has been incorporated into the description of the existing environment below.

### THE ONSHORE/ OFFSHORE EXPORT CABLE CORRIDOR

11.7.5 Within the offshore export cable corridor there are 102 records for wrecks, aircraft, obstructions, foul ground and sites, including one aircraft record correlating with a geophysical anomaly. Of these, 23 were seen in the geophysical data, including one aircraft and 16 wrecks. Interpreted channel systems recorded by Emu *et al.* (2009) and valleys and channels of geoarchaeological potential identified in the SBP data can be seen across the ECC, predominantly at the western extent of the cable route (Figure 11.4).



11.7.6 In addition to this PEIR chapter, a technical report and an Outline Marine WSI (Volume 4, Annex 11.1: Offshore Archaeology and Cultural Heritage Technical Report and Annex 11.2: Outline Marine Written Scheme of Investigation) were produced for the ECC area. A review of the key findings from that study has been incorporated into the description of the existing environment below.



**LEGEND**

- PEIR Red Line Boundary
- Marine archaeology study area

UKHO, NRHE and HER records:

- + obstruction (seen in geophysical data)
- > wreck
- UKHO and NRHE area records
- Interpreted channel systems (EMU, 2009)

Channels with geoarchaeological potential

- MA3003
- MA3004
- MA3005
- MA3006
- MA3007
- MA3008
- MA3009

Data Source:  
 Basemap: World Ocean Base: OceanWise, Esri, DeLorme, NaturalVue  
 World Ocean Reference: Esri, HERE, Garmin, Foursquare, GeoTechnologies, Inc, METI/NASA, USGS

**PROJECT TITLE:**  
 FIVE ESTUARIES OFFSHORE WINDFARM

**DRAWING TITLE:**  
 Records and geophysical features within the array areas

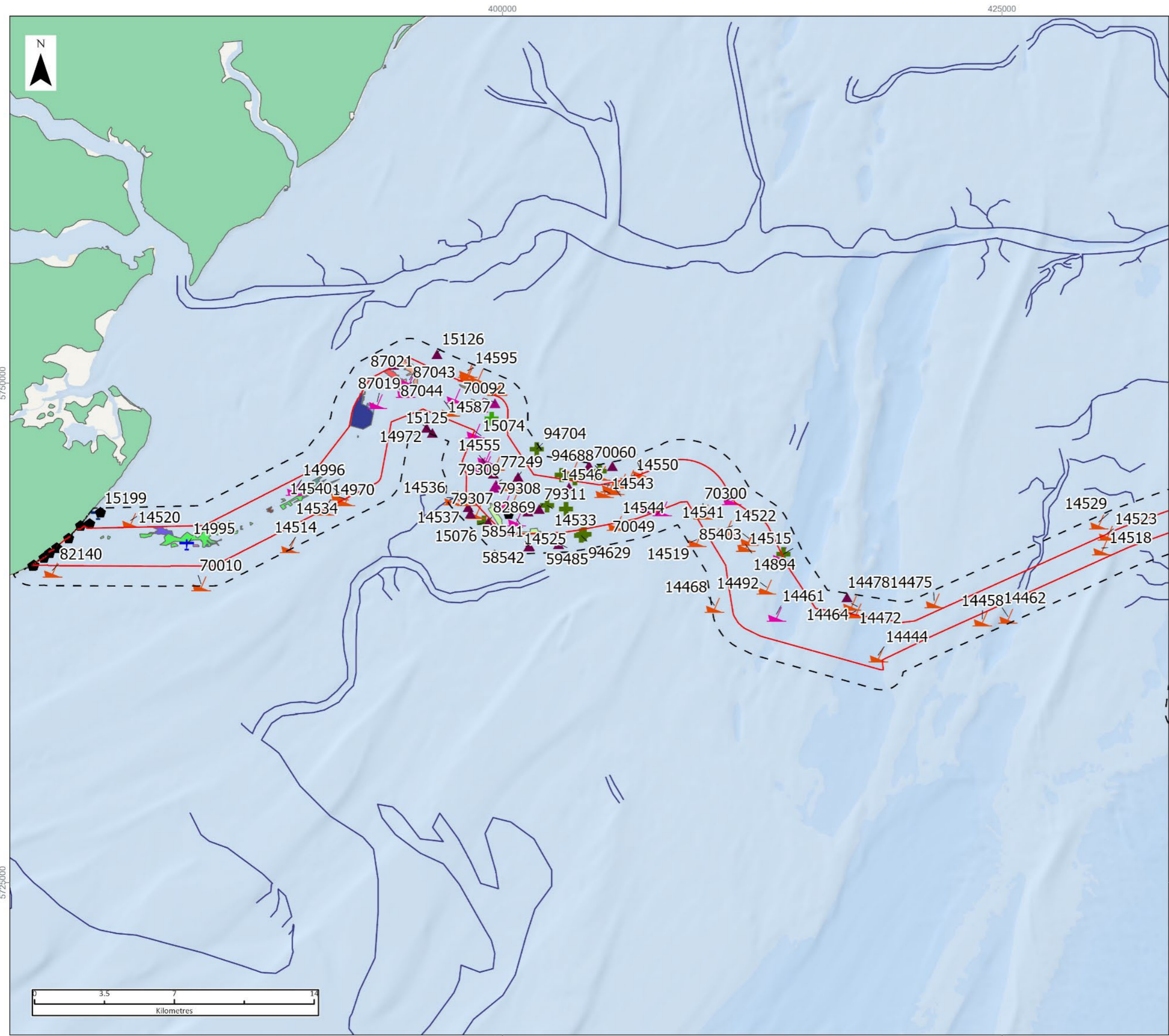
VER	DATE	REMARKS	Drawn	Checked
1	28/02/2023	DRAFT	HA	CH

**DRAWING NUMBER:**  
 11.3

SCALE: 1:120,000    PLOT SIZE: A3    DATUM: WGS84    PROJECTION: UTM31N







**LEGEND**

- PEIR Red Line Boundary
- Marine archaeology study area

UKHO, NRHE and HER records:

- + aircraft
- + aircraft (seen in geophysical data)
- ▲ foul ground
- ▲ foul ground (seen in geophysical data)
- + obstruction
- + obstruction (seen in geophysical data)
- site
- wreck
- wreck (seen in geophysical data)
- Interpreted channel systems (EMU, 2009)

Channels with geoarchaeological potential

MA3000	MA3010	MA3014
MA3001	MA3011	MA3015
MA3002	MA3012	MA3016
MA3003	MA3013	MA3017

Data Source:  
 Basemap: World Ocean Base: OceanWise, Esri, DeLorme, NaturalVue  
 World Ocean Reference: Esri UK, Esri, HERE, Garmin, Foursquare, METI/NASA, USGS

PROJECT TITLE:  
**FIVE ESTUARIES OFFSHORE WINDFARM**

DRAWING TITLE:  
**Records and geophysical features within the ECC**

VER	DATE	REMARKS	Drawn	Checked
1	28/02/2023	DRAFT	HA	CH

DRAWING NUMBER:  
**11.4**

SCALE: 1:200,000    PLOT SIZE: A3    DATUM: WGS84    PROJECTION: UTM31N





## ENVIRONMENTAL CONTEXT AND MARITIME ACTIVITY

- 11.7.7 The area of seabed that the marine archaeology study area covers was previously a large swathe of dryland that was inhabited during the Pleistocene and early Holocene (Mesolithic). There have been numerous glacial cycles resulting in periods of lower and higher sea-level compared to today. The dynamic processes of climate and landscape change throughout the Pleistocene as a result of warming and cooling cycles and fluctuations in sea-level resulted in repeated (re)colonization and abandonment of these landscapes (Cohen *et al.*, 2017). Large swathes of land that are now submerged would have been inhabited and exploited by our human ancestors and any archaeological finds from the Palaeolithic period in the offshore zone are likely to be from periods when the sea-level was lower.
- 11.7.8 These periods of (re)colonisation are associated with the retreat of icesheets following the last three glacial maximums:
- > Devensian: Upper Palaeolithic c. 100 – 22,000 BP (glacial maximum);
  - > Wolstonian: Lower Palaeolithic c. 250 – 150,000 BP (glacial maximum); and
  - > Anglian: Lower Palaeolithic c. 350 – 280,000 BP (glacial maximum).
- 11.7.9 The potential for submerged landscapes within the marine archaeology study area is high. To the north of the marine archaeology study area, at Happisburgh and Pakefield, the earliest evidence of hominin occupation of northern Europe (c. 900 ka to 800 ka) comes from sites, features and finds within the coastal and marine zone (Parfitt *et al.*, 2005, 2010; Bynoe, 2018). While to the south lie significant Lower Palaeolithic sites at Clacton (Emu *et al.*, 2009).
- 11.7.10 Due to the effects of ice scouring during each successive glacial period, the North Sea Basin has the highest potential for Palaeolithic material from within the last 100,000 years and increases significantly following the last glacial maximum, at the onset of the Holocene (Flemming, 2002). This is because these former Pleistocene land surfaces have not been eroded or reworked by younger landscapes (Cohen *et al.*, 2017).
- 11.7.11 The deposits laid down in the marine zone during glacial cycles during the last 500,000 years are of great importance for understanding the localised geomorphological changes of the Essex and Suffolk coasts. Changing routes of river systems during these periods of glaciation is exemplified in the terraces of the Thames-Medway rivers which originally occupied a more northerly course in Norfolk, but were pushed south to their current location approximately 450,000 BP.
- 11.7.12 The Naze, now a headland on the Essex coast, once formed the northern side of the major river valley which contained the Thames, Medway, Crouch, Colne and Blackwater and their minor tributaries. This coastal setting with major estuaries, high in marine resources, suggests the Naze would have been a prime location for early human settlement but the area is likely to have been inundated by rising sea-levels around 10,000 BP.



- 11.7.13 The significant assemblage of microliths discovered at Stone Point, approximately 5.5 km to the north of the VE landfall, suggests Mesolithic activity in the area was taking place at a time when the coast had reached its present outline following a rise in sea-levels. The discovery of Neolithic pottery and axe heads in this same area suggests settlement here was continuous over a long period (Oxford Archaeology, 2007).
- 11.7.14 The archaeological and palaeoenvironmental potential of the offshore deposits from the southern end of the North Sea basin is demonstrated by the wealth of artefacts, faunal remains and peat evidence that have been identified to date. However, *in situ* offshore finds are rare, with most artefacts within the marine zone being found on the seabed in a secondary context.
- 11.7.15 There are no *in situ* finds from the region, although the potential for the preservation of such material is well attested in similar contexts based on finds from developments such as aggregate dredging Area 240 approximately 60 km north of the marine archaeology study area, off the coast of Norfolk (Tizzard *et al.*, 2014) where an assemblage of Middle Palaeolithic tools has been recovered.
- 11.7.16 Eight prehistoric and Palaeolithic finds have also been recorded in the marine archaeology area within the HER and NRHE databases including three mammoth tooth find spots recorded in the NHRE data, an additional mammoth tooth find spot and tools found from the Palaeolithic, Mesolithic and Neolithic recorded in the HER data. A Palaeolithic hand axe was found along the beach in Frinton-on-Sea and was also recorded by CITiZAN. There are currently no protected areas or statutory designations in relation to submerged landscapes within the marine archaeology study area.
- 11.7.17 The rate of sea-level change had slowed considerably by c. 6,000 BP for much of the British Isles and much of the land mass connecting the UK and continental Europe was permanently inundated.
- 11.7.18 From around 4,500 BP the operation of maritime networks linking Britain across the North Sea, the Channel and the Irish Sea are shown in the long-distance exchange of exotic objects and artefacts. These included finds of Beaker pottery, copper and bronze weapons and tools, flint daggers, arrowheads, and jewellery, or other adornments of gold, amber, faience, jet, and tin (Sturt and Van Noort via Research Framework, 2022).
- 11.7.19 The potential for substantial submerged landscape deposits offshore is further reduced in the Bronze Age due to the increased stability in sea levels. However, with increasingly sedentary populations, both on the coast and inland, this inevitably gave rise to increased communications along the coast and waterways of the region.
- 11.7.20 There is substantial potential for *in situ* archaeological remains in the intertidal zone: These would include occupational material, ritual deposits, burials, and structures relating to coastal marine practices, such as jetties, causeways, and fish traps; however, there is also potential for secondary context material from eroded deposits in the inshore and intertidal zone.



- 11.7.21 By the Iron Age, sea-level change no longer has a significant effect on the geomorphology of the coastline and is replaced by coastal erosion as the key factor in these changes. Maritime trade networks were further developed, with evidence of cross-channel, as well as coastal and inland, trade. From the Late Iron Age there is more clear evidence for increasing levels of contacts, trade, and exchange across the Channel. This evidence includes a wider range of materials than in the Bronze Age, including coins, pottery, and foodstuffs from the western Mediterranean and France/Belgium, and a range of other traded and imported Roman material.
- 11.7.22 During the Romano-British period, there is clear evidence for seaborne and coastal activity along the Suffolk and Essex coastlines. Several important sites were established in Suffolk following the Roman invasion in AD 43, including Ipswich, as well as evidence of enclosures, trackways and fields. A range of maritime vessel types would have been in use during the Romano-British period to facilitate activity along the east coast. Watercraft used for less archaeologically visible pursuits such as fishing would have also been present.
- 11.7.23 There was a decline in maritime activity in the Early Medieval period, after the fall of the Roman Empire, until the late 6th century when there was a resurgence of trade with continental Europe which continued into the 9th century. As with the Roman period, the variety of maritime activities meant an extensive range of vessels were used. These vessels continued to increase in size and complexity, however smaller craft were still commonly used, especially for coastal and inshore activities.
- 11.7.24 In the post-medieval period, there was a marked increase in detailed historical records, which meant that known maritime losses began to be recorded. There was also a continued increase in trade and maritime activity, and with this expansion of shipping activity and traffic came an ever-greater number of wrecking events within the marine archaeology study area. One vessel constructed during the post-medieval period (UKHO 15819, *SS Willy*) is recorded within the marine archaeology study area. This record is detailed in Section 3.3 of Volume 4, Annex 11.1: Offshore Archaeology and Cultural Heritage Technical Report.
- 11.7.25 The rapid pace of technological development in the beginning of the twentieth century had a great impact on the broad pattern of maritime activity. Wartime innovations led to the increase in use of new types of vessels and technologies, and a transformation of a growing global shipping trade. Globalisation also expanded into the leisure industry, with a decrease in the use of ocean liners in favour of cruise ships and newly developed passenger aircraft in the mid-1900s, and planes becoming the primary method of intercontinental travel. All recorded wrecks within the marine archaeology study area where the date of loss is known are considered modern. These are detailed in Section 3.3 of Volume 4, Annex 11.1: Offshore Archaeology and Cultural Heritage Technical Report.

## KNOWN WRECKS AND OBSTRUCTIONS

- 11.7.26 Wrecks and obstructions are classified by the UKHO as:
- > LIVE: Wreck considered to exist as a result of detection through survey;
  - > DEAD: Not detected over repeated surveys, therefore not considered to exist in that location;
  - > LIFT: Wreck has been salvaged;



- > UNKNOWN: The state of the wreck is unknown or unconfirmed; and
- > ABEY: Existence of wreck in doubt and therefore not shown on charts.

11.7.27 Records from the NRHE were checked against the UKHO records and any duplications were removed. Where the recorded wrecks were not also seen in the geophysical data the locations listed in the UKHO data were used.

11.7.28 The archaeological assessment of geophysical data combined with the baseline conditions has identified 36 LIVE wrecks (including two aircrafts), 24 DEAD wrecks, seven UNKNOWN or unconfirmed, no LIFTED wrecks, and one wreck listed as 'Not Fully Surveyed' within the marine archaeology study area (Figure 11.5). Of the wrecks recorded in the UKHO and NRHE baseline data assessment, 16 were identified within the geophysical data. Additionally, the recorded locations of five foul ground, two obstructions and one aircraft site were seen to correspond with anomalies identified in the geophysical data (Section 11.8).

## AVIATION REMAINS

11.7.29 Remains of aircraft crash sites, either coherent assemblages or scattered material are usually the result of Second World War military conflict. The numerous passenger casualties, particularly during the peak of seaplane activity during the inter-war period are the other most likely potential source. Aviation remains include aircraft, airships and other dirigibles dating to the First World War, although these rarely survive in the archaeological record.

11.7.30 There are two reported losses of aircrafts within the study area: UKHO15199, a FW 190 from which the engine has been recovered recorded approximately 400 m from the coast, 700 m north of the RLB and outside of the geophysical survey area (Figure 11.3).

11.7.31 The second aircraft is a charted wreck, recorded as UKHO14995 and described as a unidentified aircraft believed to be a Vickers Wellington. The Vickers Wellingtons were British twin-engine, long-range medium bombers, designed during the mid-1930s. The remains of UKHO14995 are recorded approximated 6.4 km from the coast within the ECC (Figure 11.3 and Figure 11.11) and was first located by a naval vessel in 1988 when it was measured to be 35 m long. The following year, a small piece of aircraft structure was reported as recovered by divers and confirmed as a distinctive 'geodetic' structure used in the Vickers Wellington aircrafts, a manufacturer's number confirmed this as the case. SSS, MBES and magnetometer data indicates that there some structural elements might still be present on the seafloor (MA0029), however, further investigation is needed to confirm whether MA0029 relates to the record for UKHO14995.

11.7.32 Where *in situ* remains associated with any military aviation losses are found and confirmed, they will be archaeologically significant and protected under the Protection of Military Remains Act 1986. These losses are further detailed in Section 3.3 of Volume 4, Annex 11.1: Offshore Archaeology and Cultural Heritage Technical Report.



### FISHERMEN'S FASTENERS

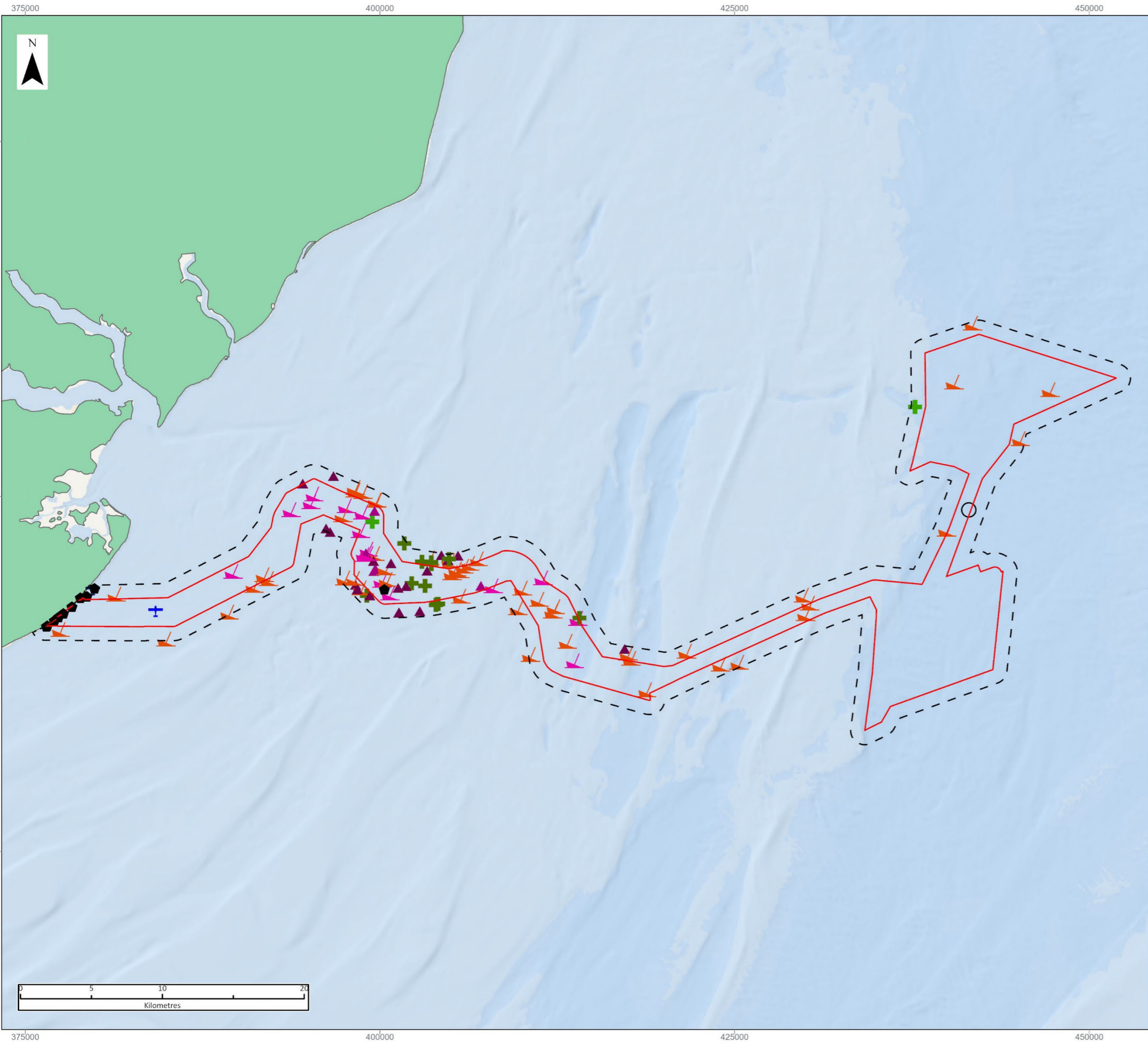
- 11.7.33 Records classed as fishermen's fasteners, or which otherwise remain unidentified and are not associated with vessel or structural remains (including records classified as DEAD by the UKHO). They are unidentified obstructions reported by fishermen, possibly indicative of a wreck or submerged feature. No other baseline information is available for any of these obstructions, and while they may well represent archaeological remains, this is not possible to ascertain from the existing sources.
- 11.7.34 Within the marine archaeology study area, there are currently no records classed as fishermen's fasteners recorded by the NRHE.

### DESIGNATED SITES

- 11.7.35 There are currently no known or identified features or sites within the marine archaeology study area that are designated under the Protection of Wrecks Act 1973, or any other site designation or statutory protection. The site of UKHO 14995, the Vickers Wellington aircraft (corresponding with geophysical anomaly MA0029) is likely to be automatically protected following investigation.

### UNLOCATED MARINE HERITAGE RECEPTORS

- 11.7.36 There is always a possibility that not yet identified marine heritage receptors are located within the marine archaeology study area and/ or PEIR RLB. Unlocated marine heritage receptors are of unknown archaeological potential and heritage significance but might still be impacted by indirect or direct impacts caused by project activities. Large offshore renewable developments have over the last years located several previously unknown and unlocated sites of high archaeological significance within site boundaries, often as part of or after completing pre-construction surveys. Mitigation for unlocated marine heritage receptors is further discussed in Section 11.11 and Volume 4, Annex 11.2: Outline Marine Written Scheme of Investigation.



**LEGEND**

- PEIR Red Line Boundary
- Marine archaeology study area

UKHO, NRHE and HER records:

- + aircraft
- + aircraft (seen in geophysical data)
- ▲ foul ground
- ▲ foul ground (seen in geophysical data)
- + obstruction
- + obstruction (seen in geophysical data)
- ◆ site
- ▲ wreck
- ▲ wreck (seen in geophysical data)
- UKHO and NRHE area records

Data Source:  
 Basemap: World Ocean Base: OceanWise, Esri, GEBCO, DeLorme, NaturalVue  
 World Ocean Reference: Esri UK, Esri, HERE, Garmin, Foursquare, METI/NASA, USGS

**PROJECT TITLE:**  
*FIVE ESTUARIES OFFSHORE WINDFARM*

**DRAWING TITLE:**  
**Known wrecks and obstructions within the marine archaeology study area**

VER	DATE	REMARKS	Drawn	Checked
1	28/02/2023	DRAFT	HA	CH

**DRAWING NUMBER:**  
 11.5

SCALE: 1:280,000    PLOT SIZE: A3    DATUM: WGS84    PROJECTION: UTM31N





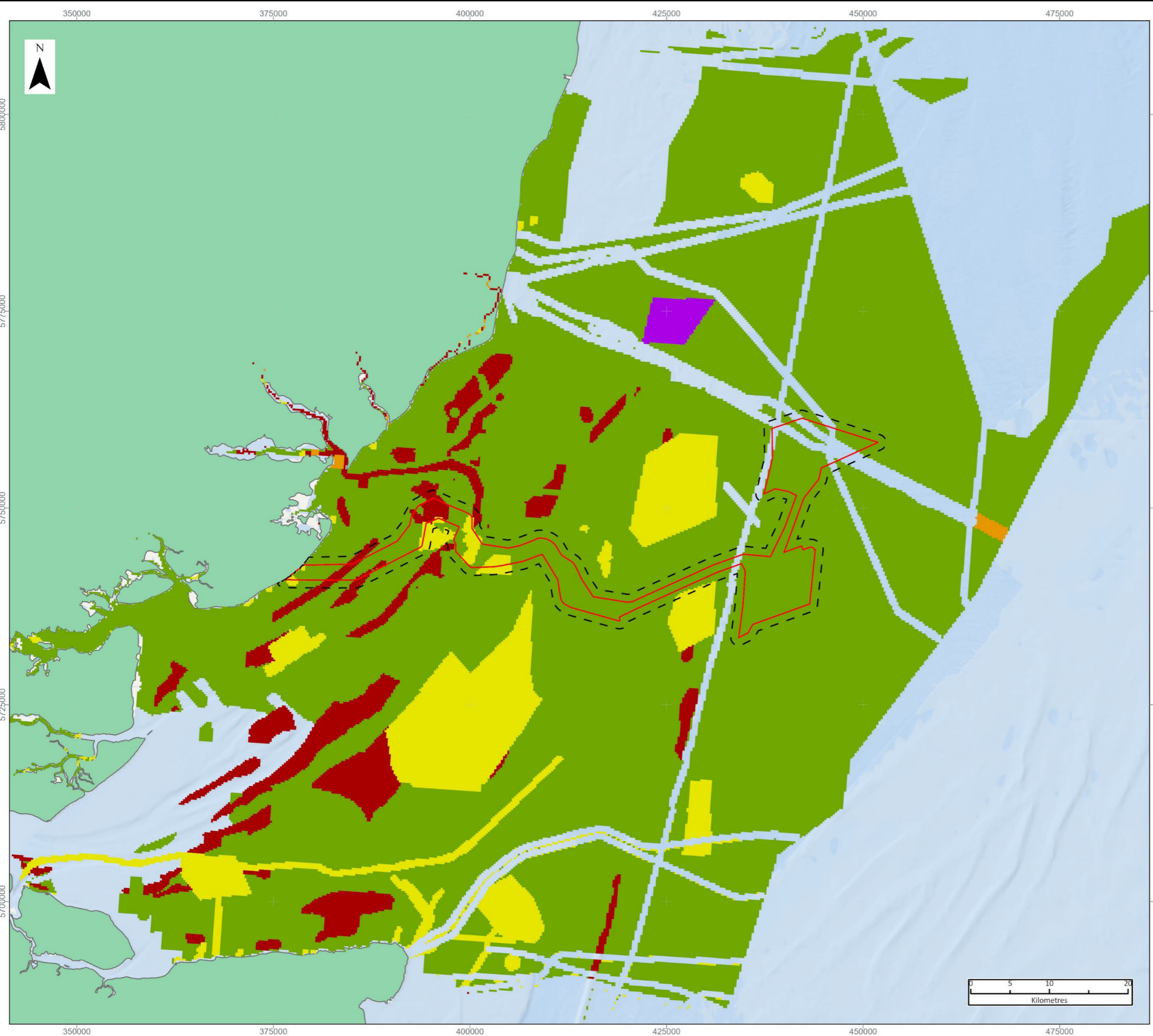
## HISTORIC SEASCAPE CHARACTERISATION

- 11.7.37 Historic Seascape Characterisation (HSC) has been used as a measure in this assessment to provide a contextual and regional approach to the historic perception of the marine archaeology study area. Historic seascapes cannot be destroyed or damaged but impacts on them can change their historical character and the perception of this. Impacts on the current seascape are further detailed in Volume 2, Chapter 10: Seascape, Landscape and Visual.
- 11.7.38 Changes to the character of the sea surface and the perception of the historic seascape as a direct result of the construction, operation, maintenance and decommissioning of VE will result from the addition of new infrastructure, such as foundations and turbines, as well as ongoing activity from installation and maintenance vessels. The seascape is dynamic and a product of change, both historic and continual, as is the perception of its character.
- 11.7.39 The HSC assessment draws on the consolidated National Historic Seascape database (LUC, 2018 via Historic England), Historic Seascape Characterisation: England's Historic Seascape: HSC Method Consolidation (Cornwall Council, 2008), and England's Historic Seascape: Demonstrating the Method (SeaZone, 2011).
- 11.7.40 The historic character of the seascape can be defined by its dynamic nature and its ability to accommodate change. Perceptions of seascapes are also dynamic and subject to the public awareness, time, and place. The intertidal marine zones are ever-changing due to physical processes such as currents, tidal range and sediment mobility. Considering this dynamism and the multi-dimensions defined by the HSC, people create complex spatial relationships within and across all marine levels, which is reflected within sites of cultural activity and their material imprints.
- 11.7.41 Potential changes to the HSC are expressed as a narrative description of the seascape character, how it is perceived by the public, and how these perceptions could be affected by the proposed VE wind farm, which may or may not be considered important from a historic perspective.
- 11.7.42 The HSC regards the historic dimension of the present day seascape and considers the added effect of VE within the multiple dimensions of the marine environment (sub sea floor, sea floor, water column, sea surface, coastal land and previous historic character) in combination with the existing activity within the Broad Historic Character Types (Navigation, Industry, Fishing, Ports and Docks, Coastal Infrastructure, Communications, Military, Settlements, Recreation, Cultural Topography, and Woodland), as further detailed in Volume 4, Annex 11.1: Offshore Archaeology and Cultural Heritage Technical Report, and summarised below.





- 11.7.43 Within the sub sea floor and sea floor, character types include Navigation, Industry, Fishing, Ports and Docks, Coastal Infrastructure, Communications, Military, Recreation and Cultural Topography (Figure 11.6 and Figure 11.7). Activities on the sea floor and sub sea floor are dominated by Industry, Fishing and Cultural Topography. The sub sea floor and sea floor are less likely to enter the perceptions of the public due to their remoteness compared to other dimensions. The perception of use within these levels is often peripheral rather than from participation. The perception of Cultural Topography and Recreation may be positively improved with the increase in understanding and awareness of palaeolandscapes, peat deposits as well as artefacts and wrecks identified in the geophysical surveys and forthcoming geotechnical surveys undertaken by VE. The impact on marine heritage receptors is further discussed Section 11.12 to Section 11.14.
- 11.7.44 Within the water column and sea surface, character types include Navigation, Industry, Fishing, Ports and Docks, Coastal Infrastructure, Military, Recreation and Cultural Topography (Figure 11.8 and Figure 11.9). Activities on the sea surface and the water column are dominated by the modern and current navigational routes in combination with historic shipping routes. The sea surface also comprises offshore infrastructure such as renewables, gas, oil, navigational markers and ocean survey equipment. The perception of the water column and sea surface regarding Navigation and Industry is likely to be impacted by VE following construction due to the presence of navigational aids and the visual impact of the turbines. This is discussed further in Volume 2, Chapter 10: Seascape, Landscape and Visual.
- 11.7.45 Within the coastal and conflated level, character types include Navigation, Industry, Fishing, Ports and Docks, Coastal Infrastructure, Communications, Military, Settlement, Recreation, Cultural Topography, Woodland, Enclosed Land, Unimproved Land and Historic Landscape Characterisation (HLC) (Figure 11.10). In this area the activities are dominated by Navigation, Industry, Fishing and Military character types. Activities on the coast are varied and most easily perceived. The perception of character types within the coastal and conflated level is not assessed to change following the development of VE. This is discussed further in Volume 2, Chapter 10: Seascape, Landscape and Visual.
- 11.7.46 The value and perception of the Broad Historic Character Types include the increased attention of the wider general public given to modern aquaculture and the benefits and disadvantages of renewable energy, sub sea communication cables and marine global trading. People's perception of the sea and its value also include the biodiversity, the archaeological potential and fishing and transport heritage.



**LEGEND**

- PEIR Red Line Boundary
- Marine archaeology study area

Sub sea floor

- Navigation
- Industry
- Communications
- Military
- Cultural Topography

Data Source:  
 Basemap: World Ocean Base: OceanWise, Esri, DeLorme, NaturalVue  
 World Ocean Reference: Esri UK, Esri, HERE, Garmin, Foursquare, FAO, METI/NASA, USGS

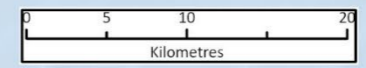
**PROJECT TITLE:**  
*FIVE ESTUARIES OFFSHORE WINDFARM*

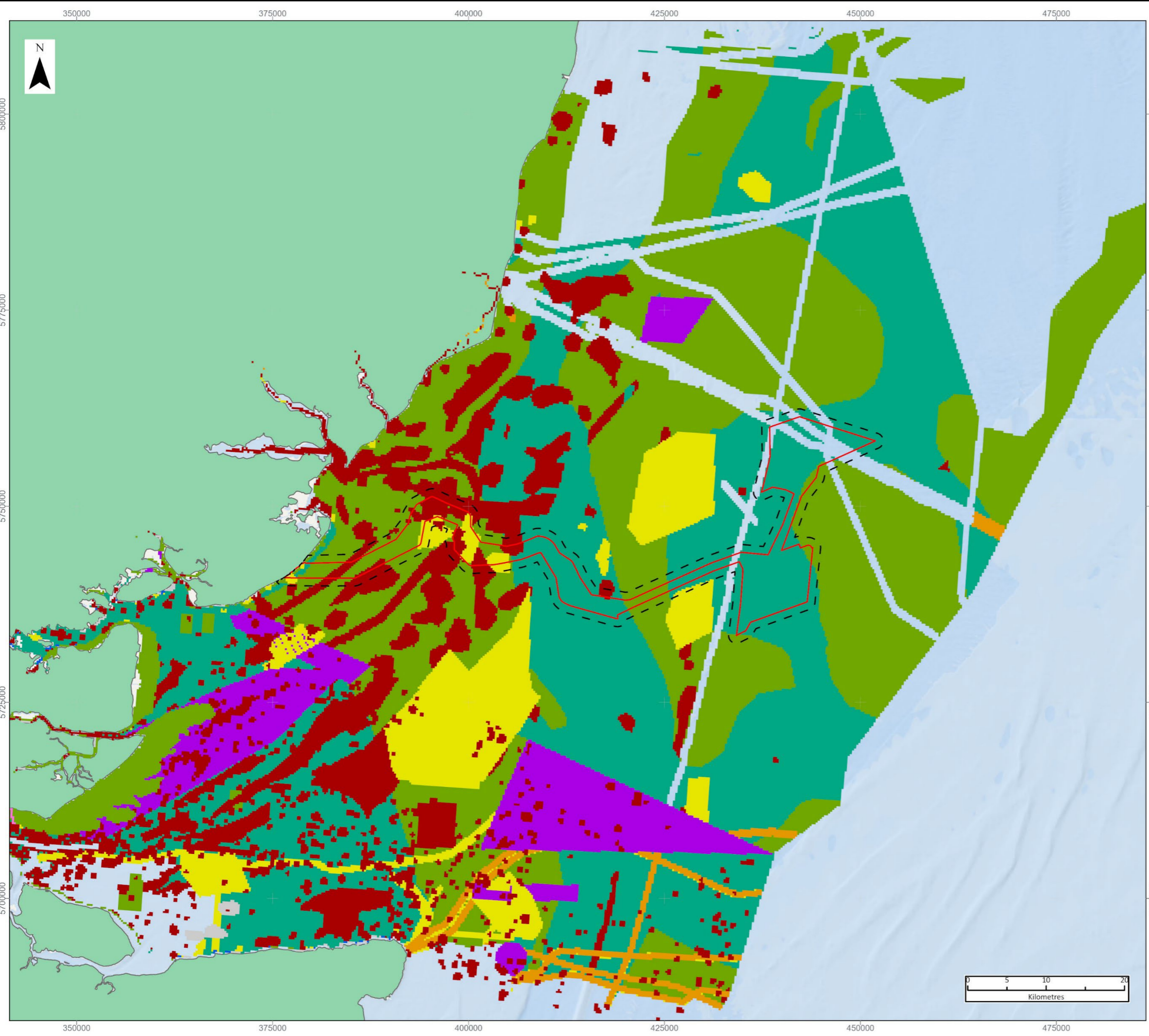
**DRAWING TITLE:**  
**Historic Seascape Characterisation of the sub seafloor level**

VER	DATE	REMARKS	Drawn	Checked
1	28/02/2023	DRAFT	HA	CH

**DRAWING NUMBER:**  
 11.6

SCALE: 1:500,000    PLOT SIZE: A3    DATUM: WGS84    PROJECTION: UTM31N





**LEGEND**

- PEIR Red Line Boundary
- Marine archaeology study area

Sea floor

- Navigation
- Industry
- Fishing
- Ports and Docks
- Coastal Infrastructure
- Communications
- Military
- Recreation
- Cultural Topography

Data Source:  
 Basemap: World Ocean Base: OceanWise, Esri, GEBCO, DeLorme, NaturalVue  
 World Ocean Reference: Esri UK, Esri, HERE, Garmin, Foursquare, FAO, METI/NASA, USGS

**PROJECT TITLE:**  
*FIVE ESTUARIES OFFSHORE WINDFARM*

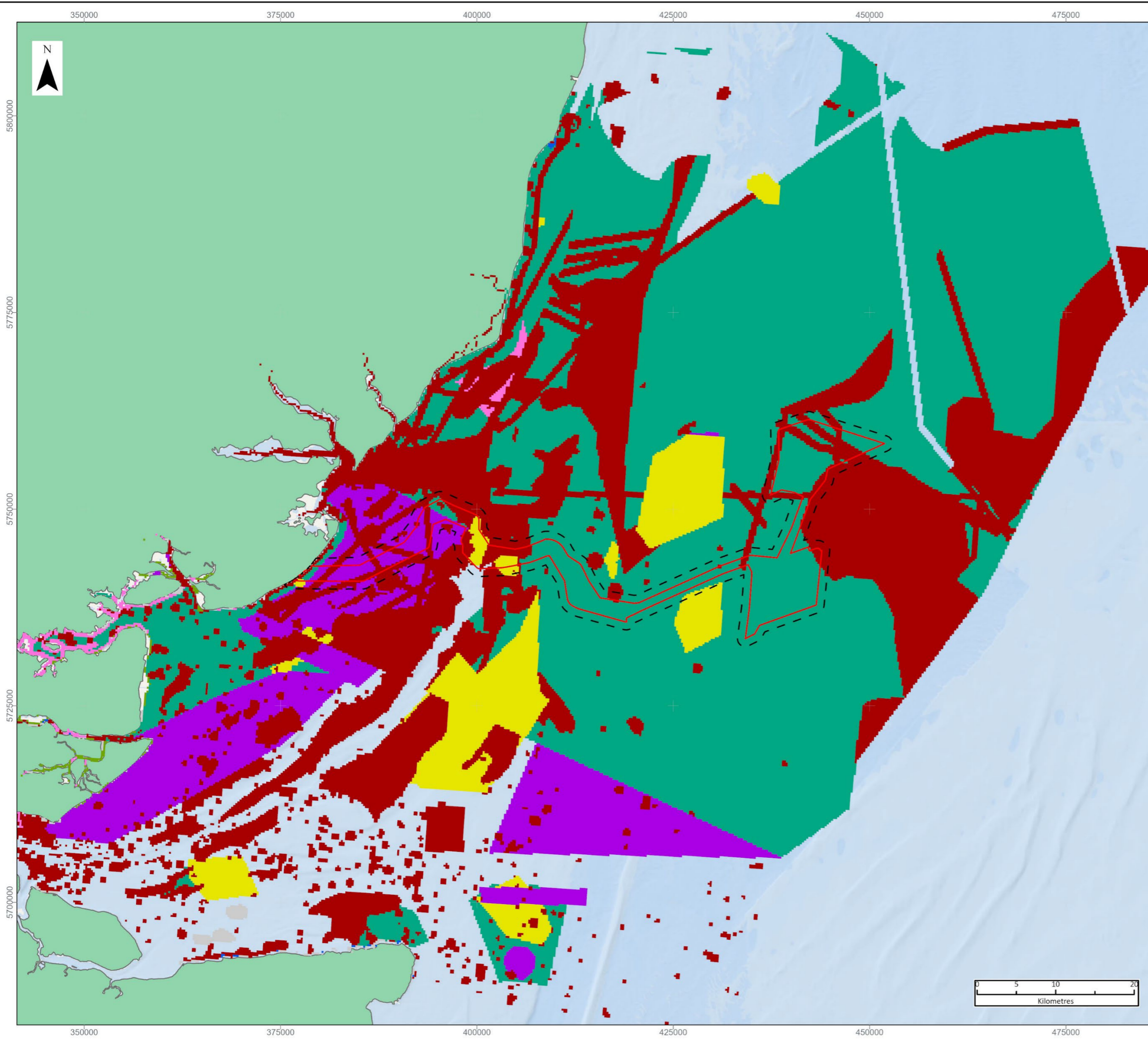
**DRAWING TITLE:**  
**Historic Seascape Characterisation of the seafloor level**

VER	DATE	REMARKS	Drawn	Checked
1	28/02/2023	DRAFT	HA	CH

**DRAWING NUMBER:**  
 11.7

SCALE: 1:500,000    PLOT SIZE: A3    DATUM: WGS84    PROJECTION: UTM31N





**LEGEND**

- PEIR Red Line Boundary
- Marine archaeology study area

**Water column**

- Navigation
- Industry
- Fishing
- Ports and Docks
- Coastal Infrastructure
- Military
- Recreation
- Cultural Topography

Data Source:  
 Basemap: World Ocean Base: OceanWise, Esri, GEBCO, DeLorme, NaturalVue  
 World Ocean Reference: Esri UK, Esri, HERE, Garmin, Foursquare, FAO, METI/NASA, USGS

**PROJECT TITLE:**  
*FIVE ESTUARIES OFFSHORE WINDFARM*

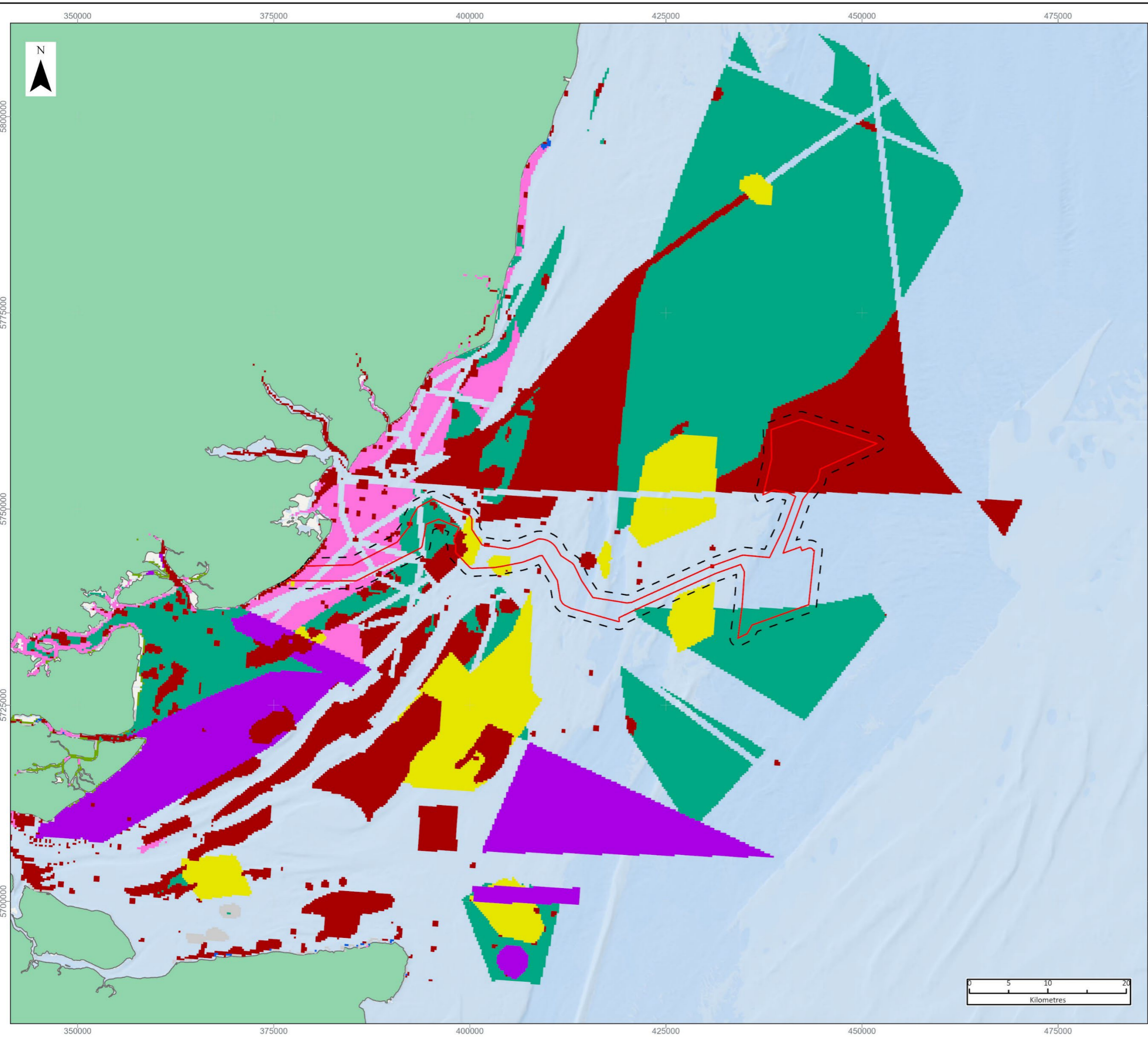
**DRAWING TITLE:**  
**Historic Seascape Characterisation of the water column level**

VER	DATE	REMARKS	Drawn	Checked
1	28/02/2023	DRAFT	HA	CH

**DRAWING NUMBER:**  
 11.8

SCALE: 1:500,000    PLOT SIZE: A3    DATUM: WGS84    PROJECTION: UTM31N





**LEGEND**

- PEIR Red Line Boundary
- Marine archaeology study area
- Sea surface
- Navigation
- Industry
- Fishing
- Ports and Docks
- Coastal Infrastructure
- Military
- Recreation
- Cultural Topography

Data Source:  
 Basemap: World Ocean Base: OceanWise, Esri, DeLorme, NaturaVue  
 World Ocean Reference: Esri UK, Esri, HERE, Garmin, Foursquare, FAO, METI/NASA, USGS

**PROJECT TITLE:**  
*FIVE ESTUARIES OFFSHORE WINDFARM*

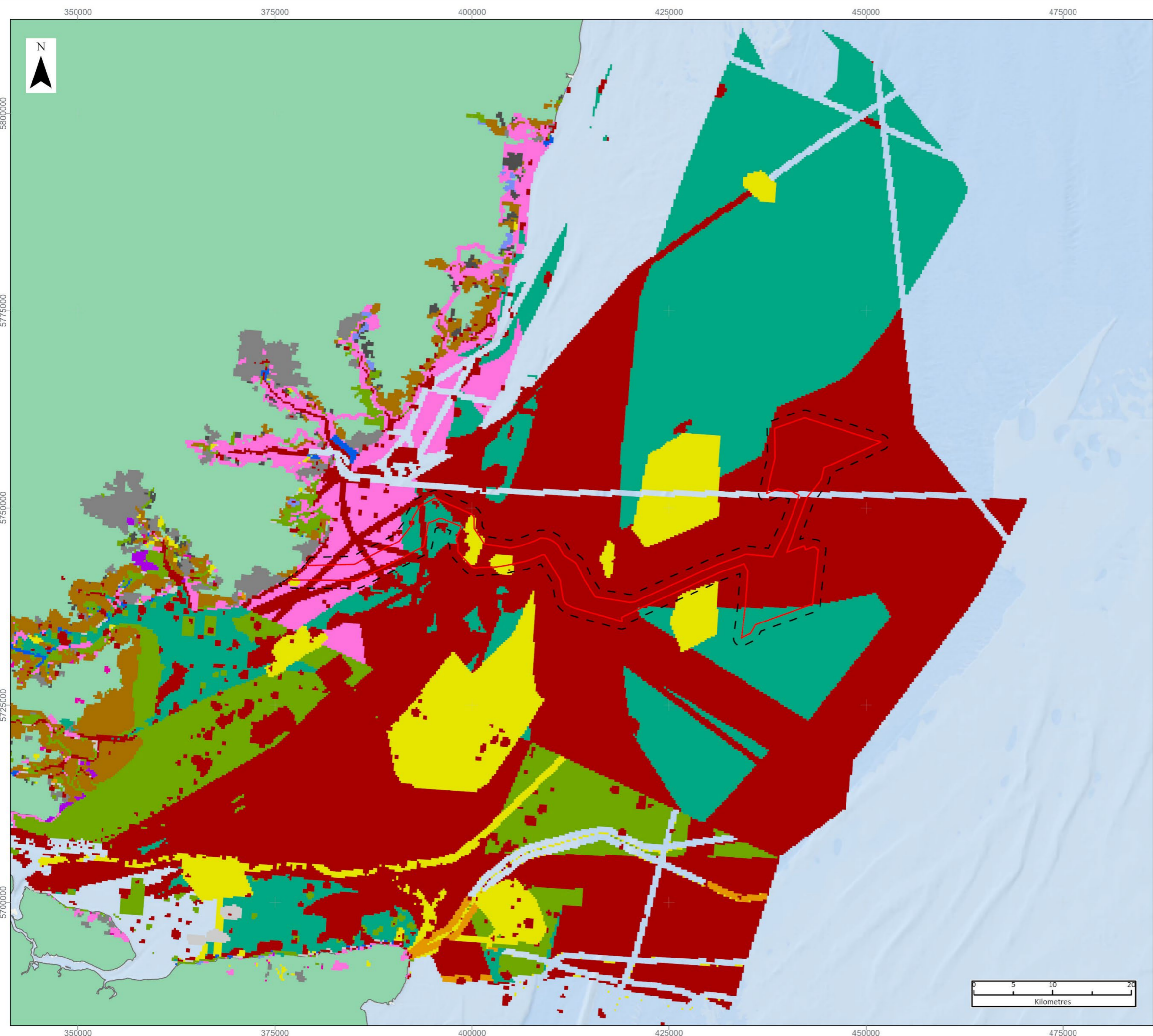
**DRAWING TITLE:**  
**Historic Seascape Characterisation of the sea surface level**

VER	DATE	REMARKS	Drawn	Checked
1	28/02/2023	DRAFT	HA	CH

**DRAWING NUMBER:**  
 11.9

SCALE: 1:500,000    PLOT SIZE: A3    DATUM: WGS84    PROJECTION: UTM31N





**LEGEND**

- PEIR Red Line Boundary
- Marine archaeology study area
- Coastal and conflated
- Navigation
- Industry
- Fishing
- Ports and Docks
- Coastal Infrastructure
- Communications
- Military
- Settlements
- Recreation
- Cultural Topography
- Woodland

Data Source:  
 Basemap: World Ocean Base: OceanWise, Esri, GEBCO, DeLorme, NaturalVue  
 World Ocean Reference: Esri UK, Esri, HERE, Garmin, Foursquare, FAO, METI/NASA, USGS

**PROJECT TITLE:**  
*FIVE ESTUARIES OFFSHORE WINDFARM*

**DRAWING TITLE:**  
 Historic Seascape Characterisation of the coastal level

VER	DATE	REMARKS	Drawn	Checked
1	28/02/2023	DRAFT	HA	CH

**DRAWING NUMBER:**  
 11.10

SCALE: 1:500,000    PLOT SIZE: A3    DATUM: WGS84    PROJECTION: UTM31N





## EVOLUTION OF THE BASELINE

- 11.7.47 An outline of the likely evolution of the baseline presented above without implementation of the development of VE due to natural changes to the environment is presented below, in accordance with the Infrastructure Planning (Environmental Impact Assessment) Regulations 2017.
- 11.7.48 The environmental baseline is expected to remain relatively unaltered over the next 50-100 years. However, there are a number of proposed and active infrastructure projects planned in the vicinity (see Table 11.19) that have the potential to cause adverse, direct impact on marine archaeological receptors or contribute with beneficial impacts such as large-scale enhanced understanding of the archaeological resource through large area geophysical/geotechnical survey data released to public domain or the enhanced knowledge of, key characteristics, features or elements, deriving from site-specific survey and investigations.
- 11.7.49 Generally, exposed metal and wooden wrecks and archaeological debris on the seabed, would continue to undergo slow degradation and erosion of materials. Due to the mobile sediments in the area, shifting sands would cause archaeological anomalies to cyclically become exposed and reburied.
- 11.7.50 In the case of wrecks and archaeological anomalies that are buried and protected from exposure, the rate of degradation would be slower.



## 11.8 ARCHAEOLOGICAL ASSESSMENT OF GEOPHYSICAL DATA

- 11.8.1 The archaeological assessment of geophysical data is presented below, and the results are summarised in Table 11.7. All geophysical anomalies have been cross-referenced with records of marine heritage receptors identified during the baseline assessment (see above).
- 11.8.2 Fugro was contracted by RWE Renewables UK Ltd to acquire shallow geophysical and Ultra-High Resolution Seismic (UHRS) data across areas being considered for development at the VE array and associated export cable route corridor (Figure 11.2).
- 11.8.3 The data quality was assessed as good, meaning suitable, clear data in which anomalies can be clearly identified and interpreted and which provides the highest probability for marine heritage receptors to be identified. The definition of survey data quality for archaeological interpretation is further detailed in Section 2.4 of Volume 4, Annex 11.1: Offshore Archaeology and Cultural Heritage Technical Report.

**Table 11.7 Summary of archaeological anomalies within the marine archaeology study area seen in the geophysical data**

Number of anomalies	Archaeological potential
58	High
173	Magnetic anomalies of high potential (>100 nT not seen in SSS or MBES data)
4	Magnetic anomalies of high potential (>100 nT not seen in SSS or MBES data, but correlate with UKHO records)
98	Medium
473	Low (excluding magnetic anomalies)
4,115	Magnetic anomalies of low potential with no correlating data (<100nT)

- 11.8.4 Two hundred and thirty-five (235) anomalies have been assessed as high archaeological potential, as seen in SSS and MBES data, showing a magnetic return of >100 nT or correlating with UKHO records. Of these, 173 have only been seen in the magnetic data and do not correlate with any records. There are four UKHO records that correlate with magnetic data which were not otherwise seen in SSS or MBES data.

### HIGH POTENTIAL ANOMALIES

- 11.8.5 The 58 anomalies of high archaeological potential seen in SSS and/ or MBES data and the four magnetic anomalies which correlate with UKHO records are summarised below and detailed in Table 11.8. Of the 62 anomalies summarised below, 28 correlate with UKHO/NRHE records (Figure 11.11).





**Table 11.8 High potential anomalies seen in geophysical data**

MA ID	Geophysical ID	Description
MA0001	> SSS MA2003	A pair of isolated, slightly curved hard reflectors with extended shadow and some scour; probable anthropogenic or wreck debris associated with UKHO15865, an obstruction recorded 65 m north.
MA0002	> SSS MA2119 > MBES MA4034 > MAG MA6002	An isolated, cylindrical hard reflector with extended shadow which correlates with the recorded location for the wreck of SS <i>Nico</i> (UKHO14513); magnetic return of 4,844 nT.
MA0003	> SSS MA2123 > MBES MA4036 > MAG MA6005	An area of scattered linear hard reflectors with shadow and scour; possibly the wreck of MV <i>Janny</i> (UKHO14461), recorded 832 m southwest, potentially wreck debris; magnetic return of 3,106 nT.
MA0004	> SSS MA2129 > MAG MA6055	A hard reflector with shadow and scour located 50 m from MA0003; potential wreck debris; magnetic return of 241 nT.
MA0005	> SSS MA2160 > MBES MA4058 > MAG MA6150	An angular hard reflector with scour; potential anthropogenic or wreck debris; magnetic return of 124 nT.
MA0006	> SSS MA2197 > MBES MA4084 > MAG MA6154	A semi-circular hard reflector with shadow; potential wheel; correlates with record for an unidentified wreck (UKHO14576); magnetic return of 120 nT.
MA0007	> SSS MA2198 > MBES MA4085 > MAG MA6154	A circular hard reflector in a patch of scour with extended shadow; probable wreck debris associated with UKHO14576, wheel or anthropogenic debris; magnetic return of 120 nT.
MA0008	> SSS MA2199 > MBES MA4086 > MAG MA6003	An ovate hard reflector with shadow and scour with smaller linear hard reflectors; partially buried wreck with potential wreck debris, hull appears intact; correlates with record for unidentified wreck (UKHO14581); magnetic return of 4,705 nT.
MA0009	> SSS MA2240 > MBES MA4289 > MAG MA6015	An isolated linear soft reflector with shadow; possible partially buried anthropogenic debris; seen in MBES as a cross-shaped feature; magnetic return of 579 nT.
MA0010	> SSS MA2241 > MBES MA4290	An isolated linear soft reflector with shadow; possible partially buried anthropogenic debris



MA ID	Geophysical ID	Description
	> MAG MA6012	associated with MA0009; magnetic return of 737 nT.
MA0011	> SSS MA2244 > MAG MA10481	Three isolated linear hard reflectors with shadow arranged in a line; potential anthropogenic debris; magnetic return of 143.1 nT.
MA0012	> SSS MA2260 > MBES MA4305 > MAG MA6000	A dispersed area of hard reflectors with shadow; correlates with position for unidentified wreck (UKHO14553); magnetic return of 20,411 nT.
MA0013	> SSS MA2263 > MBES MA4309	A hard reflector with shadow and scour with points of raised features across its length; potential wreck with rope; correlates with record for foul ground (UKHO14859); potentially associated with MA0264 located 27 m south.
MA0014	> SSS MA2270 > MBES MA4315 > MAG MA6786	An isolated angular hard reflector with shadow and scour; potential wreck or anthropogenic debris; correlates with record for unidentified wreck (UKHO15035); magnetic return of 27.7 nT.
MA0015	> SSS MA2279 > MBES MA4321 > MAG MA6089	An isolated linear hard reflector with shadow and scour; potential anthropogenic debris; magnetic return of 177 nT.
MA0016	> SSS MA2284 > MBES MA4325 > MAG MA6007	An isolated extended curvilinear hard reflector with notched shadow; probable chain; magnetic return of 1,151 nT.
MA0017	> SSS MA2286 > MBES MA4327 > MAG MA6140	A linear hard reflector with shadow and scour; possible anthropogenic or wreck debris associated with MA0016 which is found 65 m northeast; magnetic return of 129.9 nT.
MA0018	> SSS MA2289 > MAG MA6014	A pair of linear hard reflectors with shadow and scour; potential anthropogenic or wreck debris; magnetic return of 677 nT.
MA0019	> SSS MA2310 > MBES MA4345 > MAG MA6160	An isolated semi-circular hard reflector with shadow and scour; potential anthropogenic debris; magnetic return of 117.4 nT.
MA0020	> SSS MA2314 > MBES MA4349 > MAG MA6001	An area of linear hard reflectors with scour and spikes of elongated shadows; correlates with record for the wreck of SS <i>Norhauk</i> (UKHO14535); magnetic return of 19,031.6 nT.



MA ID	Geophysical ID	Description
MA0021	<ul style="list-style-type: none"> <li>&gt; SSS MA2327</li> <li>&gt; MBES MA4360</li> <li>&gt; MAG MA6587</li> </ul>	An angular hard reflector with linear hard reflector, both with shadow and scour; potential anchor associated with MA0285; correlates with record for foul ground (UKHO79309); magnetic return of 36.4 nT.
MA0022	<ul style="list-style-type: none"> <li>&gt; SSS MA2335</li> <li>&gt; MBES MA4365</li> <li>&gt; MAG MA6004</li> </ul>	An area of scattered linear hard reflectors covering approximately 100 x 50 m; likely the broken up remains of a wreck; correlates with the record for the wreck of SS <i>Morar</i> (UKHO14525); magnetic return of 3,936 nT.
MA0023	<ul style="list-style-type: none"> <li>&gt; SSS MA2342</li> <li>&gt; MBES MA4371</li> <li>&gt; MAG MA6011</li> </ul>	An isolated hard reflector with shadow; potential anthropogenic or wreck debris; magnetic return of 755 nT.
MA0024	<ul style="list-style-type: none"> <li>&gt; SSS MA2358</li> <li>&gt; MBES MA4383</li> <li>&gt; MAG MA6053</li> </ul>	An isolated linear hard reflector with shadow; potential anthropogenic or wreck debris; magnetic return of 244.8 nT.
MA0025	<ul style="list-style-type: none"> <li>&gt; SSS MA2359</li> <li>&gt; MBES MA4384</li> <li>&gt; MAG MA6076</li> </ul>	An isolated soft reflector with scour; potential partially buried anthropogenic debris; magnetic return of 196.5 nT.
MA0026	<ul style="list-style-type: none"> <li>&gt; SSS MA2372</li> <li>&gt; MBES MA4393</li> <li>&gt; MAG MA6066</li> </ul>	An isolated linear hard reflector with notched shadows; possible anthropogenic debris; magnetic return of 218 nT.
MA0027	<ul style="list-style-type: none"> <li>&gt; SSS MA2372</li> <li>&gt; MBES MA4394</li> <li>&gt; MAG MA6074</li> </ul>	An isolated soft reflector with shadow and scour; potential anthropogenic debris; magnetic return of 199 nT.
MA0028	<ul style="list-style-type: none"> <li>&gt; SSS MA2384</li> <li>&gt; MAG MA6013</li> </ul>	An isolated elongated curvilinear reflector with shadow; probable rope or chain; magnetic return of 726.5 nT.
MA0029	<ul style="list-style-type: none"> <li>&gt; SSS MA2397</li> <li>&gt; MBES MA4228</li> <li>&gt; MAG MA9137</li> </ul>	A cluster of hard reflectors with shadow; potential anthropogenic debris; correlates with recorded location for unidentified aircraft (UKHO14995); magnetic return of 6.9 nT.
MA0030	<ul style="list-style-type: none"> <li>&gt; SSS MA2456</li> <li>&gt; MAG MA6191</li> </ul>	An isolated linear hard reflector with shadow; potential anthropogenic debris; magnetic return of 102.7 nT.



MA ID	Geophysical ID	Description
MA0031	> SSS MA2459 > MBES MA4274	An isolated hard reflector with linear hatching across the extent of the feature and circular debris; probable wreck or anthropogenic debris.
MA0032	> SSS MA2472 > MAG MA6094	A pair of isolated hard reflectors with shadow; potential anthropogenic debris; magnetic return of 172.1 nT.
MA0033	> MBES MA4114 > MAG MA9346	An area of scattered raised features covering approximately 38 x 11 m; correlates with record for foul ground (UKHO70092); magnetic return of 6 nT.
MA0034	> MBES MA4146 > MAG MA6134	A small, raised feature in a patch of scour; correlates with record for unidentified wreck (UKHO15074); magnetic return of 131 nT.
MA0035	> MBES MA4159 > MAG MA6075	A small area of scour; magnetic return of 198 nT.
MA0036	> MBES MA4196 > MAG MA6091	A raised feature measuring approximately 6 x 4 m; magnetic return of 174 nT.
MA0037	> MBES MA4198 > MAG MA10465	A linear hard reflector; probable anthropogenic debris, potential pipe debris; magnetic return of 490.7 nT.
MA0038	> SSS MA2521 > MBES MA4201 > MAG MA10469	A rectangular raised feature measuring approximately 10 x 3.6 m with linear features across the middle; probable wreck; magnetic return of 246.7 nT. Area not covered by SSS, but is covered by North Falls magnetic data overlap.
MA0039	> MBES MA4209 > MAG MA6071	A small, raised feature in patch of scour; magnetic return of 200.7 nT.
MA0040	> SSS MA2647 > MBES MA4428 > MAG MA10470	An angular feature in patch of scour; magnetic return of 227.1 nT.
MA0041	> MBES MA4429 > MAG MA10482	A pair of raised features; magnetic return of 142.5 nT.
MA0042	> MBES MA4430 > MAG MA10484	A pair of raised features; magnetic return of 129.5 nT.
MA0043	> MBES MA4431 > MAG10486	A small, raised feature; magnetic return of 375 nT.



MA ID	Geophysical ID	Description
MA0062	> SSS MA2544 > MAG MA10467	Isolated small hard reflector with shadow; magnetic return of 375.9 nT, potential anthropogenic debris.
MA0063	> MBES MA4423 > MAG MA6025	A small, raised feature; magnetic return of 375 nT.
MA0065	> MBES MA4424 > MAG MA6027	A raised feature measuring approximately 7.5 x 2.7 m; magnetic return of 370 nT.
MA0068	> MBES MA4437 > MAG MA6030	A small, raised feature in area of sand waves; correlates with record for unidentified wreck (UKHO87019); magnetic return of 355 nT.
MA0088	> SSS MA2521 > MAG MA10469	An isolated curvilinear hard reflector with shadow and scour; potential cable, chain or anthropogenic or fishing debris with a magnetic return of 259.4 nT.
MA0094	> MBES MA4425 > MAG MA6057	A curvilinear feature; potential rope or chain with anchor; magnetic return of 237 nT.
MA0124	> MBES MA4426 > MAG MA6090	A linear area of scour measuring approximately 116 x 3.5 m; magnetic return of 175 nT.
MA0223	> SSS MA2542 > MAG MA10491	Isolated hard reflector with shadow with a magnetic return of 103.7 nT, potential anthropogenic or fishing debris.
MA0232	> SSS MA2378 > MBES MA4398	An isolated elongated curvilinear hard reflector; probable cable, rope or chain; correlates with record for HMS <i>Hastfen</i> (UKHO70049).
MA0283	> SSS MA2323 > MBES MA4356	An area of linear hard reflectors with extended shadows; probable wreck debris associated with MA0020 (SS <i>Norhauk</i> , UKHO14535).
MA0578	> SSS MA2334	An isolated curvilinear hard reflector with shadow and scour; potential partially buried anthropogenic or wreck debris; correlates with record for wreck of SS <i>Vancouver</i> (UKHO14555).
MA0602	> SSS MA2380	An isolated hard reflector with shadow and scour; potential anthropogenic or wreck debris; located 273 m east from recorded location of submarine HMSM <i>E6</i> (UKHO14983); area not covered by MBES or Mag data.
MA0703	> MBES MA4144	A cluster of raised features surrounded by scattered smaller raised features over area measuring approximately 37 x 19 m; correlates



MA ID	Geophysical ID	Description
		with record for distributed remains of unidentified wreck (UKHO87021).
MA0704	> MBES MA4145	A small, raised feature in patch of scour; corelates with record for unidentified potential wreck (UKHO87043).
MA0754	> SSS MA2536 > MBES MA4207 > MAG MA10505	A patch of scour; corelates with record for unidentified patch of scour (UKHO87002); magnetic return of 12 nT.
MA6243	> MAG MA6243	Magnetic anomaly with return of 83.3 nT; corelates with record for unidentified wreck (UKHO14541).
MA6377	> MAG MA6377	Magnetic anomaly with return of 53.3 nT; corelates with record for foul ground (UKHO14532).
MA6650	> MAG MA6650	Magnetic anomaly with return of 33.1 nT; corelates with record for unidentified wreck (UKHO14996).
MA6677	> MAG MA6677	Magnetic anomaly with return of 31.8 nT; corelates with record for foul ground (UKHO14803).

## MEDIUM POTENTIAL ANOMALIES

11.8.6 Ninety-eight anomalies of medium archaeological potential were identified, they are summarized below and detailed in Table 11.9 (see Figure 11.11). These did not correlate with any known UKHO/NRHE records but may represent debris associated with the recorded wrecks listed above.

**Table 11.9 Medium potential anomalies seen in geophysical data**

MA ID	Geophysical ID	Description
MA0233	> SSS MA2050 > MBES MA4048 > MAG MA6347	An isolated hard reflector with shadow and scour; potential anthropogenic debris; MA6347 (magnetic return of 57 nT) is located 38 m west.
MA0234	> SSS MA2072 > MBES MA4013 > MAG MA7093	An isolated curvilinear hard reflector with shadow; possible anthropogenic debris; MA7093 (magnetic return of 20 nT) is located 29 m northwest.
MA0235	> SSS MA2090 > MAG MA6539	An isolated linear hard reflector in a patch of scour; possible anthropogenic debris; magnetic return of 40 nT.



MA ID	Geophysical ID	Description
MA0236	> SSS MA2097 > MBES MA4021	An isolated soft reflector with scattered shadow, seen in MBES as a raised feature in an area of scour; possible anthropogenic debris or anchor; listed as possible anchor in the VE assessment of SSS data (as described in the shapefile for FE4 SSS).
MA0237	> SSS MA2101 > MAG MA6643	An isolated linear hard reflector with shadow and scour; potential anthropogenic debris; magnetic return of 33 nT.
MA0238	> SSS MA2108 > MBES MA4027 > MAG MA6226	An isolated angular hard reflector with shadow and scour lying across a sand wave; potential anthropogenic debris; magnetic return of 87 nT.
MA0239	> SSS MA2111 > MBES MA4030 > MAG MA7468	An isolated hard reflector with shadow in an area of sand waves; possible anthropogenic debris; magnetic return of 15 nT.
MA0240	> SSS MA2117 > MBES MA4032	Parallel linear raised features extending over 110 m; probable anthropogenic debris.
MA0241	> SSS MA2121	A hard reflector with shadows and scour located 41 m north of MA0002; probable wreck debris associated with MA0002 (SS <i>Nico</i> , UKHO14513).
MA0242	> SSS MA2143 > MBES MA4403 > MAG MA7895	An isolated pair of hard reflectors with shadow and scour; possible anthropogenic debris; magnetic return of 11.5 nT.
MA0243	> SSS MA2148 > MBES MA4052	An isolated curvilinear hard reflector with shadow and scour; potential anthropogenic debris.
MA0244	> SSS MA2153	Three isolated linear hard reflectors; potential anthropogenic debris.
MA0245	> SSS MA2154 > MBES MA4055 > MAG MA9569	An isolated hard reflector with scour and extended shadow; possible anthropogenic debris; magnetic return of 6 nT (MA9569) located 20 m northeast.
MA0246	> SSS MA2158 > MBES MA4057 > MAG MA6206	A linear hard reflector with smaller hard reflectors approximately 20 m to the east and west; potential anthropogenic debris; magnetic return of 97 nT.



MA ID	Geophysical ID	Description
MA0247	> SSS MA2161 > MBES MA4059	An isolated curvilinear hard reflector with shadow and scour with apparent attached linear hard reflectors; probable cable or rope.
MA0248	> SSS MA2179 > MBES MA4072 > MAG MA6464	An isolated hard reflector with shadow; possible anthropogenic debris; MA6464 (magnetic return of 45 nT) is located 21 m east.
MA0249	> SSS MA2181 > MBES MA4107 > MAG MA7442	An isolated linear soft reflector with shadow; possible anthropogenic debris; MA7442 (magnetic return of 15 nT) is located 22 m southwest.
MA0250	> SSS MA2212 > MBES MA4094	An isolated linear hard reflector with shadow and scour; potential wreck debris associated with MA0008 (unidentified wreck, UKHO14581).
MA0251	> SSS MA2216 > MBES MA4097	A cluster of hard reflectors next to a curvilinear hard reflector; potential anthropogenic debris with cable or rope.
MA0252	> SSS MA2217 > MBES MA4098 > MAG MA10235	A cluster of hard reflectors with shadow and scour over area covering 48 x 25 m; potential scattering of anthropogenic debris; magnetic return of 5 nT.
MA0253	> SSS MA2227	An isolated square hard reflector with linear features; probable anthropogenic debris.
MA0254	> SSS MA2231 > MBES MA4106	An isolated V-shaped hard reflector with shadow and scour; probable anthropogenic debris.
MA0255	> SSS MA2242 > MBES MA4291 > MAG MA10497	An isolated soft reflector with scour; possible partially buried anthropogenic debris; seen in MBES as two patches of scour located 18 m apart; MA10497 (magnetic return of 92 nT) located 35 m northwest.
MA0256	> SSS MA2253 > MBES MA4299 > MAG MA6220	An isolated hard reflector with shadow and scour; possible anthropogenic debris.
MA0257	> SSS MA2255 > MBES MA4300 > MAG MA6535	An isolated pair of linear hard reflectors with shadow and scour; potential anthropogenic debris; magnetic return of 40.3 nT.





MA ID	Geophysical ID	Description
MA0258	> SSS MA2256 > MBES MA4301	A linear hard reflector with scour; potential wreck debris associated with MA0012 (unidentified wreck, UKHO14553) which is located 80 m east.
MA0259	> SSS MA2257 > MBES MA4302	A cluster of hard reflectors with shadow; seen in MBES as a linear feature in a patch of scour; probable wreck debris associated with MA0012 (unidentified wreck, UKHO14553).
MA0260	> SSS MA2258 > MBES MA4303	A hard reflector with shadow and scour; probable wreck debris associated with MA0012 (unidentified wreck, UKHO14553).
MA0261	> SSS MA2259 > MBES MA4304	A curvilinear hard reflector with shadow and scour; seen in MBES as a raised feature in a patch of scour; probable wreck debris associated with MA0012 (unidentified wreck, UKHO14553).
MA0262	> SSS MA2261 > MBES MA4306	A curvilinear hard reflector with shadow; seen as scour in MBES; potential wreck debris associated with MA0012 (unidentified wreck, UKHO14553).
MA0263	> SSS MA2262 > MBES MA4307 > MAG MA6265	An isolated linear hard reflector with shadow and scour; potential anthropogenic debris; magnetic return of 78.2 nT.
MA0264	> SSS MA2265 > MBES MA4310	A semi-circular hard reflector with an extended linear hard reflector, both with shadow and scour; probable anchor and chain or wreck debris associated with MA0013 (currently recorded as foul ground, UKHO14859).
MA0265	> SSS MA2271 > MBES MA4316 > MAG MA6513	An isolated curvilinear hard reflector with shadow and scour; potential chain, rope, or anthropogenic debris; magnetic return of 41.7 nT.
MA0266	> SSS MA2278 > MBES MA4320 > MAG MA9935	An isolated pair of hard reflectors adjacent to another softer reflector, all with shadow; seen in MBES as small, raised feature in a patch of scour; potential anthropogenic debris; magnetic return of 5.6 nT.
MA0267	> SSS MA2280 > MBES MA4322	An isolated hard reflector with shadow; potential anthropogenic debris; magnetic return of 24.3 nT.



MA ID	Geophysical ID	Description
	> MAG MA6895	
MA0268	<ul style="list-style-type: none"> <li>&gt; SSS MA2281</li> <li>&gt; MBES MA4323</li> <li>&gt; MAG MA8493</li> </ul>	A curvilinear soft reflector with shadow and a thin linear trail of shadow; possibly partially buried anthropogenic debris; magnetic return of 8.8 nT; potentially associated with and contained completely within the 100 m AEZ for MA0231 (a complex magnetic anomaly not identified in SSS or MBES data).
MA0269	<ul style="list-style-type: none"> <li>&gt; SSS MA2285</li> <li>&gt; MBES MA4326</li> <li>&gt; MAG MA6688</li> </ul>	An isolated angular hard reflector with shadow and scour; potential anthropogenic debris; magnetic return of 31.5 nT.
MA0270	<ul style="list-style-type: none"> <li>&gt; SSS MA2287</li> <li>&gt; MAG MA6636</li> </ul>	An isolated curvilinear hard reflector with shadow; possible anthropogenic debris; magnetic return of 33.8 nT.
MA0271	<ul style="list-style-type: none"> <li>&gt; SSS MA2291</li> <li>&gt; MBES MA4328</li> <li>&gt; MAG MA6207</li> </ul>	An isolated curvilinear hard reflector with shadow; potential anthropogenic debris associated with MA0018 an unrecorded potential wreck located 19 m south; magnetic return of 97.1 nT.
MA0272	<ul style="list-style-type: none"> <li>&gt; SSS MA2293</li> <li>&gt; MBES MA4330</li> <li>&gt; MAG MA7755</li> </ul>	An isolated hard reflector with shadow and scour; potential anthropogenic debris; magnetic return of 12.4 nT.
MA0273	<ul style="list-style-type: none"> <li>&gt; SSS MA2294</li> <li>&gt; MBES MA4331</li> <li>&gt; MAG MA6822</li> </ul>	An isolated linear hard reflector with shadow and scour; possible anthropogenic debris; magnetic return of 26.3 nT.
MA0274	<ul style="list-style-type: none"> <li>&gt; SSS MA2302</li> <li>&gt; MBES MA4337</li> <li>&gt; MAG MA7236</li> </ul>	An isolated linear hard reflector with extended shadow and scour; possible anthropogenic debris; magnetic return of 17.9 nT.
MA0275	<ul style="list-style-type: none"> <li>&gt; SSS MA2303</li> <li>&gt; MBES MA4338</li> <li>&gt; MAG MA7097</li> </ul>	An isolated hard reflector with shadow and scour; possible anthropogenic debris; magnetic return of 20.1 nT.
MA0276	<ul style="list-style-type: none"> <li>&gt; SSS MA2306</li> <li>&gt; MBES MA4341</li> <li>&gt; MAG MA6545</li> </ul>	An isolated triangular hard reflector with shadow in a patch of scour; seen in MBES as a small, raised feature in a patch of scour; potential anthropogenic debris; magnetic return of 39.6 nT.



MA ID	Geophysical ID	Description
MA0277	<ul style="list-style-type: none"> <li>&gt; SSS MA2312</li> <li>&gt; MBES MA4347</li> <li>&gt; MAG MA6413</li> </ul>	An isolated triangular hard reflector with shadow and scour; potential anthropogenic debris; seen in MBES as a small, linear feature in a patch of scour; magnetic return of 49.5 nT.
MA0278	<ul style="list-style-type: none"> <li>&gt; SSS MA2313</li> <li>&gt; MBES MA4348</li> </ul>	A triangular hard reflector with shadow and scour; probable wreck debris associated with MA0020 (SS <i>Norhauk</i> , UKHO14535) located 93 m east.
MA0279	<ul style="list-style-type: none"> <li>&gt; SSS MA2315</li> <li>&gt; MBES MA4350</li> </ul>	A curvilinear elongated hard reflector with shadow and scour; probable rope or chain associated with MA0020 (SS <i>Norhauk</i> , UKHO14535) located 73 m southeast.
MA0280	<ul style="list-style-type: none"> <li>&gt; SSS MA2318</li> <li>&gt; MBES MA4352</li> </ul>	A circular hard reflector in scour with shadow; probable wheel or wreck debris associated with MA0020 (SS <i>Norhauk</i> , UKHO14535) located 75 m west.
MA0281	<ul style="list-style-type: none"> <li>&gt; SSS MA2319</li> <li>&gt; MBES MA4353</li> </ul>	A circular hard reflector with shadow and scour; probable wheel or wreck debris associated with MA0020 (SS <i>Norhauk</i> , UKHO14535) located 51 m north.
MA0282	<ul style="list-style-type: none"> <li>&gt; SSS MA2320</li> <li>&gt; MBES MA4354</li> </ul>	An angular hard reflector with shadow and scour; potential wreck debris or anchor found 21 m south from the end of MA0279.
MA0284	<ul style="list-style-type: none"> <li>&gt; SSS MA2326</li> <li>&gt; MBES4359</li> </ul>	An isolated pair of hard reflectors next to each other; potential wreck or anthropogenic debris.
MA0285	<ul style="list-style-type: none"> <li>&gt; SSS2328</li> </ul>	An extended linear hard reflector; probable cable, rope, or chain; potentially associated with MA0021 (foul ground, UKHO79309).
MA0286	<ul style="list-style-type: none"> <li>&gt; SSS MA2336</li> <li>&gt; MBES MA4366</li> <li>&gt; MAG MA6267</li> </ul>	A linear hard reflector with shadow and scour located approximately 150 m east northeast from MA0022 (SS <i>Morar</i> , UKHO14525); magnetic return of 77.9 nT.
MA0287	<ul style="list-style-type: none"> <li>&gt; SSS MA2339</li> <li>&gt; MBES MA4368</li> <li>&gt; MAG MA7045</li> </ul>	An isolated angular hard reflector with shadow and scour; possible anthropogenic debris; magnetic return of 21 nT.
MA0288	<ul style="list-style-type: none"> <li>&gt; SSS MA2344</li> <li>&gt; MBES MA4373</li> <li>&gt; MAG MA6588</li> </ul>	An isolated linear hard reflector with shadow lying across sand waves; potential anthropogenic debris; magnetic return of 36.3 nT.



MA ID	Geophysical ID	Description
MA0289	> SSS MA2348 > MBES MA4376	An isolated curved soft reflector with shadow and scour; potential partially buried anthropogenic debris likely associated with MA0022 (SS <i>Morar</i> , UKHO14525).
MA0290	> SSS MA2352	An isolated hard reflector with extended shadow and scour; potential anthropogenic debris likely associated with MA0022 (SS <i>Morar</i> , UKHO14525).
MA0291	> SSS MA2354 > MBES MA4379 > MAG MA6945	A linear hard reflector with shadow and scour; possible anthropogenic debris; magnetic return of 23.1 nT.
MA0292	> SSS MA2356 > MBES MA4381 > MAG MA6934	An isolated hard reflector with shadow and scour in area of sand waves; potential anthropogenic debris; magnetic return of 23.5 nT.
MA0293	> SSS MA2360 > MBES MA4171	An isolated pair of arrangements of linear hard reflectors with extended shadow; probable wreck or anthropogenic debris, potentially associated with MA0022 (SS <i>Morar</i> , UKHO14525) located 107 m northeast.
MA0294	> SSS MA2370 > MAG MA6964	An isolated hard reflector with shadow and scour; potential anthropogenic debris; magnetic return of 22.6 nT.
MA0295	> SSS MA2371 > MAG MA6357	An isolated linear hard reflector with shadow and scour; potential anthropogenic debris; magnetic return of 56.4 nT.
MA0296	> SSS MA2374 > MBES MA4395 > MAG MA6853	An isolated cluster of linear hard reflectors with shadow and scour; potential anthropogenic debris; magnetic return of 25.5 nT.
MA0297	> SSS MA2375 > MBES MA4396 > MAG MA6468	An isolated hard reflector with shadow and scour; potential anthropogenic debris, possibly associated with MA0602 (HMSM <i>E6</i> , UKHO14983), located 289 m southeast; magnetic return of 44.9 nT.
MA0298	> SSS MA2377 > MAG MA6492	An isolated hard reflector with shadow and scour; potential anthropogenic debris; magnetic return of 43 nT.
MA0299	> SSS MA2382 > MBES MA4212	An isolated elongated curvilinear soft reflector with shadow; probable cable, rope, or chain; magnetic return of 43.5 nT.



MA ID	Geophysical ID	Description
	> MAG MA6485	
MA0300	> SSS MA2396 > MA4220	An isolated linear hard reflector with arm-like features; seen in MBES as raised feature; potential anchor.
MA0301	> SSS MA2398 > MBES MA4229 > MAG MA6883	A cluster of hard reflectors with shadow potentially debris associated with MA0029 (unidentified aircraft, UKHO14995) located 46 m north; magnetic return of 24.7 nT.
MA0302	> SSS MA2408 > MBES MA4237	A circular patch of hard reflectors with shadow; potential anthropogenic debris.
MA0303	> SSS MA2409 > MBES MA4238 > MAG MA8524	An isolated linear hard reflector with shadow and scour; potential anthropogenic debris; magnetic return of 8.6 nT.
MA0304	> SSS MA2426 > MBES MA4247	An isolated linear hard reflector with linear protrusions at the centre and an apparently curvilinear feature at the end; seen in MBES as small, raised feature in patch of scour; potential anchor.
MA0305	> SSS MA2432 > MBES MA4251 > MAG MA6862	An isolated hard reflector with extended shadow; potential anthropogenic debris; magnetic return of 25.2 nT.
MA0306	> SSS MA2435 > MBES MA4254	An isolated linear hard reflector seen in some lines to have a multidirectional shadow; seen in MBES as raised feature with scour to south; potential anchor.
MA0307	> SSS MA2446 > MBES MA4262 > MAG MA7083	An area of small hard reflectors with shadow; potential anthropogenic debris or ballast; magnetic return of 20.3 nT.
MA0308	> SSS MA2460 > MBES MA4275	A hard linear reflector with a curvilinear feature lying adjacent at one end, with scour; potential anchor, located 50 m east northeast from MA0654 (described as probable cable, rope, or chain).
MA0309	> SSS MA2466 > MBES MA4280	An isolated ovate hard reflector with three smaller reflectors at the eastern side, all with shadow; potential anthropogenic or wreck debris.



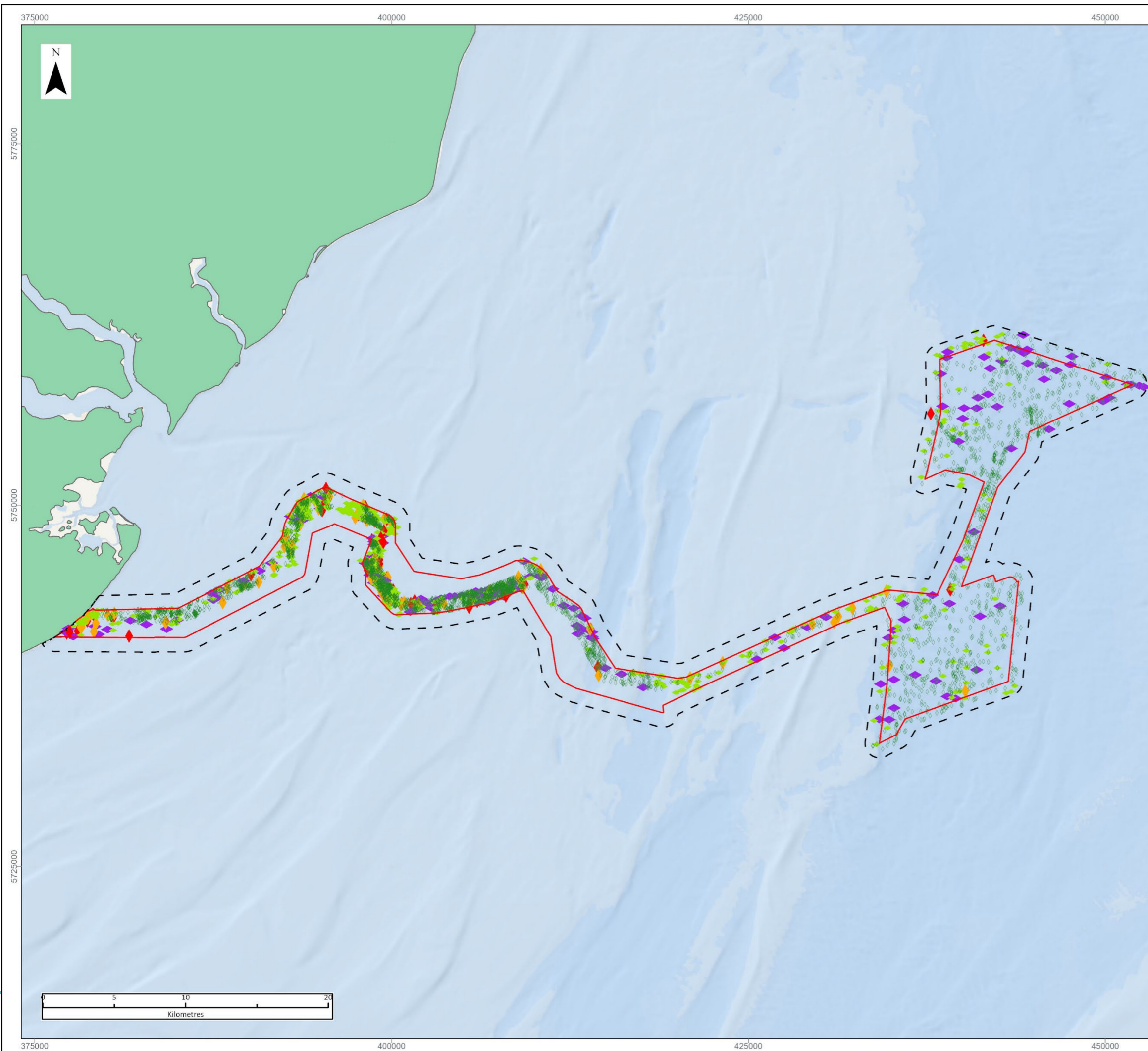
MA ID	Geophysical ID	Description
MA0310	<ul style="list-style-type: none"> <li>&gt; SSS MA2467</li> <li>&gt; MBES MA4281</li> <li>&gt; MAG MA6739</li> </ul>	An isolated curvilinear hard reflector with shadow and scour with potentially associated small hard reflectors in surrounding area; possible anthropogenic debris; magnetic return of 29.5 nT (MA6739) is located 38 m southeast.
MA0311	<ul style="list-style-type: none"> <li>&gt; SSS MA2470</li> <li>&gt; MBES MA4283</li> <li>&gt; MAG MA7770</li> </ul>	An isolated ovate hard reflector with shadow and scour; potential anthropogenic debris; MA7770 (magnetic return of 12.3 nT) is located 12 m northwest.
MA0312	<ul style="list-style-type: none"> <li>&gt; MBES MA4116</li> <li>&gt; MAG MA6776</li> </ul>	A line of three small, raised features; magnetic return of 28 nT.
MA0313	<ul style="list-style-type: none"> <li>&gt; MBES MA4125</li> <li>&gt; MAG MA6713</li> </ul>	A 19 m linear feature and cross-shaped raised feature; potential anchor; magnetic return of 30 nT.
MA0314	<ul style="list-style-type: none"> <li>&gt; MBES MA4127</li> <li>&gt; MAG MA7629</li> </ul>	A cluster of raised features with scour over an area measuring 28 x 11 m; MA7629 (magnetic return of 13 nT) is located 22 m north.
MA0315	<ul style="list-style-type: none"> <li>&gt; MBES MA4128</li> <li>&gt; MAG MA6250</li> </ul>	A curvilinear raised feature measuring 26 m, located 10 m north of MA0720; potential rope or chain with anchor (MA0720); magnetic return of 80 nT.
MA0316	<ul style="list-style-type: none"> <li>&gt; MBES MA4132</li> <li>&gt; MAG MA8043</li> </ul>	A small, raised feature in a patch of scour measuring 60 x 60 m; magnetic return of 10.8 nT (MA8043) is located 22 m northwest.
MA0317	<ul style="list-style-type: none"> <li>&gt; MBES MA4140</li> <li>&gt; MAG MA7724</li> </ul>	A raised feature measuring 15 x 11 m; magnetic return of 12 nT.
MA0318	<ul style="list-style-type: none"> <li>&gt; MBES MA4141</li> <li>&gt; MAG MA7354</li> </ul>	A raised feature measuring 14 x 14 m; located 34 m west northwest of MA0317; magnetic return of 16 nT.
MA0319	<ul style="list-style-type: none"> <li>&gt; MBES MA4142</li> <li>&gt; MAG MA7228</li> </ul>	A small, raised feature in area of seabed scarring; magnetic return of 18 nT.
MA0320	<ul style="list-style-type: none"> <li>&gt; MBES MA4173</li> <li>&gt; MAG MA6328</li> </ul>	An angular patch of scour; magnetic return of 60.4 nT.
MA0321	<ul style="list-style-type: none"> <li>&gt; MBES MA4187</li> <li>&gt; MAG MA6349</li> </ul>	A raised feature next to small patch of scour; magnetic return of 57 nT.
MA0322	<ul style="list-style-type: none"> <li>&gt; SSS MA2524</li> </ul>	A pair of raised features with scour; probable wreck debris associated with MA0038,



MA ID	Geophysical ID	Description
	> MBES MA4202 > MAG MA10507	located 22 m northwest; magnetic return of 28.5 nT.
MA0323	> SSS MA2527 > MBES MA4205 > MAG MA10495	A linear hard reflector in an area of scour; probable anthropogenic debris; magnetic return of 57.1 nT.
MA0324	> MBES MA4206 > MAG MA10496	A raised feature with scour either side; magnetic return of 56.2 nT.
MA0325	> MBES MA4432 > MAG MA10493	A small, angular raised feature; magnetic return of 89.1 nT.
MA0326	> MBES MA4433 > MAG MA10498	A small, raised feature located 20 m northeast from MA0038; potential wreck debris; magnetic return of 31.1 nT.
MA0327	> MAG MA10494	Magnetic anomaly with return of 67.2 nT, potentially associated with MA0538 (described as potential anthropogenic debris with a magnetic return of 9 nT, seen in SSS and MBES as an isolated linear reflector with scour) which is located 20 m northeast.
MA0328	> SSS MA2364 > MBES MA4388 > MAG MA6274	An isolated soft reflector with triangular scour and thin shadows; possible partially buried anthropogenic debris; magnetic return of 76.2 nT.
MA0787	> MA2514	An area of scattered linear hard reflectors with shadow; possible anthropogenic debris.
MA0789	> SSS MA2516	An area of scattered linear hard reflectors with shadow and scour; potential anthropogenic or wreck debris.
MA0796	> SSS MA2526 > MBES MA4450	A rectangular hard reflector with repeating parallel linear features across extent; probable anthropogenic, wreck or fishing debris.

## LOW POTENTIAL ANOMALIES

- 11.8.7 The low potential anomalies have been characterised as a mixture of small features, often boulder like, or isolated linear features and modern debris such as rope, chain, fishing gear or lost equipment.
- 11.8.8 Magnetic anomalies under 100 nT with no corresponding records or research resources and no corresponding anomalies in any of the assessed geophysical datasets have also been assigned low archaeological potential (Figure 11.11).



- LEGEND**
- PEIR Red Line Boundary
  - Marine archaeology study area
  - VE geophysical results (SSS, MBES, MAG)
  - ◆ High (58)
  - ◆ High (mag only) (177)
  - ◆ Medium (98)
  - ◆ Low (473)
  - ◆ Low (mag only) (4115)

Data Source:  
 Basemap: World Ocean Base: OceanWise, Eri, DeLorme, NaturalVue  
 World Ocean Reference: Esri UK, Esri, HERE, Garmin, Foursquare, METI/IASA, USGS

**PROJECT TITLE:**  
*FIVE ESTUARIES OFFSHORE WINDFARM*

**DRAWING TITLE:**  
**Anomalies of archaeological potential identified in the geophysical data**

VER	DATE	REMARKS	Drawn	Checked
1	28/02/2023	DRAFT	HA	CH

**DRAWING NUMBER:**  
 11.11

SCALE: 1:275,000    PLOT SIZE: A3    DATUM: WGS84    PROJECTION: UTM31N







## 11.9 GEOARCHAEOLOGICAL ASSESSMENT OF GEOPHYSICAL DATA

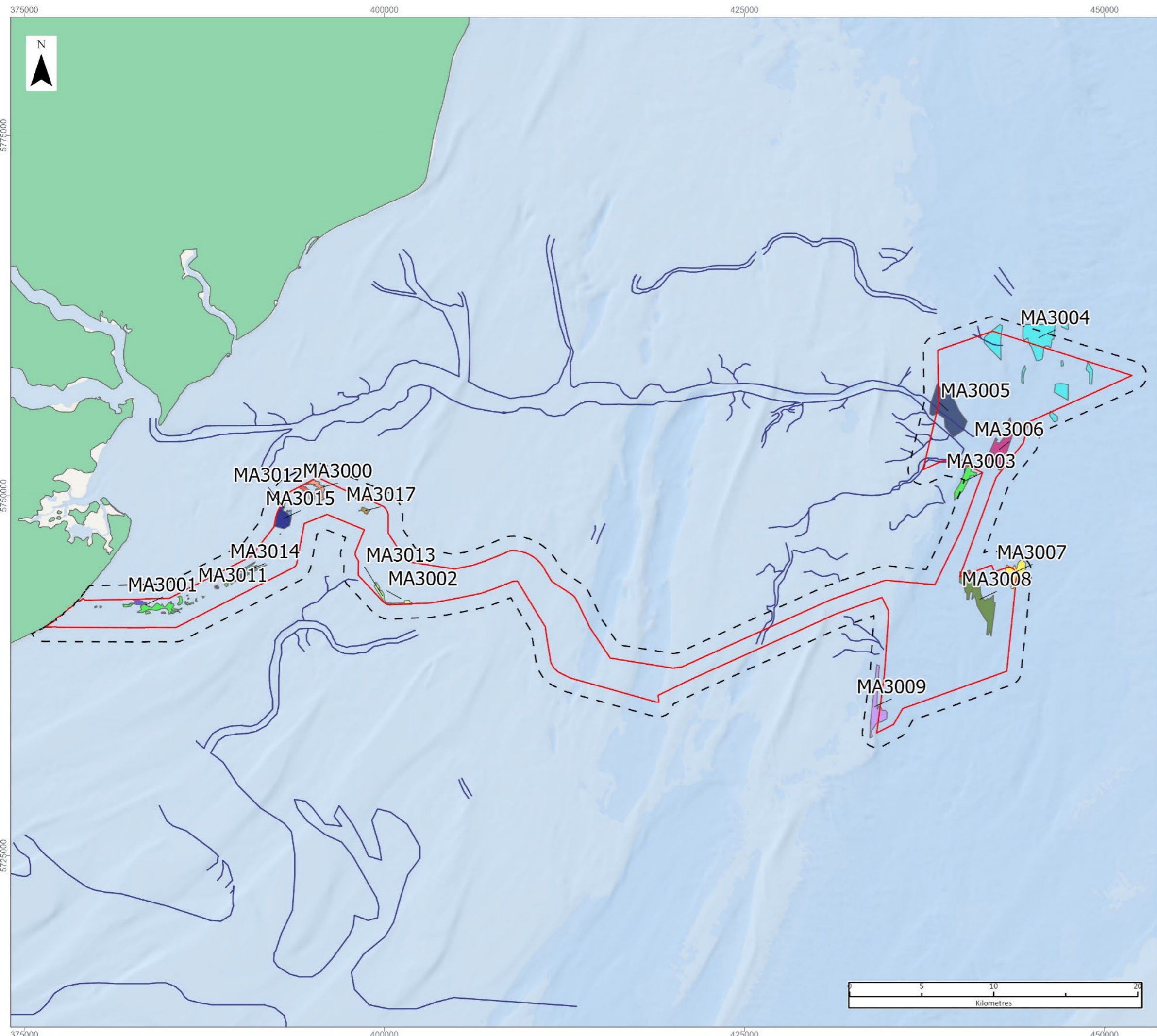
- 11.9.1 The nature, extent, and distribution of preserved palaeolandscapes is being mapped and understood as survey methods are developing. The contextual relationship between channels, micro and macro fauna, submerged forests, and identified and potential sites, both in the marine zone and terrestrial area, are becoming more apparent as the volume of data is increasing and this should continue to be assessed as per the phased approach outlined in Offshore Geotechnical Investigation and Historic Environment Analysis (COWRIE, 2011).
- 11.9.2 As also seen in seismic data interpreted by Emu *et al.* (2009), this area is characterised by complex cross-cutting channels that can exceed 40 m thickness in places and the presence of shallow gas suggesting fine-grained or organic deposits may be preserved. This interpretation is very similar to the sub-bottom assessment of data for VE as outlined below (described in detail in Section 4.3 of Volume 4, Annex 11.1: Offshore Archaeology and Cultural Heritage Technical Report). Several of the channels indicate crosscutting features. Blanking is seen across large parts of the area, often in association with channel deposits, which indicates that well preserved deposits with high geoarchaeological potential are extant within the study area.
- 11.9.3 While less evidence for both organic material and clear channel and valley features is seen within the two array areas of VE, the ECC does go through areas where geoarchaeological channels have previously been mapped and an increase of deposits of interest are noted (MA3000, to MA3003 and MA3010 to MA3017).
- 11.9.4 The channels and riverbeds identified by the Thames REC project (Emu *et al.*, 2009) within the array area correlate with the VE SBP data analysis as illustrated on Figure 11.12. See; MA3004, MA3005, MA3006 and MA3009.
- 11.9.5 The channels along the ECC are also possibly associated or extensions of the features identified in the Thames REC project (Emu *et al.*, 2009), see MA3000, MA3013 MA3016.
- 11.9.6 As noted, this area demonstrated complex cross-cutting channels. The features are not easily identified across survey lines, or survey directions. As an example, this is seen at feature MA3006 and explains why some of the channels along the ECC are not easily associated with the features identified in the Thames REC project (Emu *et al.*, 2009).
- 11.9.7 The blanking which may be associated with possible organic material (MA3003) is frequently seen across the whole study area and is likely to be associated with deposits previously identified and analysed, (Wessex Archaeology, 2016; Brown and Russell, 2019).
- 11.9.8 As outlined in Table 11.10, the seabed in the marine archaeology study area is dominated by shallow mobile sands (Unit 5) overlaying London Clay (Unit 3) which in areas protrudes from the seabed and is visible or is just under the seabed sediments. A number of cut and fill features as well as channel sand valleys have been identified within the SBP data and are described below (Unit 4). Earlier sediments such as the Harwich Formation (Unit 2) and Reading or Woolwich Formation (Unit 1) are also found across the area.



11.9.9 The outline deposit model will be further refined following a phased geoarchaeological assessment as detailed in Volume 4, Annex 11.2: Outline Marine Written Scheme of Investigation.

**Table 11.10 Outline deposit model**

Unit	Sediment	Description	Epoch	Geoarchaeological potential
5	Mobile seabed sediments	Sand and gravel.	Holocene	No
4	Channel/Valley infill	Soft possibly peaty silt, clay or sand.	Late Pleistocene to Early Holocene	Yes
3	London Clay	Sometimes referred to as till. Firm to hard silty clay.	Tertiary	Low
2	Harwich Formation	Silty clays and sandy clayey silts.	Ypresian (MIS 3)	Low
1	Reading or Woolwich Formation	Dark grey shelly clay, laminated clay and silt or fine- to coarse-grained sand.	Thanetian to Ypresian (MIS 4-3)	Low



**LEGEND**

- PEIR Red Line Boundary
  - Marine archaeology study area
  - Interpreted channel systems (EMU, 2009)
- Channels with geoarchaeological potential
- |                                                                                                                                                       |                                                                                                                                                       |
|-------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|
| <span style="display: inline-block; width: 10px; height: 10px; background-color: #f4a460; border: 1px solid black; margin-right: 5px;"></span> MA3000 | <span style="display: inline-block; width: 10px; height: 10px; background-color: #9932cc; border: 1px solid black; margin-right: 5px;"></span> MA3009 |
| <span style="display: inline-block; width: 10px; height: 10px; background-color: #4169e1; border: 1px solid black; margin-right: 5px;"></span> MA3001 | <span style="display: inline-block; width: 10px; height: 10px; background-color: #800000; border: 1px solid black; margin-right: 5px;"></span> MA3010 |
| <span style="display: inline-block; width: 10px; height: 10px; background-color: #32cd32; border: 1px solid black; margin-right: 5px;"></span> MA3003 | <span style="display: inline-block; width: 10px; height: 10px; background-color: #6495ed; border: 1px solid black; margin-right: 5px;"></span> MA3011 |
| <span style="display: inline-block; width: 10px; height: 10px; background-color: #00ced1; border: 1px solid black; margin-right: 5px;"></span> MA3004 | <span style="display: inline-block; width: 10px; height: 10px; background-color: #90ee90; border: 1px solid black; margin-right: 5px;"></span> MA3012 |
| <span style="display: inline-block; width: 10px; height: 10px; background-color: #191970; border: 1px solid black; margin-right: 5px;"></span> MA3005 | <span style="display: inline-block; width: 10px; height: 10px; background-color: #2e8b57; border: 1px solid black; margin-right: 5px;"></span> MA3013 |
| <span style="display: inline-block; width: 10px; height: 10px; background-color: #800080; border: 1px solid black; margin-right: 5px;"></span> MA3006 | <span style="display: inline-block; width: 10px; height: 10px; background-color: #000080; border: 1px solid black; margin-right: 5px;"></span> MA3014 |
| <span style="display: inline-block; width: 10px; height: 10px; background-color: #ffff00; border: 1px solid black; margin-right: 5px;"></span> MA3007 | <span style="display: inline-block; width: 10px; height: 10px; background-color: #ff0000; border: 1px solid black; margin-right: 5px;"></span> MA3015 |
| <span style="display: inline-block; width: 10px; height: 10px; background-color: #6aa84f; border: 1px solid black; margin-right: 5px;"></span> MA3008 | <span style="display: inline-block; width: 10px; height: 10px; background-color: #d2691e; border: 1px solid black; margin-right: 5px;"></span> MA3016 |
|                                                                                                                                                       | <span style="display: inline-block; width: 10px; height: 10px; background-color: #d2691e; border: 1px solid black; margin-right: 5px;"></span> MA3017 |

Data Source:  
 Basemap: World Ocean Base: OceanWise, Esri, DeLorme, NaturalVue  
 World Ocean Reference: Esri UK, Esri, HERE, Garmin, Foursquare, METI/NASA, USGS

PROJECT TITLE:  
**FIVE ESTUARIES OFFSHORE WINDFARM**

DRAWING TITLE:  
**Valleys and channels of geoarchaeological potential**

VER	DATE	REMARKS	Drawn	Checked
1	28/02/2023	DRAFT	HA	CH

DRAWING NUMBER:  
**11.12**

SCALE: 1:275,000    PLOT SIZE: A3    DATUM: WGS84    PROJECTION: UTM31N





## 11.10 KEY PARAMETERS FOR ASSESSMENT

11.10.1 The following section identifies the Maximum Design Scenario (MDS) in environmental terms, defined by the project design envelope. This is to establish the maximum potential impact associated with the project on marine heritage receptors. The engineering parameters of the project design envelope are defined in Volume 2, Chapter 1: Offshore Project Description.

11.10.2 The maximum impact table assumes:

- > Up to 79 Wind Turbine Generators and associated foundations (WTG);
- > Up to two Offshore Substation Platforms (OSP) and associated Offshore Platform Foundations (OPF);
- > The use of Gravity Base Jacket foundations for WTG and OSP;
- > The use of scour protection volume is based on Gravity Based Monopile Structure
- > Cable;
- > 200 km maximum length of inter-array cables with 26 estimated crossings;
- > A maximum export cable length of 369.8 km;
- > For decommissioning the array and export cables, scour and cable protection are assumed to be left *in situ*; and
- > For decommissioning VE will consider the best environmental option at the time. For the purpose of this impact assessment, removal of structures is expected to involve the approximate reverse of the installation process.

11.10.3 Although the proposed VE development will be confined within the PEIR RLB, the exact layout of the turbines, other structures and cable route is yet to be confirmed. The maximum design parameters, and therefore maximum possible effect, have been used to inform the below assessment. Variations in the final layout may determine the extent of effects on different marine heritage receptors, however a worst-case scenario approach ensures that any difference in layout has been fully captured. Where potential impacts would be due to a result in sedimentary and hydrodynamic processes the assessment should be read in conjunction with Volume 2, Chapter 2: Marine Geology, Oceanography and Physical processes.



**Table 11.11: Maximum design scenario for the project alone**

Potential effect	Maximum adverse scenario assessed	Justification
<b>Construction</b>		
<p>Impact 1: Direct impact of sediment removal containing undisturbed archaeological contexts during seabed preparation ahead of construction activities leading to the total or partial loss of the marine heritage receptors</p>	<ul style="list-style-type: none"> <li>&gt; Total maximum impact of seabed preparation               <ul style="list-style-type: none"> <li>&gt; 79 gravity base jacket foundations, per foundation 3,600 m<sup>2</sup> total, 284,400 m<sup>2</sup></li> <li>&gt; for 2 Gravity Base Monopile OSP foundations 14,000 m<sup>2</sup></li> </ul> </li> <li>&gt; Total volume of seabed preparation spoil volume               <ul style="list-style-type: none"> <li>&gt; 79 WTG foundations 1,137,600m<sup>3</sup></li> <li>&gt; 2 OPS foundations 56,000m<sup>3</sup></li> </ul> </li> <li>&gt; Total volume of gravel bed per foundation,               <ul style="list-style-type: none"> <li>&gt; WTG 284,400 m<sup>3</sup>,</li> <li>&gt; OSP 7,000 m<sup>3</sup></li> </ul> </li> <li>&gt; Total volume of sediment disturbed by sand wave clearance;               <ul style="list-style-type: none"> <li>&gt; inter-array cable laying 35,000,000 m<sup>3</sup></li> </ul> </li> </ul>	<p>The maximum assessment assumptions represent the maximum seabed disturbance by sediment removal could that potentially affect marine heritage receptors located within the proposed development</p>



Potential effect	Maximum adverse scenario assessed	Justification
	<ul style="list-style-type: none"> <li>&gt; export cable installations 64,750,000 m<sup>3</sup></li> <li>&gt; Maximum area of seabed disturbed by wet storage area 15,000 m<sup>2</sup> (with an indicative shape of 75 m x 200 m).</li> </ul>	
<p>Impact 2: Direct impact by penetration, compression, and disturbance of piling foundations leading to the total or partial loss of marine heritage receptors</p>	<ul style="list-style-type: none"> <li>&gt; Total maximum impact of seabed preparation               <ul style="list-style-type: none"> <li>&gt; 79 gravity base jacket foundations, per foundation 3,600 m<sup>2</sup> total, 284,400 m<sup>2</sup></li> <li>&gt; for 2 Gravity Base Monopile OSP foundations 14,000 m<sup>2</sup></li> </ul> </li> <li>&gt; Maximum scour protection volume;               <ul style="list-style-type: none"> <li>&gt; 79 WTG Gravity Based Monopile Structures: 2,109,300 m<sup>3</sup></li> <li>&gt; 2 OSP Gravity Based Monopile Structures: 148,100 m<sup>3</sup></li> </ul> </li> </ul>	<p>The maximum assessment assumptions represent the maximum seabed disturbance by piling operations that could potentially affect marine heritage receptors located within the proposed development</p>
<p>Impact 3: Direct impact by penetration, compression, and disturbance of stratigraphic contexts containing archaeological material from the combined weight of the Wind Turbine Generators (WTG) and associated foundations leading to total or partial loss of marine heritage receptors</p>	<ul style="list-style-type: none"> <li>&gt; Largest rotor turbines combined weight 1150 tons</li> </ul>	<p>The maximum assessment assumptions represent the maximum seabed disturbance by WTGs potentially affecting marine heritage receptors located within</p>



Potential effect	Maximum adverse scenario assessed	Justification
		the proposed development
<p>Impact 4: Direct impact by penetration, compression, and disturbance of cable laying operations leading to total or partial loss of marine heritage receptors.</p>	<ul style="list-style-type: none"> <li>&gt; Total volume of sediment disturbed by cable installation;               <ul style="list-style-type: none"> <li>&gt; Inter-array cables 3,150,000 m<sup>3</sup></li> <li>&gt; export cables 2,156,175 m<sup>3</sup></li> </ul> </li> <li>&gt; Total volume of sediment disturbed by sand wave clearance;               <ul style="list-style-type: none"> <li>&gt; inter-array cable laying 35,000,000 m<sup>3</sup></li> <li>&gt; export cable installations 64,750,000 m<sup>3</sup></li> </ul> </li> <li>&gt; Total area of seabed disturbed by Pre-Lay Grapnel Run;               <ul style="list-style-type: none"> <li>&gt; Inter-array cables 3,000,000 m<sup>2</sup></li> <li>&gt; Export cables 5,550,000 m<sup>2</sup></li> </ul> </li> <li>&gt; Maximum area of seabed covered by cable protection;               <ul style="list-style-type: none"> <li>&gt; inter-array cable protection 324,000 m<sup>2</sup></li> <li>&gt; export cable protection 1,104,000 m<sup>2</sup></li> </ul> </li> </ul>	<p>The maximum assessment assumptions represent the maximum seabed disturbance of cable laying operations that could potentially affect marine heritage receptors located within the proposed development</p>



Potential effect	Maximum adverse scenario assessed	Justification
	<ul style="list-style-type: none"> <li>&gt; Total volume of sediment disturbed by trail trenching;               <ul style="list-style-type: none"> <li>&gt; Inter-array cables 78,750 m<sup>3</sup></li> <li>&gt; Export cables 78,750 m<sup>3</sup></li> </ul> </li> <li>&gt; Total area of seabed disturbed by boulder plough/ clearance;               <ul style="list-style-type: none"> <li>&gt; inter-array cables 3,600,000 m<sup>2</sup></li> <li>&gt; export cable protection 6,660,000 m<sup>2</sup></li> </ul> </li> <li>&gt; Total area of seabed covered by cable crossings;               <ul style="list-style-type: none"> <li>&gt; inter-array cables 118,716 m<sup>2</sup></li> <li>&gt; export cable protection 383,544 m<sup>2</sup></li> </ul> </li> <li>&gt; Up to 5 HDD exit pits, maximum seabed disturbance (10 m x 75 m x 3 m) 1,875 m<sup>3</sup> per HDD total 9,375 m<sup>3</sup></li> <li>&gt; Maximum area of seabed disturbed by wet storage area 15,000 m<sup>2</sup> (with an indicative shape of 75 m x 200 m).</li> </ul>	





Potential effect	Maximum adverse scenario assessed	Justification
<p>Impact 5: Direct impact by penetration, compression, and disturbance effects of jack-up barges and anchoring of construction vessels during construction activities leading to total or partial loss of marine heritage receptors</p>	<ul style="list-style-type: none"> <li>&gt; Maximum volume of sediment disturbed for all jack-up operations during construction; 8,316,000m<sup>2</sup></li> <li>&gt; Total impact of anchor footprints during construction;               <ul style="list-style-type: none"> <li>&gt; WTG, &amp; OPS installation in the arrays 1,516,320 m<sup>3</sup>,</li> <li>&gt; export cable installation 692,564 m<sup>3</sup></li> <li>&gt; inter-array installation 374,693 m<sup>3</sup></li> <li>&gt; total seabed volume disturbed by up to 6 vessel mooring buoys during construction 120,960 m<sup>3</sup></li> <li>&gt; Wet storage area for anchors and other items to be temporarily placed on the seabed. Maximum area of disturbance: 15,000 m<sup>2</sup> with an indicative shape of 75 m X 200 m</li> </ul> </li> </ul>	<p>The maximum assessment assumptions represent the maximum seabed disturbance by vessel activities that could potentially affect marine heritage receptors located within the proposed development</p>
<p>Impact 6: Indirect impact causing disturbance of sediment containing potential marine heritage receptors (material and contexts) leading to the exposure of those marine heritage receptors to natural, chemical or biological processes and indirectly causing or accelerating their loss</p>	<ul style="list-style-type: none"> <li>&gt; Total maximum impact of seabed preparation               <ul style="list-style-type: none"> <li>&gt; 79 gravity base jacket foundations, per foundation 3,600 m<sup>2</sup> total, 284,400 m<sup>2</sup></li> <li>&gt; for 2 Gravity Base Monopile OSP foundations 14,000 m<sup>2</sup></li> </ul> </li> </ul>	<p>The maximum assessment assumptions represent the maximum seabed disturbance by sediment disturbance that could potentially affect marine heritage receptors located within</p>



Potential effect	Maximum adverse scenario assessed	Justification
	<ul style="list-style-type: none"> <li>&gt; Total volume of seabed preparation spoil volume               <ul style="list-style-type: none"> <li>&gt; 79 foundations 1,137,600m<sup>3</sup></li> <li>&gt; 2 OPS foundations 56,000m<sup>3</sup></li> </ul> </li> <li>&gt; Total volume of gravel bed per foundation,               <ul style="list-style-type: none"> <li>&gt; WTG 284,400 m<sup>3</sup>,</li> <li>&gt; OSP 7,000 m<sup>3</sup></li> </ul> </li> <li>&gt; Total volume of sediment disturbed by sand wave clearance;               <ul style="list-style-type: none"> <li>&gt; inter-array cable laying 35,000,000 m<sup>3</sup></li> <li>&gt; export cable installations 64,750,000 m<sup>3</sup></li> </ul> </li> <li>&gt; Maximum area of seabed disturbed by wet storage area 15,000 m<sup>2</sup> (with an indicative shape of 75 m x 200 m).</li> <li>&gt; Total maximum impact of seabed preparation               <ul style="list-style-type: none"> <li>&gt; 79 gravity base jacket foundations, per foundation 3,600 m<sup>2</sup> total, 284,400 m<sup>2</sup></li> <li>&gt; for 2 Gravity Base Monopile OSP foundations 14,000 m<sup>2</sup></li> </ul> </li> <li>&gt; Maximum scour protection volume;</li> </ul>	<p>the proposed development</p>



Potential effect	Maximum adverse scenario assessed	Justification
	<ul style="list-style-type: none"> <li>&gt; 79 WTG Gravity Based Monopile Structures: 2,109,300 m<sup>3</sup></li> <li>&gt; 2 OSP Gravity Based Monopile Structures: 148,100 m<sup>3</sup></li> <li>&gt; Maximum volume of sediment disturbed for all jack-up operations during construction; 8,316,000m<sup>2</sup></li> <li>&gt; Total impact of anchor footprints during construction;               <ul style="list-style-type: none"> <li>&gt; WTG, &amp; OPS installation in the arrays 1,516,320 m<sup>3</sup>,</li> <li>&gt; export cable installation 692,564 m<sup>3</sup></li> <li>&gt; inter-array installation 374,693 m<sup>3</sup></li> <li>&gt; total seabed volume disturbed by up to 6 vessel mooring buoys during construction 120,960 m<sup>3</sup></li> </ul> </li> </ul>	
<p>Impact 7: Indirect impacts causing changes to the Historic Seascape Character as a result of construction and survey vessel activities and the addition of cables, foundations and turbines indirectly leading to changes to the perceived historic use of the seascape during construction activities</p>	<ul style="list-style-type: none"> <li>&gt; Total project area 128 km<sup>2</sup></li> <li>&gt; Up to 41 large or 79 smaller WTG</li> <li>&gt; WTG maximum rotor diameter               <ul style="list-style-type: none"> <li>&gt; large 360 m</li> <li>&gt; smaller 260 m</li> </ul> </li> </ul>	<p>The maximum assessment assumptions represent construction activities that could potentially affect perception of the HSC</p>



Potential effect	Maximum adverse scenario assessed	Justification
	<ul style="list-style-type: none"><li>&gt; Maximum upper blade tip eight above MHSW<ul style="list-style-type: none"><li>&gt; large 420 m</li><li>&gt; smaller 320 m</li></ul></li><li>&gt; Up to 2 of OSPs</li><li>&gt; Topside height above LAT (including stowed crane, helideck and mast) 195 m</li><li>&gt; Minimum spacing for structures in the arrays<ul style="list-style-type: none"><li>&gt; WTGs 830 m</li><li>&gt; OSPs 450 m</li></ul></li><li>&gt; 200 km maximum length of inter-array cables</li><li>&gt; Maximum export cable length 369.8 km</li><li>&gt; Maximum peak number of construction vessels;<ul style="list-style-type: none"><li>&gt; foundations (WTG and OSP) 38</li><li>&gt; WTG installation 15</li><li>&gt; OSP installation 4</li><li>&gt; export cable installation 12</li><li>&gt; inter-array cable installation 12</li><li>&gt; commissioning vessels 5</li></ul></li></ul>	



Potential effect	Maximum adverse scenario assessed	Justification
	<ul style="list-style-type: none"> <li>&gt; other vessels 19</li> <li>&gt; Maximum number of vessels               <ul style="list-style-type: none"> <li>&gt; peak 101</li> <li>&gt; round trips 5,110</li> </ul> </li> <li>&gt; Indicative peak vessels on-site simultaneously               <ul style="list-style-type: none"> <li>&gt; peak 35</li> <li>&gt; round trips 35</li> </ul> </li> <li>&gt; Maximum 530 return trips by 2 helicopters</li> <li>&gt; Up to 6 permanent mooring anchors</li> </ul>	
<b>Operation</b>		
<p>Impact 8: Direct impact by penetration, compression and disturbance effects of maintenance activities at WTG substation foundations and along inter-array and export cables leading to total or partial loss of marine heritage receptors.</p>	<ul style="list-style-type: none"> <li>&gt; Up to 8 number of inter-array cable repairs/replacements over the project lifetime (approximately 40 years)               <ul style="list-style-type: none"> <li>&gt; Seabed disturbance per inter-array cable repair/replacement event (including vessel anchors) 34,582 m<sup>2</sup></li> <li>&gt; Total seabed disturbance for inter-array cables over project lifetime 276,656 m<sup>2</sup></li> </ul> </li> </ul>	<p>The maximum assessment assumptions represent the maximum seabed disturbance during maintenance activities that could potentially affect marine heritage receptors located within the proposed development</p>



Potential effect	Maximum adverse scenario assessed	Justification
	<ul style="list-style-type: none"> <li>&gt; Up to 5,000 m of inter-array cables requiring remedial burial over project lifetime via jetting or rock placement               <ul style="list-style-type: none"> <li>&gt; Seabed disturbance volume per inter-array cable burial event (including vessel anchors) 14,072 m<sup>3</sup></li> <li>&gt; Total seabed disturbance volume for inter-array cables over project lifetime 112,576 m<sup>3</sup></li> </ul> </li> <li>&gt; Up to 16 numbers of export cable repairs over project lifetime (Approximately 40 years)               <ul style="list-style-type: none"> <li>&gt; Seabed disturbance per export cable repair event (including vessel anchors) 16,205 m<sup>2</sup></li> <li>&gt; Total seabed disturbance for export cables over project lifetime 259,280 m<sup>2</sup></li> </ul> </li> <li>&gt; Up to 5,000 m of export cables requiring remedial burial over project lifetime via jetting or rock placement               <ul style="list-style-type: none"> <li>&gt; Seabed disturbance volume per export cable burial event (including vessel anchors) 9,307 m<sup>3</sup></li> </ul> </li> </ul>	



Potential effect	Maximum adverse scenario assessed	Justification
	<ul style="list-style-type: none"> <li>&gt; Total seabed disturbance volume for inter-array cables over project lifetime 148,912 m<sup>3</sup></li> </ul>	
<p>Impact 9: Indirect impacts during the operation phase causing disturbance of sediment containing potential marine heritage receptors during maintenance activities leading to the exposure of those marine heritage receptors to natural, chemical or biological process, accelerating loss of the same</p>	<ul style="list-style-type: none"> <li>&gt; Up to 8 number of inter-array cable repairs/replacements over the project lifetime (approximately 40 years)               <ul style="list-style-type: none"> <li>&gt; Seabed disturbance per inter-array cable repair/replacement event (including vessel anchors) 34,582 m<sup>2</sup></li> <li>&gt; Total seabed disturbance for inter-array cables over project lifetime 276,656 m<sup>2</sup></li> </ul> </li> <li>&gt; Up to 5,000 m of inter-array cables requiring remedial burial over project lifetime via jetting or rock placement               <ul style="list-style-type: none"> <li>&gt; Seabed disturbance volume per inter-array cable burial event (including vessel anchors) 14,072 m<sup>3</sup></li> <li>&gt; Total seabed disturbance volume for inter-array cables over project lifetime 112,576 m<sup>3</sup></li> </ul> </li> <li>&gt; Up to 16 numbers of export cable repairs over project lifetime (Approximately 40 years)</li> </ul>	<p>The maximum assessment assumptions represent the maximum seabed disturbance during the operational phase that could potentially affect marine heritage receptors located within the proposed development</p>



Potential effect	Maximum adverse scenario assessed	Justification
	<ul style="list-style-type: none"> <li>&gt; Seabed disturbance per export cable repair event (including vessel anchors) 16,205 m<sup>2</sup></li> <li>&gt; Total seabed disturbance for export cables over project lifetime 259,280 m<sup>2</sup></li> <li>&gt; Up to 5,000 m of export cables requiring remedial burial over project lifetime via jetting or rock placement               <ul style="list-style-type: none"> <li>&gt; Seabed disturbance volume per export cable burial event (including vessel anchors) 9,307 m<sup>3</sup></li> </ul> </li> </ul> <p>Total seabed disturbance volume for inter-array cables over project lifetime 148,912 m<sup>3</sup></p>	
<p>Impact 10: Direct impact by penetration, compression, and disturbance effects of jack-up barges and anchoring of operation and maintenance vessels during the operation and maintenance phase leading to total or partial loss of marine heritage receptors.</p>	<ul style="list-style-type: none"> <li>&gt; Maximum Jack-up vessel operations during construction; 284</li> <li>&gt; Individual leg footprint; 275m<sup>2</sup></li> <li>&gt; Maximum area of seabed impacted per Jack-up vessel operation; 1,100 m<sup>2</sup></li> <li>&gt; Typical seabed penetration 15 m</li> <li>&gt; Maximum volume of sediment disturbed for all Jack-up vessel operations; 4,686,000</li> <li>&gt; Maximum impact footprint of all 6 permanent navigation buoy chains on sea floor during operation 283,200 m<sup>2</sup></li> </ul>	<p>The maximum assessment assumptions represent the maximum seabed disturbance by vessels activities that could potentially affect marine heritage receptors located within the proposed development</p>





Potential effect	Maximum adverse scenario assessed	Justification
<p>Impact 11: Indirect impacts causing scour effects as a result of the presence of WTG substation foundations and the exposure of inter-array and export cables or the use of cable protection measures leading to the exposure of those marine heritage receptors to natural, chemical or biological processes and indirectly causing or accelerating their loss</p>	<ul style="list-style-type: none"> <li>&gt; Maximum scour protection volume for all foundations 2,257,430 m<sup>3</sup></li> <li>&gt; Maximum impact footprint of all 6 permanent navigation buoy chains on sea floor during operation 283,200 m<sup>2</sup></li> <li>&gt; 200 km maximum length of inter-array cables</li> <li>&gt; Maximum export cable length 369.8 km</li> <li>&gt; Maximum area of seabed covered by cable protection;               <ul style="list-style-type: none"> <li>&gt; inter-array cable protection 324,000 m<sup>2</sup></li> <li>&gt; export cable protection 1,104,000 m<sup>2</sup></li> </ul> </li> <li>&gt; Volume 2 Chapter 2 outlines that for all foundations, the footprint area of scour protection is larger than the predicted footprint of local scour. The overall level of effect of scour around foundations has therefore been assessed as being of minor adverse significance which is not significant in EIA terms.</li> </ul>	<p>The maximum assessment assumptions represent the maximum seabed disturbance and scour that could potentially affect marine heritage receptors located within the proposed development</p>



<p>Impact 12: Indirect impacts causing changes to the Historic Seascape Character as a result of operation and maintenance vessel activities and the presence of the completed wind farm indirectly leading to changes to the perceived historic use of the seascape during the operation phase</p>	<ul style="list-style-type: none"><li>&gt; Total project area 128 km<sup>2</sup></li><li>&gt; Up to 41 large or 79 smaller WTG</li><li>&gt; WTG maximum rotor diameter<ul style="list-style-type: none"><li>&gt; large 360 m</li><li>&gt; smaller 260 m</li></ul></li><li>&gt; Maximum upper blade tip height above MHWS<ul style="list-style-type: none"><li>&gt; large 420 m</li><li>&gt; smaller 320 m</li></ul></li><li>&gt; Up to 2 of OSPs</li><li>&gt; Topside height above LAT (including stowed crane, helideck and mast) 195 m</li><li>&gt; Minimum spacing for structures in the arrays<ul style="list-style-type: none"><li>&gt; WTGs 830 m</li><li>&gt; OSPs 450 m</li></ul></li><li>&gt; 200 km maximum length of inter-array cables</li><li>&gt; Maximum export cable length 369.8 km</li><li>&gt; Maximum peak number of operation vessels;<ul style="list-style-type: none"><li>&gt; peak 27</li><li>&gt; round trips 1,776</li></ul></li></ul>	<p>The maximum assessment assumptions represent construction activities that could potentially affect perception of the HSC</p>
-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	---------------------------------------------------------------------------------------------------------------------------------



Potential effect	Maximum adverse scenario assessed	Justification
	<ul style="list-style-type: none"> <li>&gt; Indicative peak vessels on-site simultaneously               <ul style="list-style-type: none"> <li>&gt; peak 27</li> <li>&gt; round trips 27</li> </ul> </li> <li>&gt; Maximum 125 return trips by helicopters</li> <li>&gt; Up to 6 permanent mooring anchors</li> </ul>	
<b>Decommissioning</b>		
<p>Impact 13: Direct impact by penetration, compression and disturbance effects of jack-up barges and anchoring of decommissioning vessels leading to total or partial loss of marine heritage receptors</p>	<ul style="list-style-type: none"> <li>&gt; For the purposes of the MDS for EIA, at the end of the operational lifetime of VE, it is assumed that all infrastructure above the seabed will be completely removed. The decommissioning sequence will generally be in the reverse of construction (reverse lay) and is expected to involve similar types and numbers of vessels and equipment and take place over a three-year period.</li> <li>&gt; An initial Decommissioning Plan, including programme, waste management and proposed end state of the environment is expected to be required to be submitted pre-construction</li> </ul>	<p>The maximum assessment assumptions represent the maximum seabed disturbance by vessels activities that could potentially affect marine heritage receptors during decommissioning</p>



Potential effect	Maximum adverse scenario assessed	Justification
<p>Impact 14: Indirect impacts creating draw-down of sediment into voids left by removed WTG foundations leading to loss of sediment or destabilisation of archaeological sites and contexts indirectly leading to exposing marine heritage receptors to natural, chemical, or biological processes and causing or accelerating loss of the same</p>	<ul style="list-style-type: none"> <li>&gt; Total maximum impact on seabed when using monopile, Suction Bucket Jacket WTG foundations 397,097 m<sup>3</sup></li> <li>&gt; Total maximum impact on seabed when using Suction Bucket Jacket OSP foundations 33929.2 m<sup>3</sup></li> </ul>	<p>The maximum assessment assumptions represent the maximum seabed disturbance by voids that could potentially affect marine heritage receptors during decommissioning</p>
<p>Impact 15: Indirect impacts causing changes to the Historic Seascape Character as a result of decommissioning activities and the removal of wind farm components indirectly leading to changes to the perceived historic</p>	<ul style="list-style-type: none"> <li>&gt; Total project area 128 km<sup>2</sup></li> <li>&gt; Maximum 79 small or 41 large WTG</li> <li>&gt; Maximum rotor diameter 259 (small) 360 (large)</li> <li>&gt; Max upper blade tip eight above MHWS 419.94 m</li> <li>&gt; Absolute minimum turbine spacing (centre to centre) 830 m</li> <li>&gt; 200 km maximum length of inter-array cable with 26 estimated crossings;</li> <li>&gt; Maximum export cable length 369.8 km</li> </ul>	<p>The maximum assessment assumptions represent decommissioning activities that could potentially affect perception of the HSC</p>



<b>Potential effect</b>	<b>Maximum adverse scenario assessed</b>	<b>Justification</b>
use of the seascape during the decommissioning phase		



## 11.11 EMBEDDED MITIGATION

- 11.11.1 The embedded mitigation contained in Table 11.12 are mitigation measures or commitments that have been identified and adopted as part of the evolution of the project design of relevance to the topic, these include project design measures, compliance with elements of good practice and use of standard protocols. Where the assessment determined significant effects accounting for embedded mitigation, further measures may be required, which will be presented as additional mitigation.
- 11.11.2 The mitigation measures described below are embedded in the sense that they are secured through the Outline Marine WSI, and measures will be required to be agreed and in place. The exact mitigation design may evolve through the pre-construction development process and will be updated to reflect any further study and in consultation with the Archaeological Curators.
- 11.11.3 Wherever possible mitigation will be proactive in the identification of potential marine heritage receptors and reactive in measures to minimise impact and risk on known and recently located receptors.

**Table 11.12 Embedded mitigation relating to Offshore Archaeology and Cultural Heritage**

Project phase	Mitigation measures embedded into the project design
<b>General</b>	
Written Schemes of Investigation (WSI)	An Outline Marine WSI document has been produced to accompany the PEIR to outline the AEZs and establish the basis for mitigation measures and further archaeological campaigns for the project. This will be developed to form the Draft Marine WSI followed by the Agreed Marine WSI.
Archaeological Exclusion Zones (AEZ)	All intrusive activities undertaken during the life of the project will be routed and micro-sited to avoid any identified marine heritage receptors pre-construction, with AEZs as detailed in the Outline Marine WSI unless other mitigation is agreed with Historic England.
Protocol for Archaeological Discoveries (PAD)	Additional unknown or unexpected cultural heritage and marine heritage receptors identified during the project stages will be reported utilising the project specific PAD.
Archaeological assessment of available data	Offshore geophysical surveys (including UXO surveys) and offshore geotechnical campaigns undertaken pre-construction will be subject to full archaeological review, where relevant in consultation with Historic England. Areas with geoarchaeological potential will be targeted during the geotechnical sampling campaigns and results published will aim to enhance the palaeogeographic knowledge and understanding of the area.



Project phase	Mitigation measures embedded into the project design
Post-construction monitoring plan	A post-construction monitoring plan as per the Outline Marine WSI will be produced. The post-construction monitoring plan will identify any areas or sites of high archaeological significance recommended for further investigation and outline how post-construction monitoring campaigns will collect, assess and report on changes to marine heritage receptors that may have occurred during the construction phase.

### WSI

- 11.11.4 The Outline Marine WSI (Volume 4, Annex 11.2: Outline Marine Written Scheme of Investigation) sets out the recommended AEZ for geophysical anomalies, provides information about areas of archaeological potential and where further geotechnical works may provide evidence of archaeological interest. The WSI also sets out procedures for further works that will require archaeological input even when their main purpose is non-archaeological, so that the potential for information and efficiency is maximized.
- 11.11.5 Throughout the lifetime of the project, the Marine WSI will evolve from the current Outline Marine WSI (Volume 4, Annex 11.2: Outline Marine Written Scheme of Investigation) to the Draft Marine WSI through to the final Agreed Marine WSI. These documents will be produced in line with The Crown Estate guidance (2021). The mitigation set out in the WSI will be discussed and agreed in consultation with the Archaeological Curators. Note that the implementation of this Marine WSI is mitigation, rather than the document itself.

### AEZ

- 11.11.6 Archaeological exclusion zones are recommended around all recorded wrecks and obstructions, as well as those assessed as high and medium archaeological potential identified in the geophysical assessment. The avoidance of marine heritage assets remaining in situ follows best archaeological practice, and impact by the proposed development will be avoided through the implementation of buffers around the known extents of sites. All development and related activities that could impact the seabed are micro-sited within the boundaries of an AEZ.
- 11.11.7 The final development layout of VE will take into account the locations of all AEZs. Where it is deemed that impacts cannot be avoided, measures to reduce, remedy or offset disturbances will be agreed.
- 11.11.8 AEZs have the potential to be amended (enlarged or reduced) or removed at a later date, subject to further data and review. Any changes to the AEZs which may occur will be agreed with the Archaeological Curators.



- 11.11.9 AEZs of 50 m are recommended around anomalies of medium archaeological potential (Table 11.9) and records for wrecks and obstructions which did not correlate with geophysical anomalies. For anomalies of high archaeological potential identified in the geophysical data AEZs of 100 m are recommended. The extent of the AEZs are based around the visible extent of the anomaly, where it can be identified, or in the case of recorded anomalies not also identified in the geophysical data and anomalies identified only in the magnetometer data the buffer is based around the recorded location.
- 11.11.10 For anomalies assessed as low archaeological potential no AEZ have been recommended at this time. However, avoidance of these features by micrositing is recommended if there is potential for them to be impacted by the development.
- 11.11.11 It is possible these anomalies could represent material from wreck sites or other marine heritage assets of significance but are not currently identifiable as such. If these anomalies are likely to be impacted, they should be assessed on a case-by-case basis, in agreement with the Archaeological Curators. Further assessment may be in the form of investigation undertaken in conjunction with ROV or UXO surveys.
- 11.11.12 The methodology for assessing anomalies is set out in Section 8 of Volume 4, Annex 11.2: Outline Marine Written Scheme of Investigation.

#### PAD

- 11.11.13 There is potential for previously unknown sites or material of archaeological potential to be encountered during development works. As per the WSI, a project specific PAD will be adopted to ensure impacts to these unexpected discoveries can be reduced.
- 11.11.14 The PAD document acts as a safety net alongside other mitigation measures to ensure reactive and effective reporting of any unexpected finds of archaeological potential so that they can be investigated and assessed to avoid further impacts.
- 11.11.15 Temporary exclusion zones (TEZ) may be established around areas of possible archaeological potential until further investigation and assessment can be conducted.

#### ARCHAEOLOGICAL ASSESSMENT OF AVAILABLE DATA

- 11.11.16 Offshore geophysical surveys (including UXO surveys) undertaken during the life of the project will be subject to full archaeological review, where relevant. Archaeological review will be in consultation with Historic England.
- 11.11.17 Offshore geotechnical surveys prior to construction will be undertaken following early discussions with Historic England. Areas with geoarchaeological potential will be targeted during geotechnical sampling campaigns and the results of the geoarchaeological assessment will be presented in phased geoarchaeological reports inclusive of publication. The published results will aim to enhance the palaeogeographic knowledge and understanding of the area.
- 11.11.18 Specialist archaeological input will be incorporated, as a proactive measure, into the survey methodologies and techniques through to the identification of anomalies and subsequent avoidance strategies and mitigation.





11.11.19 The area is of known importance for historic military and merchant activity as well as of for geoarchaeology. Any features of potential archaeological interest or significance will be avoided where possible or, where impacts cannot be avoided, will be further investigated and risk of impacts managed. Any locations of potential geoarchaeological interest or significance will be targeted where possible during geotechnical works to contribute to the characterisation of the palaeoenvironment and deposit model. Additional archaeologically specific cores will also be collected.

#### POST-CONSTRUCTION MONITORING PLAN

11.11.20 A post-construction monitoring plan will be produced within the Agreed Marine WSI (the iteration of the Outline Marine WSI (Volume 4, Annex 11.2: Outline Marine Written Scheme of Investigation) which will be developed post-consent and pre-construction). The post-construction monitoring plan will set out areas or sites of high archaeological interest and/ or significance and outline proposed measures to avoid or monitor such sites. It will also outline how any post-construction monitoring campaigns will collect, assess, and report on changes to marine heritage receptors that may have occurred during the construction phase.

#### 11.12 ENVIRONMENTAL ASSESSMENT: CONSTRUCTION PHASE

11.12.1 Activities associated with the construction phase that have the potential to directly or indirectly impact marine archaeology receptors are considered here. The magnitude of all outlined impacts on marine heritage receptors has been assessed according to the criteria outlined in Table 11.4 and is taking into account the embedded mitigations as outlined in Table 11.12. The assumed maximum impact table (Table 11.11), demonstrates that potential direct and indirect impact during the construction phase is possible within the RLB and outlines relevant parameters.

11.12.2 If, as a result of the construction phase activities, any marine heritage receptors are subject to increased sedimentation that covers and so protects the receptor, the marine heritage receptor might benefit from the conditions which could provide a higher level of preservation *in situ* and therefore a beneficial magnitude of impact.

11.12.3 The sensitivity (value) of the marine heritage receptors identified within the marine archaeology study area takes into account both the impact of magnitude (Table 11.4) and the sensitivity (value) of those receptors as a result of potential impacts during the construction phase. Professional judgement based on the guidance set out by the Department for Culture, Media and Sport (2013) has also been applied. The sensitivity (value) of the known marine heritage receptors potentially impacted during the construction phase are detailed in Table 11.13.



**Table 11.13 Receptor sensitivity (value): Construction phase**

No.	Marine archaeological receptor	Receptor sensitivity (value)
235	High potential anomalies	High
98	Medium potential anomalies	Medium
473	Low potential anomalies	High to Low
4115	Low potential magnetic anomalies	High to Low
6	High significance (archaeological term) known wrecks	High
23	Medium significance (archaeological term) known wrecks	High/ Medium
9	Low significance (archaeological term) known wrecks	High/ Medium
1	Unknown significance (archaeological term) known wrecks	Unknown
60	Reported losses/ fishermen's fasteners/ obstructions/ dead wrecks (not identified in geophysical data)	Low/ Negligible
	Channels, valleys and deposits of geoarchaeological potential	High to Low

**IMPACT 1: DIRECT IMPACT OF SEDIMENT REMOVAL CONTAINING UNDISTURBED ARCHAEOLOGICAL CONTEXTS DURING SEABED PREPARATION AHEAD OF CONSTRUCTION ACTIVITIES LEADING TO THE TOTAL OR PARTIAL LOSS OF THE MARINE HERITAGE RECEPTORS**

**MAGNITUDE OF IMPACT**

11.12.4 Impacts of sediment removal on marine heritage receptors may lead to direct impact and total or partial loss of marine archaeology receptors. If a direct impact occurs, it will generally be local, major and adverse or irreversible and result in a permanent change to the receptor meaning **High** magnitude of impact as detailed in Table 11.4).

**SENSITIVITY (VALUE) OF THE RECEPTOR**

11.12.5 The sensitivity (value) of the marine heritage receptors potentially impacted by sediment removal activities and identified within the marine archaeology study area is considered to be **negligible** to **high** as defined in Table 11.5 which takes into account both the impact of magnitude (Table 11.4) and the sensitivity (value) of those receptors as a result of potential impacts. The sensitivity (value) of the known marine heritage receptors potentially impacted by sediment removal is detailed in Table 11.13.

**SIGNIFICANCE OF EFFECT**

11.12.6 As per embedded mitigation outlined in Table 11.12 locations on the seabed of potential and confirmed marine heritage receptors are informed by the archaeological assessment of geophysical and geotechnical data and Archaeological Exclusion Zones have been recommended as outlined in Volume 4, Annex 11.2: Outline Marine Written Scheme of Investigation.



- 11.12.7 Mitigation by avoidance aims to ensure that there is no direct, indirect, or permanent impact on marine heritage receptors of the proposed VE development meaning a **negligible** magnitude of impact as defined in Table 11.4.
- 11.12.8 Where avoidance is not possible or in case of not yet located marine heritage receptors further mitigation and archaeological works will be a requirement under Volume 4, Annex 11.2: Outline Marine Written Scheme of Investigation, and associated documents to ensure **negligible** magnitude of impact as defined in Table 11.4.
- 11.12.9 It is predicted that the sensitivity (value) of known heritage receptors impacted by sediment removal is **negligible** to **very high** (Table 11.13).
- 11.12.10 Considering the magnitude of impact and receptor sensitivity (value) within the significance of effect matrix (Table 11.6) on marine heritage receptors potentially effected by sediment removal, the magnitude of impact is assessed as **negligible (neutral)** and the sensitivity (value) of the receptor as **negligible** to **high**. The significance of effect has therefore been assessed as **minor** to **negligible** and the effect is consequently considered **not significant** in EIA terms.

## IMPACT 2: DIRECT IMPACT BY PENETRATION, COMPRESSION, AND DISTURBANCE OF PILING FOUNDATIONS LEADING TO THE TOTAL OR PARTIAL LOSS OF MARINE HERITAGE RECEPTORS

### MAGNITUDE OF IMPACT

- 11.12.11 Impacts of piling activities on marine heritage receptors may lead to direct impact and total or partial loss of marine archaeology receptors. If a direct impact occurs, it will generally be local, major and adverse or irreversible and result in a permanent change to the receptor meaning **High** impact of magnitude as detailed in Table 11.4).

### SENSITIVITY (VALUE) OF THE RECEPTOR

- 11.12.12 The sensitivity (value) of the marine heritage receptors potentially impacted by piling activities and identified within the marine archaeology study area is considered to be **negligible** to **high** as defined in Table 11.5 which takes into account both the impact of magnitude (Table 11.4) and the sensitivity (value) of those receptors as a result of potential impacts. The sensitivity (value) of the known marine heritage receptors potentially impacted by piling activities is detailed in Table 11.13.

### SIGNIFICANCE OF EFFECT

- 11.12.13 As per embedded mitigation outlined in Table 11.12 locations on the seabed of potential and confirmed marine heritage receptors are informed by the archaeological assessment of geophysical and geotechnical data and Archaeological Exclusion Zones have been recommended as outlined in Volume 4, Annex 11.2: Outline Marine Written Scheme of Investigation.
- 11.12.14 Mitigation by avoidance aims to ensure that there is no direct, indirect, or permanent impact on marine heritage receptors of the proposed VE development meaning a **negligible** magnitude of impact as defined in Table 11.4.



- 11.12.15 Where avoidance is not possible or in cases of not yet located marine heritage receptors further mitigation and archaeological works will be a requirement under Volume 4, Annex 11.2 and associated documents, to ensure **negligible** magnitude of impact as defined in Table 11.4.
- 11.12.16 It is predicted that the sensitivity (value) of known heritage receptors impacted by piling activities is **negligible** to **very high** (Table 11.14).
- 11.12.17 Considering the magnitude of impact and receptor sensitivity (value) within the significance of effect matrix (Table 11.6) on marine heritage receptors potentially effected by piling activities, the magnitude of impact is assessed as **negligible (neutral)** and the sensitivity (value) of the receptor as **negligible** to **high**. The significance of effect has therefore been assessed as **minor** to **negligible** and the effect is consequently considered **not significant** in EIA terms.

### IMPACT 3: DIRECT IMPACT BY PENETRATION, COMPRESSION, AND DISTURBANCE OF STRATIGRAPHIC CONTEXTS CONTAINING ARCHAEOLOGICAL MATERIAL FROM THE COMBINED WEIGHT OF THE WIND TURBINE GENERATORS (WTG) AND ASSOCIATED FOUNDATIONS LEADING TO TOTAL OR PARTIAL LOSS OF MARINE HERITAGE RECEPTORS

#### MAGNITUDE OF IMPACT

- 11.12.18 Impacts resulting from combined weight on marine heritage receptors may lead to direct impact and total or partial loss of marine archaeology receptors. If a direct impact occurs, it will generally be local, major and adverse or irreversible and result in a permanent change to the receptor meaning **High** impact of magnitude as detailed in Table 11.4).

#### SENSITIVITY (VALUE) OF THE RECEPTOR

- 11.12.19 The sensitivity (value) of the marine heritage receptors potentially impacted by piling activities and identified within the marine archaeology study area is considered to be **negligible** to **high** as defined in Table 11.5 which takes into account both the impact of magnitude (Table 11.4) and the sensitivity (value) of those receptors as a result of potential impacts. The sensitivity (value) of the known marine heritage receptors potentially resulting from combined weight is detailed in Table 11.13.

#### SIGNIFICANCE OF EFFECT

- 11.12.20 As per embedded mitigation outlined in Table 11.12 locations on the seabed of potential and confirmed marine heritage receptors are informed by the archaeological assessment of geophysical and geotechnical data and Archaeological Exclusion Zones have been recommended as outlined in Volume 4, Annex 11.2: Outline Marine Written Scheme of Investigation.
- 11.12.21 Mitigation by avoidance aims to ensure that there is no direct, indirect, or permanent impact on marine heritage receptors from the proposed VE development meaning a **negligible** magnitude of impact as defined in Table 11.4.
- 11.12.22 Where avoidance is not possible or in case of not yet located marine heritage receptors further mitigation and archaeological works will be a requirement under Volume 4, Annex 11.2 and associated documents, to ensure **negligible** magnitude of impact as defined in Table 11.4.



11.12.23 It is predicted that the sensitivity (value) of known heritage receptors impacted by the combined weight is **negligible** to **very high** (Table 11.15).

11.12.24 Considering the magnitude of impact and receptor sensitivity (value) within the significance of effect matrix (Table 11.6) on marine heritage receptors potentially affected by the combined weight, the magnitude of impact is assessed as **negligible** (**neutral**) and the sensitivity (value) of the receptor as **negligible** to **high**. The significance of effect has therefore been assessed as **minor** to **negligible** and the effect is consequently considered **not significant** in EIA terms.

#### **IMPACT 4: DIRECT IMPACT BY PENETRATION, COMPRESSION, AND DISTURBANCE OF CABLE LAYING OPERATIONS LEADING TO TOTAL OR PARTIAL LOSS OF MARINE HERITAGE RECEPTORS**

##### **MAGNITUDE OF IMPACT**

11.12.25 Impacts as a result of cable laying operations on marine heritage receptors may lead to direct impact and total or partial loss of marine archaeology receptors. If a direct impact occurs, it will generally be local, major and adverse or irreversible and result in a permanent change to the receptor meaning **High** impact of magnitude (as detailed in Table 11.4).

##### **SENSITIVITY (VALUE) OF THE RECEPTOR**

11.12.26 The sensitivity (value) of the marine heritage receptors potentially impacted by sediment removal activities and identified within the marine archaeology study area is considered to be **negligible** to **high** as defined in Table 11.5 which takes into account both the impact of magnitude (Table 11.4) and the sensitivity (value) of those receptors as a result of potential impacts. The sensitivity (value) of the known marine heritage receptors potentially impacted by cable laying operations is detailed in Table 11.13.

##### **SIGNIFICANCE OF EFFECT**

11.12.27 As per embedded mitigation outlined in Table 11.12 locations on the seabed of potential and confirmed marine heritage receptors are informed by the archaeological assessment of geophysical and geotechnical data and Archaeological Exclusion Zones have been recommended as outlined in Volume 4, Annex 11.2: Outline Marine Written Scheme of Investigation.

11.12.28 Mitigation by avoidance aims to ensure that there is no direct, indirect, or permanent impact on marine heritage receptors of the proposed VE development meaning a **negligible** magnitude of impact as defined in Table 11.4.

11.12.29 Where avoidance is not possible or in case of not yet located marine heritage receptors further mitigation and archaeological works will be a requirement under Volume 4, Annex 11.2 and associated documents, to ensure **negligible** magnitude of impact as defined in Table 11.4.

11.12.30 It is predicted that the sensitivity (value) of known heritage receptors impacted by cable laying activities is **negligible** to **very high** (Table 11.16).



11.12.31 Considering the magnitude of impact and receptor sensitivity (value) within the significance of effect matrix (Table 11.6) on marine heritage receptors potentially effected by cable laying activities, the magnitude of impact is assessed as **negligible (neutral)** and the sensitivity (value) of the receptor as **negligible to high**. The significance of effect has therefore been assessed as minor to negligible and the effect is consequently considered **not significant** in EIA terms.

## **IMPACT 5: DIRECT IMPACT BY PENETRATION, COMPRESSION, AND DISTURBANCE EFFECTS OF JACK-UP BARGES AND ANCHORING OF CONSTRUCTION VESSELS DURING CONSTRUCTION ACTIVITIES LEADING TO TOTAL OR PARTIAL LOSS OF MARINE HERITAGE RECEPTORS**

### **MAGNITUDE OF IMPACT**

11.12.32 Impacts as a result of vessel operations on marine heritage receptors may lead to direct impact and total or partial loss of marine archaeology receptors. If a direct impact occurs, it will generally be local, major and adverse or irreversible and result in a permanent change to the receptor meaning **High** impact of magnitude (as detailed in Table 11.4).

### **SENSITIVITY (VALUE) OF THE RECEPTOR**

11.12.33 The sensitivity (value) of the marine heritage receptors potentially impacted by sediment removal activities and identified within the marine archaeology study area is considered to be **negligible to high** as defined in Table 11.5 which takes into account both the impact of magnitude (Table 11.4) and the sensitivity (value) of those receptors as a result of potential impacts. The sensitivity (value) of the known marine heritage receptors potentially impacted by vessel operations is detailed in Table 11.13.

### **SIGNIFICANCE OF EFFECT**

11.12.34 As per embedded mitigation outlined in Table 11.12 locations on the seabed of potential and confirmed marine heritage receptors are informed by the archaeological assessment of geophysical and geotechnical data and Archaeological Exclusion Zones have been recommended as outlined in Volume 4, Annex 11.2: Outline Marine Written Scheme of Investigation.

11.12.35 Mitigation by avoidance aims to ensure that there is no direct, indirect, or permanent impact on marine heritage receptors of the proposed VE development meaning a **negligible** magnitude of impact as defined in Table 11.4.

11.12.36 Where avoidance is not possible or in case of not yet located marine heritage receptors further mitigation and archaeological works will be a requirement under Volume 4, Annex 11.2 and associated documents, to ensure **negligible** magnitude of impact as defined in Table 11.4.

11.12.37 It is predicted that the sensitivity (value) of known heritage receptors impacted by vessel activities is **negligible to very high** (Table 11.17).



11.12.38 Considering the magnitude of impact and receptor sensitivity (value) within the significance of effect matrix (Table 11.6) on marine heritage receptors potentially effected by vessel activities, the magnitude of impact is assessed as **negligible (neutral)** and the sensitivity (value) of the receptor as **negligible to high**. The significance of effect has therefore been assessed as **minor to negligible** and the effect is consequently considered **not significant** in EIA terms.

#### **IMPACT 6: INDIRECT IMPACT CAUSING DISTURBANCE OF SEDIMENT CONTAINING POTENTIAL MARINE HERITAGE RECEPTORS (MATERIAL AND CONTEXTS) LEADING TO THE EXPOSURE OF THOSE MARINE HERITAGE RECEPTORS TO NATURAL, CHEMICAL OR BIOLOGICAL PROCESSES AND INDIRECTLY CAUSING OR ACCELERATING THEIR LOSS**

##### **MAGNITUDE OF IMPACT**

11.12.39 Magnitude of indirect impact on marine heritage receptors of sediment disturbance may lead to exposure of those marine heritage receptors to natural, chemical or biological processes and indirectly cause or accelerate their loss. If an indirect impact occurs, it will generally be local, major and adverse or irreversible and result in a permanent change to the receptor meaning **High** impact of magnitude as detailed in Table 11.4).

##### **SENSITIVITY (VALUE) OF THE RECEPTOR**

11.12.40 The sensitivity (value) of the marine heritage receptors identified within the marine archaeology study area is considered to be negligible to high as defined in Table 11.5 which takes into account both the impact of magnitude (Table 11.4) and the sensitivity (value) of those receptors as a result of potential impacts. The sensitivity (value) of the known marine heritage receptors potentially impacted by sediment disturbance is detailed in Table 11.13.

##### **SIGNIFICANCE OF EFFECT**

11.12.41 As per embedded mitigation outlined in Table 11.12 locations on the seabed of potential and confirmed marine heritage receptors are informed by the archaeological assessment of geophysical and geotechnical data and Archaeological Exclusion Zones have been recommended as outlined in Volume 4, Annex 11.2: Outline Marine Written Scheme of Investigation.

11.12.42 Mitigation by avoidance aims to ensure that there is no direct, indirect, or permanent impact on marine heritage receptors of the proposed VE development meaning a **negligible** magnitude of impact as defined in Table 11.4.

11.12.43 Where avoidance is not possible or in case of not yet located marine heritage receptors further mitigation and archaeological works will be a requirement under Volume 4, Annex 11.2, and associated documents to ensure **negligible** magnitude of impact as defined in Table 11.4.

11.12.44 It is predicted that the sensitivity (value) of known heritage receptors impacted by sediment disturbance is **negligible to very high** (Table 11.18).



11.12.45 Considering the magnitude of impact and receptor sensitivity (value) within the significance of effect matrix (Table 11.6) on marine heritage receptors potentially effected by sediment disturbance, the magnitude of impact is assessed as **negligible (neutral)** and the sensitivity (value) of the receptor as **negligible to high**. The significance of effect has therefore been assessed as **minor to negligible** and the effect is consequently considered **not significant** in EIA terms.

## **IMPACT 7: INDIRECT IMPACTS CAUSING CHANGES TO THE HISTORIC SEASCAPE CHARACTER AS A RESULT OF CONSTRUCTION AND SURVEY VESSEL ACTIVITIES AND THE ADDITION OF CABLES, FOUNDATIONS AND TURBINES INDIRECTLY LEADING TO CHANGES TO THE PERCEIVED HISTORIC USE OF THE SEASCAPE DURING CONSTRUCTION ACTIVITIES**

### **MAGNITUDE OF IMPACT**

11.12.46 Magnitude of indirect impact on the HSC during the construction phase has been assessed according to the criteria outlined in Table 11.4 and is taking into account the embedded mitigations as outlined in Table 11.12.

11.12.47 HSC has been used in this assessment as a measure to provide a contextual and regional approach to the marine archaeology study area. Historic seascapes cannot be physically destroyed or damaged but impacts on them can change their historic character and the perception surrounding them.

11.12.48 The historic character of a seascape can be defined by its dynamic nature and ability to accommodate change. Perceptions of the seascape are also dynamic and subject to public awareness, time, and place. The intertidal and marine zones are ever changing due to physical processes such as currents, tidal range and sediment mobility. Considering this dynamism and the multiple dimensions defined by HSC, people create complex spatial relationships within and across all marine levels, reflected within the sites of cultural activity and their material imprints.

11.12.49 The presence of construction vessels is considered to be comparatively inconsequential considering the current marine activity within the marine archaeology study area. The inshore activities at landfall will be short term and small scale with temporary use of larger construction vessels, as outlined in the assumed maximum impact table (Table 11.11).

11.12.50 The addition of cables on the sub seafloor and seafloor is unlikely to enter the perception of the public, and therefore are unlikely to change the public perception of seascape. Foundations within the water column and sea surface will likely contribute to a change in people's perception of the HSC. This can be a positive, negative, or neutral change which is dependent on personal experience of the area and will continue to be a subjective perception over time.

11.12.51 The magnitude of impact on marine heritage receptors on HSC, specifically the installation of cables on the sub seafloor and seafloor, foundations within the water column and sea surface and turbines above the sea surface during the construction phase is therefore assessed as a narrative using the Broad Historic Character Types, as summarised in Section 11.7.





11.12.52 It should be noted that changes to the visible elements of the shore and the sea surface have been assessed further in Volume 2, Chapter 10: Seascape, Landscape and Visual, and therefore this chapter only considers the historic aspects of Seascape Characterisation.

### SENSITIVITY (VALUE) OF THE RECEPTOR

11.12.53 The sensitivity (value) of the Broad Historic Character Types identified within proposed development is assessed in terms of their ability to adapt to change, as outlined in Section 11.7.

11.12.54 The existing seascape of VE marine archaeology study area is known for its marine and intertidal historic character utilised mainly for Navigation, Industry, Fishing, Ports and Docks, Coastal Infrastructure, Military, Settlements and Recreation.

11.12.55 HSC relates to the historic dimension of the present-day seascape and considers the added effect of VE within the multiple dimensions of the marine environment (sub sea floor, sea floor, water column, sea surface, coastal land and previous historic character) in combination with the existing activity within the Broad Historic Character Types, as detailed in Section 11.7. and Volume 4, Annex 11.1: Offshore Archaeology and Cultural Heritage Technical Report and summarised in Table 11.14.

**Table 11.14 Changes to the Historic Seascape Character (HSC) during construction**

Broad Historic Character Types	Perception of the Historic Seascape Character	Changes to Perception
Navigation (activities, maritime safety and hazards)	This area along the east coast and Outer Thames Estuary has historically been an area of intensive navigation activities and as such has demonstrated its capacity to accommodate change and growth over time.	Positive perceived change: the added addition of temporary vessel activities in a busy navigational area is not expected to contribute to change. However, the addition of safety infrastructure as part of the offshore wind farm has the potential to lead to safer navigation, (see Volume 7, Report 6: Navigational risk assessment for detail).
Industry (extractive, energy, processing, shipbuilding, shipping)	Industry in its many forms has been and continues to be the one of the dominant influences on the character across coastal, intertidal and marine areas at all levels around the UK.	No perceived change: the addition of VE infrastructure as a source of renewable energy would contribute to the existing perception of industry the HSC, adding to a sense of a modern and sustainable industry. See also Volume 2, Chapter 10: Seascape, Landscape and Visual.



Broad Historic Character Types	Perception of the Historic Seascape Character	Changes to Perception
Fishing	<p>The fishing industry of the Eastern England region has been evidenced since prehistoric times. Although the fishing industry in this area has seen a decline since the Second World War there is still a deeply ingrained sense of its traditional role in local lives and economy.</p>	<p>No perceived change: while some areas may be temporarily unavailable for fishing during the construction phase, in the long term no change to HSC as a result of VE is expected on either local or offshore fishing industries. Also see Volume 2, Chapter 8: Commercial Fisheries.</p>
Ports and docks	<p>The Eastern England region contains numerous examples of small hards (consolidated loading platforms), quays and landing places and major ports including docks, ferry terminals and car terminals. Although many of the port locations may be inaccessible to the public, the harbours contain an amenity value which is linked to recreational and leisure activities such as sailing and wildlife watching. The ports of Colchester, Ipswich and Harwich are covered in the cumulative effects assessment (Table 11.19).</p>	<p>No change perceived: the HSC of the ports and docks is not expected to be altered during the construction phase of VE.</p> <p>Volume 3, Chapter 7: Archaeology and Cultural Heritage includes an assessment of historic assessment of quays.</p> <p>Volume 2, Chapter 10: Seascape, Landscape and Visual includes baseline views of ports and quays.</p>
Coastal infrastructure (flood and erosion defences)	<p>Sea, flood and erosion defences are generally seen as essential for the preservation of settlements along the eastern coast of England for protecting property by preventing erosion and providing flood protection which conserves the economic value and provides local residents with reassurance. Approaches vary from 'hard' defences, such as sea walls, which absorb or reflect wave energy, and 'soft', nature-based solutions which encourage natural systems,</p>	<p>No perceived change: the HSC of the coastal infrastructure is not expected to be altered during the construction phase of VE.</p> <p>Volume 3, Chapter 7: Archaeology and Cultural Heritage includes an assessment of HLC of coastal infrastructure.</p> <p>Volume 2, Chapter 10: Seascape, Landscape and Visual includes baseline views of coastal infrastructure.</p>



Broad Historic Character Types	Perception of the Historic Seascape Character	Changes to Perception
	such as beaches and salt marshes which protect the coast.	
Communications (transport, telecommunications)	<p>Coastally specific and maritime-related infrastructure includes canals, motorways, main roads, railways and airports which enable people to settle in and visit coastal regions. Canals were an important element in the early industrial period as they allowed for low-cost transport of bulk and raw materials. The use of many of these diminished following the construction of new railway lines, but are maintained for continued recreational use, such as the Chelmer and Blackwater Canal.</p> <p>The presence of submarine telecommunications cables is likely to be known only to those who were involved in laying them, and to people involved in communications infrastructure. In spite of the importance of transport and telecommunications in the daily lives of the public their perception of the communications type is limited and based on the results of communications rather than their presence.</p>	<p>No perceived change: while canals are an integral part of the present social and cultural landscape their use and perception are now predominantly recreational rather than commercial or industrial. Modern society is dependent on submarine telecommunication cables. However, the current public perception of such infrastructure is understood to be minimal, and this is unlikely to change following the construction of VE.</p>
Military (military defence and fortification)	<p>Military coastal defences and military bases can be found all along the eastern coast. Examples range from Roman forts once established at Walton, to a heavy anti-aircraft gun site at Shotley Battery, as well as numerous records of</p>	<p>Positive perceived change: active bases and abandoned military heritage bear witness to the UK's important military history. However, the impacts on HSC during the construction phase of VE can be positive, ensuring</p>



Broad Historic Character Types	Perception of the Historic Seascape Character	Changes to Perception
	military and aircraft battle sites and wreck sites.	<p>increased protection and mitigation of impact on heritage receptors.</p> <p>Effects arising through change to HLC to military remains are outlined in Volume 3, Chapter 7: Archaeology and Cultural Heritage.</p> <p>Potential indirect and direct impacts on marine heritage receptors in the intertidal zone, and wrecks of military importance within the marine archaeology study area, are assessed in Sections 11.12 to Table 11.18.</p>
Settlements (urban)	The coastal area of the Eastern England region is densely populated. It includes a variety of coastal settlement types including urban settlements, major cities, tourist resorts and smaller fishing towns and villages.	Positive perceived change: the construction phase is not anticipated to alter public perception of the HSC but has the potential to contribute to the perception of how the seascape connects to our past and changes with our future.
Recreation (water sports, boating, recreational diving, swimming, wildlife watching)	Recreational enjoyment of the coast has a long history in the United Kingdom and tourism is an important source of income.	<p>Positive perceived change: while some areas may be temporarily unavailable for recreational activities during the construction phase, these areas will be accessible once more in the long term.</p> <p>Additionally, there is potential for improved public awareness of historic and recreational dive areas following the identification of wreck locations during archaeological surveys, leading to a greater understanding, respect and enjoyment of the seascape.</p>



Broad Historic Character Types	Perception of the Historic Seascape Character	Changes to Perception
		<p>Potential indirect and direct impacts on marine heritage receptors, such as wrecks, within the marine archaeology study area are assessed in Sections 11.12 to 11.18.</p>
<p>Cultural topography (palaeolandscape component)</p>	<p>The relevance of these to HSC is as areas of former human habitat with evidence for past topographical and ecological regimes, the contexts shaping much earlier human cultural activity and landscape perceptions.</p>	<p>Positive perceived change: the planned and undertaken geoarchaeological campaigns both in the offshore zone and on land will contribute to a greater understanding and appreciation of past topographical and ecological regimes.</p> <p>The potential for survival of palaeolandscape components and submerged archaeology in the marine environment and deposits in the study area is further discussed in Section 11.9. The cultural topography landward is discussed in detail in Volume 3, Chapter 7: Archaeology and Cultural Heritage.</p>
<p>Woodland</p>	<p>Coastal woodlands have been important in providing timber and other materials for boat building and other coastally focused activities. Patterns of woodland also form distinctive elements of the coastal landscape visible from the sea, aiding position-finding and natural navigation.</p>	<p>No perceived change: the HSC of the woodlands is not expected to be altered during the construction phase.</p> <p>Volume 3, Chapter 7: Archaeology and Cultural Heritage includes an assessment of HLC of woodland.</p> <p>Volume 2, Chapter 10: Seascape, Landscape and Visual includes baseline views of woodland.</p>



Broad Historic Character Types	Perception of the Historic Seascape Character	Changes to Perception
Enclosed land (reclaimed land)	<p>Reclamation in this area is from tidal marsh, usually saltmarsh, or wetland, with some areas being returned to saltmarsh as a buffer against rising sea-levels and storm surges.</p> <p>The current historical seascape perception of enclosed land is limited and is more relevant in the perception of the HLC.</p>	<p>No perceived change: the HSC of enclosed lands is not expected to be altered during the construction phase.</p> <p>Volume 3, Chapter 7: Archaeology and Cultural Heritage includes an assessment of HLC of enclosed land.</p> <p>Volume 3, Chapter 10: Seascape, Landscape and Visual includes baseline views of enclosed land.</p>
Unimproved land	<p>The two main examples of unimproved land within the study area are heathland, which is dominated by dwarf shrubs including heathers and gorses and provides a habitat for many rare plant and animal species; and rough grassland, which is dominated by un-intensively managed grassland, often the result of long traditions of coastal rough grazing, but in some areas reintroduced as a conservation measure to prevent land reverting to scrub.</p> <p>The current historic seascape perception of enclosed land is limited and is more relevant in the perception of the HLC.</p>	<p>No perceived change: the HSC of unimproved land is not expected to be altered during the construction phase.</p> <p>Volume 2, Chapter 7: Archaeology and Cultural Heritage includes an assessment of HLC of unimproved land.</p> <p>Volume 2, Chapter 10: Seascape, Landscape and Visual includes baseline views of unimproved land.</p>
Historic Landscape Character (HLC)	<p>There is some overlap between HSC and HLC in coastal and intertidal areas whose historic character has a distinctive maritime expression.</p>	<p>No perceived change: the seascape dimension of the HLC is not expected to be altered during the construction phase.</p> <p>Volume 3, Chapter 7: Archaeology and Cultural</p>



Broad Historic Character Types	Perception of the Historic Seascape Character	Changes to Perception
		Heritage includes an assessment of HLC.  Volume 2, Chapter 10: Seascape, Landscape and Visual includes baseline views of HLC.

## SIGNIFICANCE OF EFFECT

11.12.56 The commitment to undertake further archaeological works throughout the life of the project will be a requirement under Volume 4, Annex 11.2: Outline Marine Written Scheme of Investigation and associated documents (Table 11.12). This includes ensuring that HSC assessments where relevant are included throughout the life of the project.

11.12.57 It is therefore predicted that the ability to accommodate change is mainly a positive perceived change equalling a negligible magnitude. The significance of effect is therefore assessed as **negligible**, and the effect is consequently considered not **significant** in EIA terms.

## 11.13 ENVIRONMENTAL ASSESSMENT: OPERATIONAL PHASE

11.13.1 Activities associated with the operational phase that have the potential to directly or indirectly impact marine archaeology receptors are considered here. The magnitude of all outlined impacts on marine heritage receptors has been assessed according to the criteria outlined in Table 11.4 and is taking into account the embedded mitigations as outlined in Table 11.12. The assumed maximum impact table (Table 11.11), demonstrates that potential direct and indirect impact during the operational phase is possible within the RLB and outlines relevant parameters.

11.13.2 If, as a result of the activities associated with the operational phase, any marine heritage receptors are subject to increased sedimentation that covers and so protects the receptor, the marine heritage receptor might benefit from the conditions which could provide a higher level of preservation *in situ* and therefore a beneficial magnitude of impact.

11.13.3 The sensitivity (value) of the marine heritage receptors identified within the marine archaeology study area takes into account both the impact of magnitude (Table 11.4) and the sensitivity (value) of those receptors as a result of potential impacts during the operational phase. Professional judgement based on the guidance set out by the Department for Culture, Media and Sport (2013) has also been applied. The sensitivity (value) of the known marine heritage receptors potentially impacted during the operational phase are detailed in Table 11.15.



**Table 11.15 Receptor sensitivity (value): Operational phase**

No.	Marine archaeological receptor	Receptor sensitivity (value)
235	High potential anomalies	High
98	Medium potential anomalies	Medium
473	Low potential anomalies	High to Low
4115	Low potential magnetic anomalies	High to Low
6	High significance (archaeological term) known wrecks	High
23	Medium significance (archaeological term) known wrecks	High/ Medium
9	Low significance (archaeological term) known wrecks	High/ Medium
1	Unknown significance (archaeological term) known wrecks	Unknown
60	Reported losses/ fishermen's fasteners/ obstructions/ dead wrecks (not identified in geophysical data)	Low/ Negligible
	Channels, valleys and deposits of geoarchaeological potential	High to Low

**IMPACT 8: DIRECT IMPACT BY PENETRATION, COMPRESSION AND DISTURBANCE EFFECTS OF MAINTENANCE ACTIVITIES AT WTG SUBSTATION FOUNDATIONS AND ALONG INTER-ARRAY AND EXPORT CABLES LEADING TO TOTAL OR PARTIAL LOSS OF MARINE HERITAGE RECEPTORS**

**MAGNITUDE OF IMPACT**

11.13.4 Direct impacts as a result of maintenance activities on marine heritage receptors may lead to direct impact and total or partial loss of marine archaeology receptors. If a direct impact occurs, it will generally be local, major and adverse or irreversible and result in a permanent change to the receptor, meaning High impact of magnitude as detailed in Table 11.4).

**SENSITIVITY (VALUE) OF THE RECEPTOR**

11.13.5 The sensitivity (value) of the marine heritage receptors identified within the marine archaeology study area is considered to be negligible to high as defined in Table 11.5 which takes into account both the impact of magnitude (Table 11.4) and the sensitivity (value) of those receptors as a result of potential impacts. The sensitivity (value) of the known marine heritage receptors potentially impacted by maintenance activities is detailed in Table 11.15.

**SIGNIFICANCE OF EFFECT**

11.13.6 As per embedded mitigation outlined in Table 11.12 locations on the seabed of potential and confirmed marine heritage receptors are informed by the archaeological assessment of geophysical and geotechnical data and Archaeological Exclusion Zones have been recommended as outlined in Volume 4, Annex 11.2: Outline Marine Written Scheme of Investigation.





- 11.13.7 Mitigation by avoidance aims to ensure that there is no direct, indirect, or permanent impact on marine heritage receptors of the proposed VE development meaning a **negligible** magnitude of impact as defined in Table 11.4.
- 11.13.8 Where avoidance is not possible or in case of not yet located marine heritage receptors further mitigation and archaeological works will be a requirement under Volume 4, Annex 11.2 and associated documents, to ensure **negligible** magnitude of impact as defined in Table 11.4.
- 11.13.9 It is predicted that the sensitivity (value) of known heritage receptors impacted by maintenance activities is **negligible** to **very high** (Table 11.15).
- 11.13.10 Considering the magnitude of impact and receptor sensitivity (value) within the significance of effect matrix (Table 11.6) on marine heritage receptors potentially effected by maintenance activities, the magnitude of impact is assessed as **negligible (neutral)** and the sensitivity (value) of the receptor as **negligible** to **high**. The significance of effect has therefore been assessed as **minor** to **negligible** and the effect is consequently considered **not significant** in EIA terms.

#### **IMPACT 9: INDIRECT IMPACTS DURING THE OPERATION PHASE CAUSING DISTURBANCE OF SEDIMENT CONTAINING POTENTIAL MARINE HERITAGE RECEPTORS DURING MAINTENANCE ACTIVITIES LEADING TO THE EXPOSURE OF THOSE MARINE HERITAGE RECEPTORS TO NATURAL, CHEMICAL OR BIOLOGICAL PROCESSES AND INDIRECTLY CAUSING OR ACCELERATING LOSS OF THE SAME**

##### **MAGNITUDE OF IMPACT**

- 11.13.11 Magnitude of indirect impact on marine heritage receptors of sediment disturbance during maintenance activities may lead to exposure of those marine heritage receptors to natural, chemical or biological processes and indirectly cause or accelerate their loss. If an indirect impact occurs, it will generally be local, major and adverse or irreversible and result in a permanent change to the receptor meaning **High** impact of magnitude as detailed in Table 11.4).

##### **SENSITIVITY (VALUE) OF THE RECEPTOR**

- 11.13.12 The sensitivity (value) of the marine heritage receptors identified within the marine archaeology study area is considered to be negligible to high as defined in Table 11.5 which takes into account both the impact of magnitude (Table 11.4) and the sensitivity (value) of those receptors as a result of potential impacts. The sensitivity (value) of the known marine heritage receptors potentially impacted by sediment disturbance during maintenance activities is detailed in Table 11.13.

##### **SIGNIFICANCE OF EFFECT**

- 11.13.13 As per embedded mitigation outlined in Table 11.12 locations on the seabed of potential and confirmed marine heritage receptors are informed by the archaeological assessment of geophysical and geotechnical data and Archaeological Exclusion Zones have been recommended as outlined in Volume 4, Annex 11.2: Outline Marine Written Scheme of Investigation.
- 11.13.14 Mitigation by avoidance aims to ensure that there is no direct, indirect, or permanent impact on marine heritage receptors of the proposed VE development meaning a **negligible** magnitude of impact as defined in Table 11.4.



- 11.13.15 Where avoidance is not possible or in case of not yet located marine heritage receptors further mitigation and archaeological works will be a requirement under Volume 4, Annex 11.2 and associated documents, to ensure negligible magnitude of impact as defined in Table 11.4.
- 11.13.16 It is predicted that the sensitivity (value) of known heritage receptors impacted during the operations phase is **negligible** to **very high** (Table 11.13).
- 11.13.17 Considering the magnitude of impact and receptor sensitivity (value) within the significance of effect matrix (Table 11.6) on marine heritage receptors potentially effected during the operations phase, the magnitude of impact is assessed as **negligible (neutral)** and the sensitivity (value) of the receptor as **negligible** to **high**. The significance of effect has therefore been assessed as **minor** to **negligible** and the effect is consequently considered **not significant** in EIA terms.

## IMPACT 10: DIRECT IMPACT BY PENETRATION, COMPRESSION, AND DISTURBANCE EFFECTS OF JACK-UP BARGES AND ANCHORING OF OPERATION AND MAINTENANCE VESSELS DURING THE OPERATION AND MAINTENANCE PHASE LEADING TO TOTAL OR PARTIAL LOSS OF MARINE HERITAGE RECEPTORS

### MAGNITUDE OF IMPACT

- 11.13.18 Direct impacts as a result of vessel activities on marine heritage receptors may lead to direct impact and total or partial loss of marine archaeology receptors. If a direct impact occurs, it will generally be local, major and adverse or irreversible and result in a permanent change to the receptor, meaning High impact of magnitude as detailed in Table 11.4).

### SENSITIVITY (VALUE) OF THE RECEPTOR

- 11.13.19 The sensitivity (value) of the marine heritage receptors identified within the marine archaeology study area is considered to be negligible to high as defined in Table 11.5 which takes into account both the impact of magnitude (Table 11.4) and the sensitivity (value) of those receptors as a result of potential impacts. The sensitivity (value) of the known marine heritage receptors potentially impacted by vessel activities is detailed in Table 11.13.

### SIGNIFICANCE OF EFFECT

- 11.13.20 As per embedded mitigation outlined in Table 11.12 locations on the seabed of potential and confirmed marine heritage receptors are informed by the archaeological assessment of geophysical and geotechnical data and Archaeological Exclusion Zones have been recommended as outlined in Volume 4, Annex 11.2: Outline Marine Written Scheme of Investigation.
- 11.13.21 Mitigation by avoidance aims to ensure that there is no direct, indirect, or permanent impact on marine heritage receptors of the proposed VE development meaning a **negligible** magnitude of impact as defined in Table 11.13.
- 11.13.22 Where avoidance is not possible or in case of not yet located marine heritage receptors further mitigation and archaeological works will be a requirement under Volume 4, Annex 11.2 and associated documents, to ensure **negligible** magnitude of impact as defined in Table 11.4.



11.13.23 It is predicted that the sensitivity (value) of known heritage receptors impacted by vessel activities is **negligible** to **very high** (Table 11.15).

11.13.24 Considering the magnitude of impact and receptor sensitivity (value) within the significance of effect matrix (Table 11.6) on marine heritage receptors potentially effected by vessel activities, the magnitude of impact is assessed as **negligible** (**neutral**) and the sensitivity (value) of the receptor as **negligible** to **high**. The significance of effect has therefore been assessed as **minor** to **negligible** and the effect is consequently considered **not significant** in EIA terms.

### IMPACT 11: INDIRECT IMPACTS CAUSING SCOUR EFFECTS AS A RESULT OF THE PRESENCE OF WTG SUBSTATION FOUNDATIONS AND THE EXPOSURE OF INTER-ARRAY AND EXPORT CABLES OR THE USE OF CABLE PROTECTION MEASURES LEADING TO THE EXPOSURE OF THOSE MARINE HERITAGE RECEPTORS TO NATURAL, CHEMICAL OR BIOLOGICAL PROCESSES AND INDIRECTLY CAUSING OR ACCELERATING THEIR LOSS

#### MAGNITUDE OF IMPACT

11.13.25 Magnitude of indirect impact on marine heritage receptors of sediment disturbance as a result of scour may lead to exposure of those marine heritage receptors to natural, chemical or biological processes and indirectly cause or accelerate their loss. If an indirect impact occurs, it will generally be local, major and adverse or irreversible and result in a permanent change to the receptor meaning **High** impact of magnitude as detailed in Table 11.4).

#### SENSITIVITY (VALUE) OF THE RECEPTOR

11.13.26 The sensitivity (value) of the marine heritage receptors identified within the marine archaeology study area is considered to be **negligible** to **high** as defined in Table 11.5 which takes into account both the impact of magnitude (Table 11.4) and the sensitivity (value) of those receptors as a result of potential impacts. The sensitivity (value) of the known marine heritage receptors potentially impacted by sediment disturbance as a result of scour is detailed in Table 11.13.

#### SIGNIFICANCE OF EFFECT

11.13.27 As per embedded mitigation outlined in Table 11.12 locations on the seabed of potential and confirmed marine heritage receptors are informed by the archaeological assessment of geophysical and geotechnical data and Archaeological Exclusion Zones have been recommended as outlined in Volume 4, Annex 11.2: Outline Marine Written Scheme of Investigation.

11.13.28 Mitigation by avoidance aims to ensure that there is no direct, indirect, or permanent impact on marine heritage receptors of the proposed VE development meaning a **negligible** magnitude of impact as defined in Table 11.4.

11.13.29 Where avoidance is not possible or in case of not yet located marine heritage receptors further mitigation and archaeological works will be a requirement under Volume 4, Annex 11.2 and associated documents, to ensure **negligible** magnitude of impact as defined in Table 11.4.

11.13.30 It is predicted that the sensitivity (value) of known heritage receptors impacted by scour effects is **negligible** to very high (Table 11.15).



11.13.31 Considering the magnitude of impact and receptor sensitivity (value) within the significance of effect matrix (Table 11.6) on marine heritage receptors potentially effected by scour effects, the magnitude of impact is assessed as **negligible (neutral)** and the sensitivity (value) of the receptor as **negligible to high**. The significance of effect has therefore been assessed as **minor to negligible** and the effect is consequently considered **not significant** in EIA terms.

## IMPACT 12: INDIRECT IMPACTS CAUSING CHANGES TO THE HISTORIC SEASCAPE CHARACTER AS A RESULT OF OPERATION AND MAINTENANCE VESSEL ACTIVITIES AND THE PRESENCE OF THE COMPLETED WIND FARM INDIRECTLY LEADING TO CHANGES TO THE PERCEIVED HISTORIC USE OF THE SEASCAPE DURING THE OPERATION PHASE

### MAGNITUDE OF IMPACT

11.13.32 Magnitude of indirect impact on the HSC during the operations phase has been assessed according to the criteria outlined in Table 11.4 and is taking into account the embedded mitigations as outlined in Table 11.12: Outline Marine Written Scheme of Investigation.

11.13.33 HSC has been used in this assessment as a measure to provide a contextual and regional approach to the marine archaeology study area. Historic seascapes cannot be physically destroyed or damaged but impacts on them can change their historical character and the perception surrounding them.

11.13.34 The historic character of a seascape can be defined by its dynamic nature and ability to accommodate change. Perceptions of the seascape are also dynamic and subject to public awareness, time, and place. The intertidal and marine zones are ever changing due to physical processes such as currents, tidal range and sediment mobility. Considering this dynamism and the multiple dimensions defined by HSC, people create complex spatial relationships within and across all marine levels, reflected within the sites of cultural activity and their material imprints.

11.13.35 The presence of operation and maintenance vessels is considered to be comparatively inconsequential considering the current marine activity within the marine archaeology study area. The inshore activities at landfall will be short term and small scale with temporary use of larger construction vessels, as outlined in the assumed maximum impact table (Table 11.11).

11.13.36 The presence of cables on the sub seafloor and seafloor is unlikely to enter the perception of the public, and therefore are unlikely to change the public perception of seascape. Foundations within the water column and sea surface will likely contribute to a change in people's perception of the HSC. This can be a positive, negative, or neutral change which is dependent on personal experience of the area and will continue to be a subjective perception over time.

11.13.37 The magnitude of impact on marine heritage receptors on HSC, specifically the presence of cables on the sub seafloor and seafloor, foundations within the water column and sea surface and turbines above the sea surface during the operational phase is therefore assessed as a narrative using the Broad Historic Character Types, as summarised in Section 11.7.



11.13.38 It should be noted that changes to the visible elements of the shore and the sea surface have been assessed further in Volume 2, Chapter 10: Seascape, Landscape and Visual, and therefore this chapter only considers the historic aspects of Seascape Characterisation.

### SENSITIVITY (VALUE) OF THE RECEPTOR

11.13.39 The sensitivity (value) of the Broad Historic Character Types identified within proposed development is assessed in terms of their ability to adapt to change, as outlined in Section 11.7.

11.13.40 The existing seascape of VE marine archaeology study area is known for its marine and intertidal historic character utilised mainly for Navigation, Industry, Fishing, Ports and Docks, Coastal Infrastructure, Military, Settlements and Recreation.

11.13.41 HSC relates to the historic dimension of the present-day seascape and considers the added effect of VE within the multiple dimensions of the marine environment (sub sea floor, sea floor, water column, sea surface, coastal land and previous historic character) in combination with the existing activity within the Broad Historic Character Types, as detailed in Section 11.7 and Volume 4, Annex 11.1: Offshore Archaeology and Cultural Heritage Technical Report and summarised in Table 11.13.

**Table 11.16 Changes to the Historic Seascape Characterisation (HSC) during operation**

Broad Historic Character Types	Perception of the Historical Seascape Character	Changes to Perception
Navigation (activities, maritime safety and hazards)	This area along the east coast and Outer Thames Estuary has historically been an area of much of England's navigation activities and as such has demonstrated its capacity to accommodate change and growth over time.	Positive perceived change: the presence of substations and turbines will alter the navigational routes slightly, but all infrastructure will be fitted with navigational aids such as warning lights, facilitation easier navigation. Further the added addition of temporary vessel activities during the operation and maintenance phase in a busy navigational area is not expected to contribute with change to the HSC (see Volume 2, Chapter 9: Shipping and Navigation).
Industry (extractive, energy, processing, shipbuilding, shipping)	Industry in its many forms has been and continues to be the one of the dominant influences on the character across	No perceived change: the addition of VE infrastructure as a source of renewable energy would contribute to the



Broad Historic Character Types	Perception of the Historical Seascape Character	Changes to Perception
	coastal, intertidal and marine areas at all levels around the UK.	existing perception of industry the HSC, adding to a sense of a modern and sustainable industry. See also Volume 2, Chapter 10: Seascape, Landscape and Visual.
Fishing	The fishing industry of the Eastern England region has been evidenced since prehistoric times. Although the fishing industry in this area has seen a decline since the Second World War there is still a deeply ingrained sense of its traditional role in local lives and economy.	No perceived change: while some areas may be temporarily unavailable for fishing during the operation and maintenance phase, in the long term no change to HSC as a result of VE is expected on either local or offshore fishing industries. Also see Volume 2, Chapter 8: Commercial Fisheries.
Ports and docks	The Eastern England region contains numerous examples of small hard (consolidated loading platforms), quays and landing places and major ports including docks, ferry terminals and car terminals. Although many of the port locations may be inaccessible to the public, the harbours contain an amenity value which is linked to recreational and leisure activities such as sailing and wildlife watching. The ports of Colchester, Ipswich and Harwich are covered in the cumulative effects assessment (Table 11.19).	No change perceived: the HSC of the ports and docks is not expected to be altered during the operation and maintenance phase of VE.  Volume 3, Chapter 7: Archaeology and Cultural Heritage includes an assessment of historic assessment of quays;  Volume 2, Chapter 10: Seascape, Landscape and Visual includes baseline views of ports and quays.
Coastal Infrastructure (flood and erosion defences)	Sea, flood and erosion defences are generally seen as essential for the preservation of settlements along eastern coast of England for protecting property by preventing erosion and providing flood protection which conserves the economic value and provides local	No perceived change: the HSC of the coastal infrastructure is not expected to be altered during the operation and maintenance phase of VE.



Broad Historic Character Types	Perception of the Historical Seascape Character	Changes to Perception
	<p>residents with reassurance. Approaches vary from 'hard' defences, such as sea walls, which absorb or reflect wave energy, and 'soft', nature-based solutions which encourage natural systems, such as beaches and salt marshes which protect the coast.</p>	<p>Volume 3, Chapter 7: Archaeology and Cultural Heritage includes an assessment of HLC of coastal infrastructure.</p> <p>Volume 2, Chapter 10: Seascape, Landscape and Visual includes baseline views of coastal infrastructure.</p>
<p>Communications (transport, telecommunications)</p>	<p>Coastally specific and maritime-related infrastructure include canals, motorways, main roads, railways and airports which enabled people to settle in and visit coastal regions. Canals were an important element in the early industrial period as they allowed for low-cost transport of bulk and raw materials. The use of many of these diminished following the construction of new railway lines, but are maintained for continued recreational use, such as the Chelmer and Blackwater Canal.</p> <p>The presence of submarine telecommunications cables is likely to be known only to those who were involved in laying them, and to people involved in communications infrastructure. In spite of the importance of transport and telecommunications in the daily lives of the public their perception of the communications type is limited and based on the results of communications rather than their presence.</p>	<p>No perceived change: while canals are an integral part of the present social and cultural landscape their use and perception are now predominantly recreational rather than commercial or industrial. Modern society is dependent on submarine telecommunication cables. However, the current public perception of such infrastructure is understood to be minimal, and this is unlikely to change following the construction of VE.</p>



Broad Historic Character Types	Perception of the Historical Seascape Character	Changes to Perception
<p>Military (military defence and fortification)</p>	<p>Military coastal defences and military bases can be found all along the eastern coast. Examples range from Roman forts once established at Walton, to a heavy anti-aircraft gun site at Shotley Battery, as well as numerous records of military and aircraft battle sites and wreck sites.</p>	<p>Positive perceived change: active bases and abandoned military heritage bear witness to the UK's important military history. However, the impacts on HSC during the operation and maintenance phase of VE can be positive, ensuring increased protection and mitigation of impact on heritage receptors.</p> <p>Effects arising through change to HLC to military remains are outlined in Volume 3, Chapter 7: Archaeology and Cultural Heritage.</p> <p>Potential indirect and direct impacts on marine heritage receptors in the intertidal zone, and wrecks of military importance within the marine archaeology study area, are assessed in 11.12 to 11.18.</p>
<p>Settlements (urban)</p>	<p>The coastal area of the Eastern England region is densely populated. It includes a variety of coastal settlement types including urban settlements, major cities, tourist resorts and smaller fishing towns and villages.</p>	<p>Positive perceived change: the operation and maintenance phase is not anticipated to alter public perception of the HSC but has the potential to contribute to the perception of how the seascape connects to our past and change with our future.</p>
<p>Recreation (water sports, boating, recreational diving, swimming, wildlife watching)</p>	<p>Recreational enjoyment of the coast has a long history in the United Kingdom and tourism is an important source of income.</p>	<p>Positive perceived change: while some areas may be temporarily unavailable for recreational activities during the operation and maintenance phase, these areas will be accessible once more in the long term. Additionally, there is potential for improved public awareness of historic and</p>





Broad Historic Character Types	Perception of the Historical Seascape Character	Changes to Perception
		<p>recreational dive areas following the identification of wreck locations during archaeological surveys, leading to a greater understanding, respect and enjoyment of the seascape.</p> <p>Potential indirect and direct impacts on marine heritage receptors, such as wrecks, within the marine archaeology study area are assessed in Sections 11.12 to 11.18.</p>
Cultural Topography (palaeolandscape component)	The relevance of these to HSC is as areas of former human habitat with evidence for past topographical and ecological regimes, the contexts shaping much earlier human cultural activity and landscape perceptions.	<p>Positive perceived change: the planned and undertaken geoarchaeological campaigns both in the offshore zone and on land will contribute to a greater understanding and appreciation of past topographical and ecological regimes.</p> <p>The potential for survival of palaeolandscape components and submerged archaeology in the marine environment and deposits in the study area is further discussed in Section 11.7. The cultural topography landward is discussed in detail in Volume 3, Chapter 7: Archaeology and Cultural Heritage.</p>
Woodland	Coastal woodlands have been important in providing timber and other materials for boat building and other coastally focused activities. Patterns of woodland also form distinctive elements of the coastal landscape visible from the sea,	No perceived change: the HSC of the woodlands is not expected to be altered during the operation and maintenance phase.



Broad Historic Character Types	Perception of the Historical Seascape Character	Changes to Perception
	<p>aiding position-finding and natural navigation.</p>	<p>Volume 3, Chapter 7: Archaeology and Cultural Heritage includes an assessment of HLC of woodland.</p> <p>Volume 2, Chapter 10: Seascape, Landscape and Visual include baseline views of woodland.</p>
<p>Enclosed land (reclaimed land)</p>	<p>Reclamation in this area is from tidal marsh, usually saltmarsh, or wetland, with some areas being returned to saltmarsh as a buffer against rising sea-levels and storm surges.</p> <p>The current historical seascape perception of enclosed land is limited and is more relevant in the perception of the HLC.</p>	<p>No perceived change: the HSC of the enclosed lands is not expected to be altered during the operation and maintenance phase.</p> <p>Volume 3, Chapter 7: Archaeology and Cultural Heritage includes an assessment of HLC of enclosed land.</p> <p>Volume 3, Chapter 10: Seascape, Landscape and Visual include baseline views of enclosed land.</p>
<p>Unimproved land</p>	<p>The two main examples of unimproved land within the study area are heathland, which is dominated by dwarf shrubs including heathers and gorses and provides a habitat for many rare plant and animal species; and rough grassland, which is dominated by un-intensively managed grassland, often the result of long traditions of coastal rough grazing, but in some areas reintroduced as a conservation measure to prevent land reverting to scrub.</p> <p>The current historical seascape perception of enclosed land is</p>	<p>No perceived change: the HSC of the unimproved lands is not expected to be altered during the operation and maintenance phase.</p> <p>Volume 3, Chapter 7: Archaeology and Cultural Heritage includes an assessment of HLC of unimproved land.</p> <p>Volume 2, Chapter 10: Seascape, Landscape and Visual include baseline views of unimproved land.</p>



Broad Historic Character Types	Perception of the Historical Seascape Character	Changes to Perception
	limited and is more relevant in the perception of the HLC.	
Historic Landscape Characterisation (HLC)	There is some overlap between HSC and HLC in coastal and intertidal areas whose historic character has a distinctive maritime expression.	<p>No perceived change: the seascape dimension of the HLC is not expected to be altered during the operation and maintenance phase.</p> <p>Volume 3, Chapter 7: Archaeology and Cultural Heritage includes an assessment of HLC.</p> <p>Volume 2, Chapter 10: Seascape, Landscape and Visual include baseline views of HLC.</p>

## SIGNIFICANCE OF EFFECT

11.13.42 The commitment to undertake further archaeological works throughout the life of the project will be a requirement under the Outline Marine WSI (Volume 4, Annex 11.2: Outline Marine Written Scheme of Investigation) and associated documents (Table 11.12). This includes ensuring that HSC assessments where relevant are included throughout the life of the project.

11.13.43 It is therefore predicted that the ability to accommodate change is mainly a positive perceived change equalling a negligible magnitude. The significance of effect is therefore assessed as **negligible**, and the effect is consequently considered **not significant** in EIA terms.

## 11.14 ENVIRONMENTAL ASSESSMENT: DECOMMISSIONING PHASE

11.14.1 Activities associated with the decommissioning phase that have the potential to directly or indirectly impact marine archaeology receptors are considered here. The magnitude of all outlined impacts on marine heritage receptors has been assessed according to the criteria outlined in Table 11.4 and is taking into account the embedded mitigations as outlined in Table 11.12. The assumed maximum impact table (Table 11.11), demonstrates that potential direct and indirect impact during the operational phase is possible within the RLB and outlines relevant parameters.

11.14.2 If, as a result of the activities associated with the decommissioning phase, any marine heritage receptors are subject to increased sedimentation that covers and so protects the receptor, the marine heritage receptor might benefit from the conditions which could provide a higher level of preservation *in situ* and therefore a beneficial magnitude of impact.



11.14.3 The sensitivity (value) of the marine heritage receptors identified within the marine archaeology study area takes into account both the impact of magnitude (Table 11.4) and the sensitivity (value) of those receptors as a result of potential impacts during the operational phase. Professional judgement based on the guidance set out by the Department for Culture, Media and Sport (2013) has also been applied. The sensitivity (value) of the known marine heritage receptors potentially impacted during the decommissioning phase are detailed in Table 11.17.

**Table 11.17 Receptor sensitivity (value): Decommissioning phase**

No.	Marine archaeological receptor	Receptor sensitivity (value)
235	High potential anomalies	High
98	Medium potential anomalies	Medium
473	Low potential anomalies	High to Low
4115	Low potential magnetic anomalies	High to Low
6	High significance (archaeological term) known wrecks	High
23	Medium significance (archaeological term) known wrecks	High/ Medium
9	Low significance (archaeological term) known wrecks	High/ Medium
1	Unknown significance (archaeological term) known wrecks	Unknown
60	Reported losses/ fishermen's fasteners/ obstructions/ dead wrecks (not identified in geophysical data)	Low/ Negligible
	Channels, valleys and deposits of geoarchaeological potential	High to Low

**IMPACT 13: DIRECT IMPACT BY PENETRATION, COMPRESSION AND DISTURBANCE EFFECTS OF JACK-UP BARGES AND ANCHORING OF DECOMMISSIONING VESSELS LEADING TO TOTAL OR PARTIAL LOSS OF MARINE HERITAGE RECEPTORS**

**MAGNITUDE OF IMPACT**

11.14.4 The impacts of decommissioning activities on marine heritage receptors may lead to direct impact and total or partial loss of marine archaeology receptors. If a direct impact occurs, it will generally be local, major and adverse or irreversible and result in a permanent change to the receptor, meaning **High** impact of magnitude as detailed in Table 11.4).

**SENSITIVITY (VALUE) OF THE RECEPTOR**

11.14.5 The sensitivity (value) of the marine heritage receptors identified within the marine archaeology study area is considered to be **negligible** to **high** as defined in Table 11.5 which takes into account both the impact of magnitude (Table 11.4) and the sensitivity (value) of those receptors as a result of potential impacts. The sensitivity (value) of the known marine heritage receptors potentially impacted by the decommissioning activities is detailed in Table 11.17.



## SIGNIFICANCE OF EFFECT

- 11.14.6 As per embedded mitigation outlined in Table 11.12 locations on the seabed of potential and confirmed marine heritage receptors are informed by the archaeological assessment of geophysical and geotechnical data and Archaeological Exclusion Zones have been recommended as outlined in Volume 4, Annex 11.2: Outline Marine Written Scheme of Investigation.
- 11.14.7 Mitigation by avoidance aims to ensure that there is no direct, indirect, or permanent impact on marine heritage receptors of the proposed VE development meaning a **negligible** magnitude of impact as defined in Table 11.4.
- 11.14.8 Where avoidance is not possible or in case of not yet located marine heritage receptors further mitigation and archaeological works will be a requirement under Volume 4, Annex 11.2 and associated documents, to ensure **negligible** magnitude of impact as defined in Table 11.4.
- 11.14.9 It is predicted that the sensitivity (value) of known heritage receptors impacted by decommissioning activities is **negligible** to **very high** (Table 11.17).
- 11.14.10 Considering the magnitude of impact and receptor sensitivity (value) within the significance of effect matrix (Table 11.6) on marine heritage receptors potentially effected by decommissioning activities, the magnitude of impact is assessed as **negligible (neutral)** and the sensitivity (value) of the receptor as **negligible** to **high**. The significance of effect has therefore been assessed as **minor** to **negligible** and the effect is consequently considered **not significant** in EIA terms.

**IMPACT 14: INDIRECT IMPACTS CREATING DRAW-DOWN OF SEDIMENT INTO VOIDS LEFT BY REMOVED WTG FOUNDATIONS LEADING TO LOSS OF SEDIMENT OR DESTABILIZATION OF ARCHAEOLOGICAL SITES AND CONTEXTS INDIRECTLY LEADING TO EXPOSING MARINE HERITAGE RECEPTORS TO NATURAL, CHEMICAL, OR BIOLOGICAL PROCESSES AND CAUSING OR ACCELERATING LOSS OF THE SAME.**

## MAGNITUDE OF IMPACT

- 11.14.11 Magnitude of indirect impact on marine heritage receptors of sediment disturbance as a result of draw-down effects may lead to exposure of those marine heritage receptors to natural, chemical or biological processes and indirectly cause or accelerate their loss. If an indirect impact occurs, it will generally be local, major and adverse or irreversible and result in a permanent change to the receptor meaning **High** impact of magnitude as detailed in Table 11.4).

## SENSITIVITY (VALUE) OF THE RECEPTOR

- 11.14.12 The sensitivity (value) of the marine heritage receptors identified within the marine archaeology study area is considered to be **negligible** to **high** as defined in Table 11.5 which takes into account both the impact of magnitude (Table 11.4) and the sensitivity (value) of those receptors as a result of potential impacts. The sensitivity (value) of the known marine heritage receptors potentially impacted by sediment disturbance as a result of draw-down effects is detailed in Table 11.17.



## SIGNIFICANCE OF EFFECT

- 11.14.13 As per embedded mitigation outlined in Table 11.12 locations on the seabed of potential and confirmed marine heritage receptors are informed by the archaeological assessment of geophysical and geotechnical data and Archaeological Exclusion Zones have been recommended as outlined in Volume 4, Annex 11.2: Outline Marine Written Scheme of Investigation.
- 11.14.14 Mitigation by avoidance aims to ensure that there is no direct, indirect, or permanent impact on marine heritage receptors of the proposed VE development meaning a **negligible** magnitude of impact as defined in Table 11.4.
- 11.14.15 Where avoidance is not possible or in case of not yet located marine heritage receptors further mitigation and archaeological works will be a requirement under Volume 4, Annex 11.2 and associated documents, to ensure **negligible** magnitude of impact as defined in Table 11.4.
- 11.14.16 It is predicted that the sensitivity (value) of known heritage receptors impacted by draw-down effects is **negligible** to **very high** (Table 11.17).
- 11.14.17 Considering the magnitude of impact and receptor sensitivity (value) within the significance of effect matrix (Table 11.6) on marine heritage receptors potentially effected by draw-down effects, the magnitude of impact is assessed as **negligible (neutral)** and the sensitivity (value) of the receptor as **negligible** to **high**. The significance of effect has therefore been assessed as **minor** to **negligible** and the effect is consequently considered **not significant** in EIA terms.

## IMPACT 15: INDIRECT IMPACTS CAUSING CHANGES TO THE HISTORIC SEASCAPE CHARACTER AS A RESULT OF DECOMMISSIONING ACTIVITIES AND THE REMOVAL OF WIND FARM COMPONENTS INDIRECTLY LEADING TO CHANGES TO THE PERCEIVED HISTORIC USE OF THE SEASCAPE DURING THE DECOMMISSIONING PHASE.

### MAGNITUDE OF IMPACT

- 11.14.18 Magnitude of indirect impact on the HSC during the decommissioning phase has been assessed according to the criteria outlined in Table 11.4 and is taking into account the embedded mitigations as outlined in Table 11.12.
- 11.14.19 HSC has been used in this assessment as a measure to provide a contextual and regional approach to the marine archaeology study area. Historic seascapes cannot be physically destroyed or damaged but impacts on them can change their historical character and the perception surrounding them.
- 11.14.20 The historic character of a seascape can be defined by its dynamic nature and ability to accommodate change. Perceptions of the seascape are also dynamic and subject to public awareness, time, and place. The intertidal and marine zones are ever changing due to physical processes such as currents, tidal range and sediment mobility. Considering this dynamism and the multiple dimensions defined by HSC, people create complex spatial relationships within and across all marine levels, reflected within the sites of cultural activity and their material imprints.



- 11.14.21 The presence of decommissioning vessels is considered to be comparatively inconsequential considering the current marine activity within the marine archaeology study area. The inshore activities at landfall will be short term and small scale with temporary use of larger decommissioning vessels, as outlined in the assumed maximum impact table (Table 11.11).
- 11.14.22 The presence of cables on the sub seafloor and seafloor is unlikely to enter the perception of the public, and therefore are unlikely to change the public perception of seascape. The removal of the foundations from the water column and sea surface will likely contribute to a change in people's perception of the HSC. This can be a positive, negative, or neutral change which is dependent on personal experience of the area and will continue to be a subjective perception over time.
- 11.14.23 The magnitude of impact on marine heritage receptors on HSC, specifically the presence of cables on the sub seafloor and seafloor, removal of foundations from the water column and sea surface and turbines above the sea surface during the decommissioning phase is therefore assessed as a narrative using the Broad Historic Character Types, as summarised in Section 11.7.
- 11.14.24 It should be noted that changes to the visible elements of the shore and the sea surface have been assessed further in Volume 2, Chapter 10: Seascape, Landscape and Visual, and therefore this chapter only considers the historic aspects of Seascape Characterisation.

#### SENSITIVITY (VALUE) OF THE RECEPTOR

- 11.14.25 The sensitivity (value) of the Broad Historic Character Types identified within proposed development is assessed in terms of their ability to adapt to change, as outlined in Section 11.7.
- 11.14.26 The existing seascape of VE marine archaeology study area is known for its marine and intertidal historic character utilised mainly for Navigation, Industry, Fishing, Ports and Docks, Coastal Infrastructure, Military, Settlements and Recreation.
- 11.14.27 HSC relates to the historic dimension of the present-day seascape and considers the added effect of VE within the multiple dimensions of the marine environment (sub sea floor, sea floor, water column, sea surface, coastal land and previous historic character) in combination with the existing activity within the Broad Historic Character Types, as detailed in Section 11.7. and Volume 4, Annex 11.1: Offshore Archaeology and Cultural Heritage Technical Report and summarised in Table 11.18.



**Table 11.18 Changes to the Historic Seascape Characterisation (HSC) during decommissioning**

Broad Historic Character Types	Perception of the Historical Seascape Character	Changes to Perception
Navigation (activities, maritime safety and hazards)	This area along the east coast and Outer Thames Estuary has historically been an area of much of England's navigation activities and as such has demonstrated its capacity to accommodate change and growth over time.	No change perceived: the added addition of temporary vessel activities in a busy navigational area is not expected to contribute with change (see Volume 2, Chapter 9).
Industry (extractive, energy, processing, shipbuilding, shipping)	Industry in its many forms has been and continues to be the one of the dominant influences on the character across coastal, intertidal and marine areas at all levels around the UK.	No perceived change: the addition of VE infrastructure as a source of renewable energy would contribute to the existing perception of industry the HSC, adding to a sense of a modern and sustainable industry. See also Volume 2, Chapter 10.
Fishing	The fishing industry of the Eastern England region has been evidenced since prehistoric times. Although the fishing industry in this area has seen a decline since the Second World War there is still a deeply ingrained sense of its traditional role in local lives and economy.	No perceived change: while some areas may be temporarily unavailable for fishing during the decommissioning phase, in the long term no change to HSC as a result of VE is expected on either local or offshore fishing industries. Also see Volume 2, Chapter 8.
Ports and docks	The Eastern England region contains numerous examples of small hard (consolidated loading platforms), quays and landing places and major ports including docks, ferry terminals and car terminals. Although many of the port locations may be inaccessible to the public, the harbours contain an amenity value which is linked to recreational and leisure activities such as sailing and	No change perceived: the HSC of the ports and docks is not expected to be altered during the decommissioning phase of VE.  Volume 3, Chapter 7: Archaeology and Cultural Heritage includes an assessment of historic assessment of quays;





Broad Historic Character Types	Perception of the Historical Seascape Character	Changes to Perception
	wildlife watching. The ports of Colchester, Ipswich and Harwich are covered in the cumulative effects assessment (Table 11.19).	Volume 2, Chapter 10: Seascape, Landscape and Visual includes baseline views of ports and quays.
Coastal Infrastructure (flood and erosion defences)	Sea, flood and erosion defences are generally seen as essential for the preservation of settlements along eastern coast of England for protecting property by preventing erosion and providing flood protection which conserves the economic value and provides local residents with reassurance. Approaches vary from 'hard' defences, such as sea walls, which absorb or reflect wave energy, and 'soft', nature-based solutions which encourage natural systems, such as beaches and salt marshes which protect the coast.	<p>No perceived change: the HSC of the coastal infrastructure is not expected to be altered during the decommissioning phase of VE.</p> <p>Volume 3, Chapter 7: Archaeology and Cultural Heritage includes an assessment of HLC of coastal infrastructure.</p> <p>Volume 2, Chapter 10: Seascape, Landscape and Visual includes baseline views of coastal infrastructure.</p>
Communications (transport, telecommunications)	<p>Coastally specific and maritime-related infrastructure include canals, motorways, main roads, railways and airports which enabled people to settle in and visit coastal regions. Canals were an important element in the early industrial period as they allowed for low-cost transport of bulk and raw materials. The use of many of these diminished following the construction of new railway lines, but are maintained for continued recreational use, such as the Chelmer and Blackwater Canal.</p> <p>The presence of submarine telecommunications cables is</p>	<p>No perceived change: while canals are an integral part of the present social and cultural landscape their use and perception are now predominantly recreational rather than commercial or industrial. Modern society is dependent on submarine telecommunication cables. However, the current public perception of such infrastructure is understood to be minimal, and this is unlikely to change following the construction of VE.</p>



Broad Historic Character Types	Perception of the Historical Seascape Character	Changes to Perception
	<p>likely to be known only to those who were involved in laying them, and to people involved in communications infrastructure. In spite of the importance of transport and telecommunications in the daily lives of the public their perception of the communications type is limited and based on the results of communications rather than their presence.</p>	
<p>Military (military defence and fortification)</p>	<p>Military coastal defences and military bases can be found all along the eastern coast. Examples range from Roman forts once established at Walton, to a heavy anti-aircraft gun site at Shotley Battery, as well as numerous records of military and aircraft battle sites and wreck sites.</p>	<p>Positive perceived change: active bases and abandoned military heritage bear witness to the UK's important military history. However, the impacts on HSC during the decommissioning phase of VE can be positive, ensuring increased protection and mitigation of impact on heritage receptors.</p> <p>Effects arising through change to HLC to military remains are outlined in Volume 3, Chapter 7: Archaeology and Cultural Heritage.</p> <p>Potential indirect and direct impacts on marine heritage receptors in the intertidal zone, and wrecks of military importance within the marine archaeology study area, are assessed in Sections 11.12 to 11.18.</p>
<p>Settlements (urban)</p>	<p>The coastal area of the Eastern England region is densely populated. It includes a variety of coastal settlement types including urban settlements, major cities, tourist resorts and</p>	<p>Positive perceived change: the decommissioning phase is not anticipated to alter public perception of the HSC but has the potential to contribute to the perception of how the seascape connects to our</p>



Broad Historic Character Types	Perception of the Historical Seascape Character	Changes to Perception
	smaller fishing towns and villages.	past and change with our future.
Recreation (water sports, boating, recreational diving, swimming, wildlife watching)	Recreational enjoyment of the coast has a long history in the United Kingdom and tourism is an important source of income.	<p>Positive perceived change: while some areas may be temporarily unavailable for recreational activities during the decommissioning phase, these areas will be accessible once more in the long term. Additionally, there is potential for improved public awareness of historic and recreational dive areas following the identification of wreck locations during archaeological surveys, leading to a greater understanding, respect and enjoyment of the seascape.</p> <p>Potential indirect and direct impacts on marine heritage receptors, such as wrecks, within the marine archaeology study area are assessed in Sections 11.12 to 11.18.</p>
Cultural Topography (palaeolandscape component)	The relevance of these to HSC is as areas of former human habitat with evidence for past topographical and ecological regimes, the contexts shaping much earlier human cultural activity and landscape perceptions.	<p>Positive perceived change: the planned and undertaken geoarchaeological campaigns both in the offshore zone and on land will contribute to a greater understanding and appreciation of past topographical and ecological regimes.</p> <p>The potential for survival of palaeolandscape components and submerged archaeology in the marine environment and deposits in the study area is further discussed in Section 11.7. The cultural topography</p>



Broad Historic Character Types	Perception of the Historical Seascape Character	Changes to Perception
		landward is discussed in detail in Volume 3, Chapter 7: Archaeology and Cultural Heritage.
Woodland	Coastal woodlands have been important in providing timber and other materials for boat building and other coastally focused activities. Patterns of woodland also form distinctive elements of the coastal landscape visible from the sea, aiding position-finding and natural navigation.	<p>No perceived change: the HSC of the woodlands is not expected to be altered during the decommissioning phase.</p> <p>Volume 3, Chapter 7: Archaeology and Cultural Heritage includes an assessment of HLC of woodland.</p> <p>Volume 2, Chapter 10: Seascape, Landscape and Visual include baseline views of woodland.</p>
Enclosed land (reclaimed land)	<p>Reclamation in this area is from tidal marsh, usually saltmarsh, or wetland, with some areas being returned to saltmarsh as a buffer against rising sea-levels and storm surges.</p> <p>The current historical seascape perception of enclosed land is limited and is more relevant in the perception of the HLC.</p>	<p>No perceived change: the HSC of the enclosed lands is not expected to be altered during the decommissioning phase.</p> <p>Volume 3, Chapter 7: Archaeology and Cultural Heritage includes an assessment of HLC of enclosed land.</p> <p>Volume 3, Chapter 10: Seascape, Landscape and Visual include baseline views of enclosed land.</p>
Unimproved land	The two main examples of unimproved land within the study area are heathland, which is dominated by dwarf shrubs including heathers and gorses and provides a habitat for many rare plant and animal species; and rough grassland, which is dominated by un-	<p>No perceived change: the HSC of the unimproved lands is not expected to be altered during the decommissioning phase.</p> <p>Volume 3, Chapter 7: Archaeology and Cultural</p>



Broad Historic Character Types	Perception of the Historical Seascape Character	Changes to Perception
	<p>intensively managed grassland, often the result of long traditions of coastal rough grazing, but in some areas reintroduced as a conservation measure to prevent land reverting to scrub.</p> <p>The current historical seascape perception of enclosed land is limited and is more relevant in the perception of the HLC.</p>	<p>Heritage includes an assessment of HLC of unimproved land.</p> <p>Volume 2, Chapter 10: Seascape, Landscape and Visual include baseline views of unimproved land.</p>
Historic Landscape Characterisation (HLC)	<p>There is some overlap between HSC and HLC in coastal and intertidal areas whose historic character has a distinctive maritime expression.</p>	<p>No perceived change: the seascape dimension of the HLC is not expected to be altered during the decommissioning phase.</p> <p>Volume 3, Chapter 7: Archaeology and Cultural Heritage includes an assessment of HLC.</p> <p>Volume 2, Chapter 10: Seascape, Landscape and Visual include baseline views of HLC.</p>

## SIGNIFICANCE OF EFFECT

- 11.14.28 The commitment to undertake further archaeological works throughout the life of the project will be a requirement under Volume 4, Annex 11.2 and associated documents (Table 11.12). This includes ensuring that HSC assessments where relevant are included throughout the life of the project.
- 11.14.29 It is therefore predicted that the ability to accommodate change is mainly a positive perceived change equalling a negligible magnitude. The significance of effect is therefore assessed as **negligible**, and the effect is consequently considered **not significant** in EIA terms.

## 11.15 ENVIRONMENTAL ASSESSMENT: CUMULATIVE EFFECTS

- 11.15.1 This cumulative impact assessment for Offshore Archaeology and Cultural Heritage has been undertaken in accordance with the methodology provided in Volume 1, Annex 3.1: Cumulative Effects Assessment Methodology.
- 11.15.2 The allocation of 'tiers' is described in detail in Volume 1, Annex 3.1: Cumulative Effects Assessment Methodology and outlined here in Table 11.19, and refers to the development stage of the projects assessed.



**Table 11.19: Description of Tiers of other developments considered for cumulative effect assessment.**

Tiers	Development Stage
Tier 1	Projects under construction.
	Permitted applications, whether under the Planning Act 2008 or other regimes, but not yet implemented.
	Submitted applications, whether under the Planning Act 2008 or other regimes, but not yet determined.
Tier 2	Projects on the Planning Inspectorate’s Programme of Projects where a Scoping Report has been submitted.
	Projects under the Planning Act 2008 where a PEIR has been submitted for consultation.
Tier 3	Projects on the Planning Inspectorate’s Programme of Projects where a Scoping Report has not been submitted.
	Identified in the relevant Development Plan (and emerging Development Plans with appropriate weight being given as they move closer to adoption) recognising that much information on any relevant proposals will be limited.
	Identified in other plans and programmes (as appropriate) which set the framework for future development consents/ approvals, where such development is reasonably likely to come forward.

11.15.3 For marine archaeology and cultural heritage, cumulative interactions may occur with other planned projects and developments in the study area.

11.15.4 A Zone of Influence (ZOI) of 50 km from the marine archaeology study area has been applied for the CEA to ensure direct and indirect cumulative effects can be appropriately identified and assessed.

11.15.5 The projects and plans selected as relevant to the assessment of impacts to Offshore Archaeology and Cultural Heritage are based upon an initial screening exercise undertaken on a long list. Each project, plan or activity has been considered and scoped in or out on the basis of effect–receptor pathway, data confidence and the temporal and spatial scales involved. For the purposes of assessing the impact of the VE on Offshore Archaeology and Cultural Heritage in the region, the cumulative effect assessment technical note submitted through the EIA Evidence Plan and forming Technical Annex 1.3.1 of this PEIR screened in a number of projects and plans as presented in Table 11.19.



**Table 11.20 Projects considered within the Offshore Archaeology and Cultural Heritage cumulative effect assessment**

Development type	Project	Status	Data confidence assessment/ phase	Tier
Aggregates Production Area	<ul style="list-style-type: none"> <li>&gt; Tarmac Marine Ltd (509/1)</li> <li>&gt; Tarmac Marine Ltd (509/2)</li> <li>&gt; CEMEX UK Marine Ltd (510/2)</li> <li>&gt; Tarmac Marine Ltd (509/3)</li> <li>&gt; CEMEX UK Marine Ltd (510/1)</li> <li>&gt; Britannia Aggregates Ltd (508)</li> <li>&gt; DEME Building Materials Ltd (524)</li> <li>&gt; CEMEX UK Marine Ltd (507/1)</li> <li>&gt; CEMEX UK Marine Ltd (507/3)</li> <li>&gt; CEMEX UK Marine Ltd (507/4)</li> <li>&gt; Britannia Aggregates Ltd (498)</li> <li>&gt; Volker Dredging Ltd (498)</li> <li>&gt; Westminster Gravels Ltd (501)</li> <li>&gt; CEMEX UK Marine Ltd (507/2)</li> <li>&gt; CEMEX UK Marine Ltd (507/6)</li> <li>&gt; CEMEX UK Marine Ltd (507/5)</li> <li>&gt; CEMEX UK Marine Ltd (430)</li> <li>&gt; Tarmac Marine Ltd (430)</li> </ul>	Operational	Medium - Third party project details published in the public domain and confirmed as being 'accurate'	Tier 1



Development type	Project	Status	Data confidence assessment/ phase	Tier
Sea Disposal Sites	<ul style="list-style-type: none"> <li>&gt; Inner Gabbard (TH052)</li> <li>&gt; Harwich Haven (TH027)</li> <li>&gt; Horsey (TH230)</li> <li>&gt; Inner Gabbard East (TH056)</li> <li>&gt; EA One Route EC-2 (TH221)</li> <li>&gt; EA One Route EC-1 (TH220)</li> <li>&gt; Copperas (TH216)</li> <li>&gt; Erwarnton Track (TH217)</li> <li>&gt; Orwell East Track (TH219)</li> <li>&gt; Wrabness Beach East (TH229)</li> <li>&gt; Orwell West Track (TH218)</li> <li>&gt; Wrabness Beach (TH213)</li> <li>&gt; Levington Site 3 (TH227)</li> <li>&gt; River Orwell (ABP) (TH034)</li> <li>&gt; Levington Site 4 (TH228)</li> <li>&gt; Levington Site 2 (TH226)</li> <li>&gt; Levington Site 1 (TH225)</li> <li>&gt; EA One Route EC-3 (TH222)</li> <li>&gt; South Falls (TH070)</li> <li>&gt; East Anglia One (TH023)</li> </ul>	Open	Medium - Third party project details published in the public domain and confirmed as being 'accurate'	Tier 1





Development type	Project	Status	Data confidence assessment/ phase	Tier
	<ul style="list-style-type: none"> <li>&gt; Orwell Yacht Club (TH032)</li> <li>&gt; EA One Route EC-5 (TH224)</li> <li>&gt; EAOW3 (HU212)</li> <li>&gt; EA One Route EC-4 (TH223)</li> <li>&gt; TEOW Disposal site 1 (TH153)</li> <li>&gt; Northey Island (TH058)</li> <li>&gt; Maldon Saltings 3 (TH064)</li> <li>&gt; TEOW Disposal site 2 (TH154)</li> <li>&gt; TEOW Disposal site 3 (TH155)</li> <li>&gt; Whitstable C (TH073)</li> <li>&gt; Nemo Disposal Site B (TH151)</li> <li>&gt; Nemo Disposal Site A (TH150)</li> </ul>			
Offshore Wind Farm Export Cable	<ul style="list-style-type: none"> <li>&gt; East Anglia Three Transmission Asset</li> <li>&gt; EA1N Transmission Asset</li> </ul>	Consented	High - Third party project details published in the public domain and confirmed as being 'accurate' by The Crown Estate	Tier 1
	<ul style="list-style-type: none"> <li>&gt; EA2 Transmission Asset</li> </ul>	In planning		



Development type	Project	Status	Data confidence assessment/ phase	Tier
Offshore Wind Farm Export Cable	> EA2 Transmission Asset	In planning	High - Third party project details published in the public domain and confirmed as being 'accurate' by The Crown Estate	Tier 1
	> East Anglia Three Transmission Asset > EA1N Transmission Asset	Consented		
Interconnector and Telecommunication Cables	> NueConnect Interconnector > Nautilus MPI > Mercator > Belgium Energio Nordsoon Denmark > Gridlink	Proposed	Medium - Third party project details published in the public domain but not confirmed as being 'accurate'	Tier 2
Offshore Wind Farm	> Northwester 2 > Borssele Kavel IV > Belwind phase 2 (Nobelwind) (Zone 1) > Belwind phase 1 > Belwind phase 2 (Nobelwind) (Zone 2) > Seastar	Production	High - Third party project details published in the public domain and confirmed as being 'accurate' by The Crown Estate	Tier 1



Development type	Project	Status	Data confidence assessment/ phase	Tier
	<ul style="list-style-type: none"> <li>&gt; East Anglia TWO</li> <li>&gt; East Anglia ONE NORTH</li> </ul>	Consented	High - Third party project details published in the public domain and confirmed as being 'accurate' by The Crown Estate	Tier 1
	<ul style="list-style-type: none"> <li>&gt; Borssele</li> </ul>	Planned	High - Third party project details published in the public domain and confirmed as being 'accurate' by The Crown Estate	Tier 2
	<ul style="list-style-type: none"> <li>&gt; North Falls</li> </ul>	Pre-planning application	High - Third party project details published in the public domain and confirmed as being 'accurate' by The Crown Estate	Tier 2
Hybrid Wave/ Wind Energy	<ul style="list-style-type: none"> <li>&gt; Mermaid</li> </ul>	Consented	High - Third party project details published in the public domain and confirmed as being 'accurate' by The Crown Estate	Tier 1
World Ports Index (WPI)	<ul style="list-style-type: none"> <li>&gt; Harwich</li> <li>&gt; Ipswich</li> <li>&gt; Colchester</li> </ul>	Active	High - Third party project details published in the public domain and confirmed as being 'accurate' by The Crown Estate	Tier 1



Development type	Project	Status	Data confidence assessment/ phase	Tier
Military, aviation and radar: Live Firing, Demolition of UXO, Pilotless Target Aircraft and Unmanned Aircraft Systems (VLOS / BVLOS) and Mine Counter Measures.	<ul style="list-style-type: none"> <li>&gt; X5121 - X5120 - X5119 N+S Galloper Kentish Knock</li> <li>&gt; X5118 Gunfleet</li> <li>&gt; D138b Shoeburyness</li> <li>&gt; D138a Shoeburyness</li> <li>&gt; D138 Shoeburyness</li> <li>&gt; D138c Shoeburyness</li> <li>&gt; D139 Fingringhoe</li> <li>&gt; D136 Shoeburyness</li> <li>&gt; X5117 Outer Gabbard</li> </ul>	Active	High - Third party project details published in the public domain and confirmed as being 'accurate' by The Crown Estate	Tier 1



**Table 11.21 Cumulative MDS for Offshore Archaeology and Cultural Heritage**

Impact	Scenario	Justification
<p>Impact 16: Direct impact of sediment removal containing undisturbed archaeological contexts or by penetration, compression, and disturbance of sediment leading to total or partial loss of marine heritage receptors.</p>	<p>Tier 1:</p> <ul style="list-style-type: none"> <li>&gt; Aggregates Production Areas</li> <li>&gt; Sea Disposal Sites</li> <li>&gt; Offshore Wind Farm Export Cables</li> <li>&gt; Telecommunication Cables</li> <li>&gt; Offshore Wind Farms</li> <li>&gt; Hybrid Wave/ Wind Energy</li> <li>&gt; World Ports Index (WPI)s</li> <li>&gt; Military, Aviation and Radar</li> <li>&gt; Live Firing, Demolition of UXO and Unmanned Aircraft Systems (VLOS)</li> <li>&gt; Live Firing, Demolition of UXO, Pilotless Target Aircraft and Unmanned Aircraft Systems (VLOS / BVLOS)</li> <li>&gt; Mine Counter Measures</li> <li>&gt; Outfall pipes</li> </ul> <p>Tier 2:</p> <ul style="list-style-type: none"> <li>&gt; Telecommunication Cables               <ul style="list-style-type: none"> <li>&gt; NueConnect Interconnector</li> <li>&gt; Nautilus MPI</li> </ul> </li> </ul>	<p>Intrusive seabed activities as well as vessel operations during all project phases of VE cumulatively with activities undertaken by the projects listed in Table 11.19 have the potential to contribute direct impacts on marine heritage receptors.</p>



Impact	Scenario	Justification
	<ul style="list-style-type: none"> <li>&gt; Mercator</li> <li>&gt; Belgium Energio Nordsoon Denmark</li> <li>&gt; Gridlink</li> <li>&gt; Offshore Wind Farms               <ul style="list-style-type: none"> <li>&gt; Borssele</li> <li>&gt; North Falls</li> </ul> </li> </ul> <p>Tier 3: No Tier 3 projects are included in this assessment</p>	
<p>Impact 17: Indirect impact causing disturbance of sediment containing potential marine heritage receptors (material and contexts) exposing the receptors to natural, chemical or biological processes and causing or accelerating loss of the same.</p>	<p>Tier 1:</p> <ul style="list-style-type: none"> <li>&gt; Aggregates Production Areas</li> <li>&gt; Sea Disposal Sites</li> <li>&gt; Offshore Wind Farm Export Cables</li> <li>&gt; Offshore Wind Farm Export Cables</li> <li>&gt; Telecommunication Cables</li> <li>&gt; Offshore Wind Farms</li> <li>&gt; World Ports</li> <li>&gt; Military, Aviation and Radar</li> </ul>	<p>Seabed activities contributing to sediment movement or disturbance during all project phases of VE cumulatively with activities undertaken by the projects listed in Table 11.19 have the potential to contribute indirect impacts on marine heritage receptors.</p>



Impact	Scenario	Justification
	<ul style="list-style-type: none"><li>&gt; Live Firing, Demolition of UXO and Unmanned Aircraft Systems (VLOS)</li><li>&gt; Live Firing, Demolition of UXO, Pilotless Target Aircraft and Unmanned Aircraft Systems (VLOS / BVLOS)</li><li>&gt; Mine Counter Measures</li></ul> <p>Tier 2:</p> <ul style="list-style-type: none"><li>&gt; Telecommunication Cables<ul style="list-style-type: none"><li>&gt; NueConnect Interconnector</li><li>&gt; Nautilus MPI</li><li>&gt; Mercator</li><li>&gt; Belgium Energio Nordsoon Denmark</li><li>&gt; Gridlink</li></ul></li><li>&gt; Offshore Wind Farms<ul style="list-style-type: none"><li>&gt; Borssele</li><li>&gt; North Falls</li></ul></li></ul> <p>Tier 3:</p> <p>No Tier 3 projects are included in this assessment</p>	



Impact	Scenario	Justification
<p>Impact 18: Indirect impact causing changes to the Historic Seascape Character as a result of cumulative effects indirectly leading to changes to the perceived historic use of the seascape.</p>	<p>Tier 1:</p> <ul style="list-style-type: none"> <li>&gt; Aggregates Production Areas</li> <li>&gt; Sea Disposal Sites</li> <li>&gt; Offshore Wind Farm Export Cables</li> <li>&gt; Offshore Wind Farm Export Cables</li> <li>&gt; Telecommunication Cables</li> <li>&gt; Offshore Wind Farms</li> <li>&gt; Hybrid Wave/ Wind Energy</li> <li>&gt; World Ports</li> <li>&gt; Military, Aviation and Radar</li> <li>&gt; Live Firing, Demolition of UXO and Unmanned Aircraft Systems (VLOS)</li> <li>&gt; Live Firing, Demolition of UXO, Pilotless Target Aircraft and Unmanned Aircraft Systems (VLOS / BVLOS)</li> <li>&gt; Mine Counter Measures</li> <li>&gt; Outfall pipes</li> </ul> <p>Tier 2:</p> <ul style="list-style-type: none"> <li>&gt; Telecommunication Cables               <ul style="list-style-type: none"> <li>&gt; NueConnect Interconnector</li> <li>&gt; Nautilus MPI</li> </ul> </li> </ul>	<p>Indirect impact on the Historic Seascape Character during all project phases of VE cumulatively with activities undertaken by the projects listed in Table 11.19 have the potential to change the historic character and the perception surrounding them.</p>





Impact	Scenario	Justification
	<ul style="list-style-type: none"><li>&gt; Mercator</li><li>&gt; Belgium Energio Nordsoon Denmark</li><li>&gt; Gridlink</li><li>&gt; Offshore Wind Farms<ul style="list-style-type: none"><li>&gt; Borssele</li><li>&gt; North Falls</li></ul></li></ul> <p>Tier 3: No Tier 3 projects are included in this assessment</p>	



## AGGREGATES PRODUCTION AREAS AND SEA DISPOSAL SITES

- 11.15.6 Indirect impacts from cumulative sediment changes during all VE project phases and the presence of active aggregate production areas and sea disposal sites in the locality, as set out in Table 11.20 may result in loss or accumulation of sediment, thereby altering or destabilising archaeological sites and contexts, including paleoenvironmental material, and exposing such material to natural, chemical, or biological processes, causing or accelerating loss of the receptor.
- 11.15.7 Despite the intrusive nature of dredging operations and disposal activities on the seafloor, no direct cumulative impacts on marine heritage receptors within the VE PEIR RLB are expected as there is no spatial overlap with aggregate production areas and the VE PEIR RLB.
- 11.15.8 The cumulative effects during all VE project phases and the described active aggregate production areas and disposal sites are therefore predicted to be of local spatial extent, long term duration, continuous and limited reversibility.
- 11.15.9 The British Marine Aggregate Producers Association (BMAPA) ensures that proportionate planning is undertaken which provides a framework to enable delivery of a 'licence to operate' for all dredging activities and operations. A Guidance Note is produced and agreed which considers the sensitivity (value) of heritage assets within proposed and active dredging areas (Crown Estate, 2017). The Guidance Note also ensures that known and unlocated marine heritage receptors are addressed at every stage of marine aggregate development and production.

## OFFSHORE WIND FARMS

- 11.15.10 There are 20 offshore windfarms within the ZOI, with 10 operational at the time of writing. The potential impacts on marine archaeological receptors during the construction phase of the operational projects is considered to have been assessed by the individual projects, and no cumulative effect of sediment movement is expected between VE and the operational projects. Therefore, the operational offshore wind farms are not further considered in this cumulative assessment.
- 11.15.11 The remaining 10 are in pre-application through to production stages, as outlined in Table 11.20. Offshore wind farms normally consist of subsea cables and permanent structures on the seabed. It is expected that all offshore wind farm construction phases, as well as the operation and maintenance phases, have the potential to cause seabed disturbance as cables and foundation structures require regular planned and unplanned maintenance.
- 11.15.12 Therefore, cumulative sediment changes during all VE project phases could result in the loss or accumulation of sediment. This disturbance could alter or destabilise archaeological sites and contexts, including paleoenvironmental material and expose such material to natural, chemical or biological processes, causing or accelerating loss of the same.



- 11.15.13 Cumulative impacts may also occur indirectly through the cumulative lack of access to the historic environment and palaeoenvironmental evidence. The total coverage of the VE infrastructure (foundations and cables), as detailed in Table 11.11 will cover 403,116m<sup>2</sup> of the seabed which would impede direct access below the infrastructure for up to 30 years. The lack of access will be offset by the gathering of information (including geophysical and geotechnical surveys) along the planned export cable route and within the WTG area, the precise locations will be outlined in forthcoming Method Statements as required by the WSI (Volume 4, Annex 11.2: Outline Marine Written Scheme of Investigation).
- 11.15.14 The parameters of total seabed coverage in cumulation with other offshore wind farms, especially the nearby North Falls, are not yet known. As stated below each windfarm has or will undertake a marine archaeology impact assessment that outlines and confirms maximum design parameters, potential impact on marine heritage receptors and specific mitigation strategies.
- 11.15.15 No direct cumulative impacts on marine heritage receptors within the VE proposed project boundary are expected; the offshore wind farms outlined in Table 11.20 are in relatively close proximity but do not have spatially overlapping boundaries.
- 11.15.16 Offshore wind farms are considered Nationally Significant Infrastructure Projects (NSIPs) and therefore require a development consent; as part of the application process each offshore windfarm has or will undertake a marine archaeology impact assessment that outlines and confirms mitigation strategies and ensures that marine heritage receptors have or will either be avoided or further investigated.
- 11.15.17 Potential cumulative impacts are, therefore, predicted to be of local spatial extent, long term duration, continuous and limited reversibility.
- 11.15.18 The magnitude of impact of cumulative effects as a result offshore windfarms is therefore expected to be avoided or indistinguishable from natural variation (**negligible**), meaning **not significant** in EIA terms.

#### TELECOMMUNICATION CABLES AND OUTFALL PIPES

- 11.15.19 Direct or indirect impacts from penetration, compression, and disturbance or cumulative sediment changes during all VE project phases and the presence of subsea cables and pipelines as outlined in Table 11.20 may result in the loss or accumulation of sediment over time.
- 11.15.20 There are an additional 12 operational telecommunication cables and 41 operational outfall pipes within the ZOI. The potential impacts on marine archaeological receptors during the construction phase of the operational projects is considered to have been assessed by the individual projects, and no cumulative effect of sediment movement is expected between VE and the operational projects. Therefore, the operational telecommunication cables and outfall pipes are not further considered in this cumulative assessment.



- 11.15.21 Maintenance operations of subsea cables and pipelines, if undertaken, may alter or destabilise unknown marine heritage receptors, archaeological sites and contexts, including paleoenvironmental information and exposing such material to natural, chemical, or biological processes, and causing or accelerating loss of the same.
- 11.15.22 No direct cumulative impacts on marine heritage receptors within the VE proposed project boundary are expected as no subsea cables or pipelines are located within the proposed project boundary.
- 11.15.23 There is currently limited detail on archaeological data and assessments within the impact assessments undertaken ahead of the subsea cables and pipelines detailed in Table 11.20 and therefore it is not possible to make a comprehensive assessment of the significance of effect. However, given that construction activities do not overlap and disturbance from operational and maintenance of VE is expected to be short term and localised to the offshore part of the proposed project boundary, it is not anticipated that any effects will result in a significant impact.
- 11.15.24 Potential cumulative effects during all VE project phases and the described presence of subsea cables and pipelines (Table 11.20) are therefore predicted to be of local spatial extent, long term duration, continuous and limited reversibility.

#### HYBRID WAVE/ WIND ENERGY

- 11.15.25 There is one hybrid energy development included in the CEA, the Mermaid/ Bligh Bank development, located within the Belgium EEZ. The development is in the early planning stages and there is currently limited detail available on the marine heritage receptors likely to be affected and the results of any impact assessments that might be undertaken according to regulations in Belgium.
- 11.15.26 However, given that there is no spatial overlap during construction, and disturbance from operational and maintenance of VE is expected to be short term and localised, it is not anticipated that any significant cumulative effects will arise.

#### PORTS

- 11.15.27 There are three working ports within the ZOI, Colchester, Harwich and Ipswich. Cumulative sediment changes during all VE project phases and activities within the port areas could result in the loss or accumulation of sediment. This disturbance could alter or destabilise archaeological sites and contexts, including paleoenvironmental material and expose such material to natural, chemical, or biological processes, causing or accelerating loss of the same.
- 11.15.28 No direct cumulative impacts on marine heritage receptors within the VE proposed project boundary are expected; the three ports do not have spatially overlapping boundaries.
- 11.15.29 Ahead of activities within the port boundary an Impact Assessment must be undertaken. The Impact Assessment for Harwich Haven Authority in 2021 ahead of dredging activities included a marine archaeological assessment that concluded that *“with mitigation in place, the impacts are predicted to be of negligible to minor significance”* (Harwich Haven Authority website, accessed October 2022).
- 11.15.30 Potential cumulative impacts are, therefore, predicted to be of local spatial extent, long term duration, continuous and limited reversibility.



## MILITARY, AVIATION AND RADAR

- 11.15.31 There are nine sites associated with military, aviation and radar within the ZOI, as outlined in Table 11.20.
- 11.15.32 The activities include parachute dropping, bombing, live firing, air firing, demolition of UXO, high energy manoeuvres and unmanned aircraft systems.
- 11.15.33 While some of the military, aviation and radar activities have the potential to cause seabed disturbance, cumulative sediment changes during all VE project phases could result in the loss or accumulation of sediment. This disturbance could alter or destabilise archaeological sites and contexts, including paleoenvironmental material and expose such material to natural, chemical, or biological processes, causing or accelerating loss of the same.
- 11.15.34 No direct cumulative impacts on marine heritage receptors within the VE proposed project boundary are expected; the military, aviation and radar activity areas outlined in Table 11.20 are in relatively close proximity but do not have spatially overlapping boundaries.
- 11.15.35 A marine licence is not required for activities carried out in defence of the realm by or on behalf of naval, military or air forces of The Crown (including reserve forces and the Royal Fleet Auxiliary) and a visiting force. The exemption does however not apply to constructing, altering, and improving works or dredging and disposal of waste where, if impact on marine heritage receptors is expected, an impact assessment should outline mitigations measures.
- 11.15.36 Potential cumulative impacts of military, aviation and radar and VE are predicted to be of local spatial extent, long term duration, continuous and limited reversibility.
- 11.15.37 The magnitude of impact of cumulative effects as a result military, aviation and radar activities is therefore expected to be avoided or indistinguishable from natural variation, meaning negligible as defined in Table 11.4.

## CUMULATIVE ASSESSMENT SUMMARY

- 11.15.38 The embedded mitigation, as outlined in Table 11.12 aims to avoid and mitigate direct, indirect, and permanent impact on marine heritage receptors (known, unlocated and HSC) within the VE RLB and ensure that archaeological input is of paramount importance throughout the life of the VE project.
- 11.15.39 Considering the magnitude of the cumulative effects during all phases of VE and the outlined other developments (Table 11.19) as well as receptor sensitivity (value) within the significance of effect matrix (Table 11.6) on marine heritage receptors potentially affected by the cumulative effects, the magnitude of impact is assessed as **negligible (neutral)** and the sensitivity (value) of the receptor as **negligible to high**. The significance of effect has therefore been assessed as **minor** to **negligible** and the effect is consequently considered **not significant** in EIA terms.



## 11.16 INTER-RELATIONSHIPS

- 11.16.1 The inter-relationships assessment considers likely significant effects from multiple impacts and activities from the construction, operation, and decommissioning of VE on the same receptor, or group of marine heritage receptors.
- 11.16.2 The greatest potential for direct spatial impact on marine heritage receptors is likely to occur during contact with the seabed during the construction and decommissioning phases. The individual impacts were assigned a significance of **negligible** due to the implementation of embedded mitigations.
- 11.16.3 While there is potential for some disturbance within the operational phase, these activities will avoid known marine heritage receptors as per the embedded mitigation (Table 11.12). It is therefore considered that impacts during the operation phase will not contribute to inter-relationships.
- 11.16.4 It is concluded that there will be no integration of effect between construction and decommissioning phases as they are undertaken during separate temporal phases and there will therefore be no inter-relationships of greater significance compared to the impacts considered alone.

## 11.17 TRANSBOUNDARY EFFECTS

- 11.17.1 Due to the localised nature of any potential impacts on known marine heritage receptors, transboundary impacts are unlikely to occur.
- 11.17.2 However, it should be noted that should wrecks or aircrafts of non-British nationality be impacted by VE further archaeological investigations may be warranted as outlined in the Volume 4, Annex 11.2: Outline Marine Written Scheme of Investigation, and further discussions on protection of non-British marine heritage receptors should include the pertinent organisation(s) in the country of relevance.
- 11.17.3 There is also potential for palaeochannels and palaeolandscapes within the North Sea to stretch beyond international boundaries. The impact on submerged landscapes in those cases is expected to be local within VE and will be mitigated and offset by archaeological assessments of available geophysical and geotechnical data.

## 11.18 SUMMARY OF EFFECTS

- 11.18.1 Table 11.21 presents a summary of the assessment of significant effect on marine heritage receptors, any relevant embedded mitigation and residual effects.



**Table 11.22 Summary of effects for Offshore Archaeology and Cultural Heritage**

Description of Impact	Effect	Additional mitigation measures	Residual impact
<b>Construction</b>			
1	Direct impact of sediment removal containing undisturbed archaeological contexts during seabed preparation ahead of construction activities leading to the total or partial loss of the marine heritage receptors.	Not applicable – no additional mitigation identified	No significant adverse residual effects
2	Direct impact by penetration, compression, and disturbance of piling foundations leading to the total or partial loss of marine heritage receptors.	Not applicable – no additional mitigation identified	No significant adverse residual effects
3	Direct impact by penetration, compression, and disturbance of stratigraphic contexts containing archaeological material from the combined weight of the Wind Turbine Generators (WTG) leading to total or partial loss of marine heritage receptors.	Not applicable – no additional mitigation identified	No significant adverse residual effects
4	Direct impact by penetration, compression, and disturbance of cable laying operations leading to total or partial loss of marine heritage receptors.	Not applicable – no additional mitigation identified	No significant adverse residual effects
5	Direct impact by penetration, compression, and disturbance effects of jack-up barges and anchoring of construction vessels during construction activities leading to total or partial loss of marine heritage receptors.	Not applicable – no additional mitigation identified	No significant adverse residual effects
6	Indirect impact causing disturbance of sediment containing potential marine heritage receptors (material and contexts) leading to the exposure of those marine heritage receptors to natural, chemical or biological processes and indirectly causing or accelerating their loss.	Not applicable – no additional mitigation identified	No significant adverse residual effects
7	Indirect impacts causing changes to the Historic Seascape Character as a result of construction and survey vessel activities	Not applicable – no additional	No significant adverse



Description of Impact	Effect	Additional mitigation measures	Residual impact
	and the addition of cables, foundations and turbines indirectly leading to changes to the perceived historic use of the seascape during construction activities.	mitigation identified	residual effects
<b>Operation</b>			
8	Direct impact by penetration, compression and disturbance effects of maintenance activities at WTG substation foundations and along inter-array and export cables leading to total or partial loss of marine heritage receptors.	Not applicable – no additional mitigation identified	No significant adverse residual effects
9	Indirect impacts during the operation phase causing disturbance of sediment containing potential marine heritage receptors during maintenance activities leading to the exposure of those marine heritage receptors to natural, chemical or biological processes and indirectly causing or accelerating their loss.	Not applicable – no additional mitigation identified	No significant adverse residual effects
10	Direct impact by penetration, compression, and disturbance effects of jack-up barges and anchoring of operation and maintenance vessels during the operation and maintenance phase leading to total or partial loss of marine heritage receptors.	Not applicable – no additional mitigation identified	No significant adverse residual effects
11	Indirect impacts causing scour effects as a result of the presence of WTG substation foundations and the exposure of inter-array and export cables or the use of cable protection measures indirectly leading to exposing marine heritage receptors to natural, chemical or biological processes and causing or accelerating loss of the same.	Not applicable – no additional mitigation identified	No significant adverse residual effects
12	Indirect impacts causing changes to the Historic Seascape Character as a result of operation and maintenance vessel activities and the presence of the completed wind farm indirectly leading to changes to the perceived historic use of the seascape during the operation phase.	Not applicable – no additional mitigation identified	No significant adverse residual effects





Description of Impact	Effect	Additional mitigation measures	Residual impact
<b>Decommissioning</b>			
13	Direct impact by penetration, compression and disturbance effects of jack-up barges and anchoring of decommissioning vessels leading to total or partial loss of marine heritage receptors.	Not applicable – no additional mitigation identified	No significant adverse residual effects
14	Indirect impacts creating draw-down of sediment into voids left by removed WTG foundations leading to loss of sediment or destabilization of archaeological sites and contexts indirectly leading to exposing marine heritage receptors to natural, chemical, or biological processes and causing or accelerating loss of the same.	Not applicable – no additional mitigation identified	No significant adverse residual effects
15	Indirect impacts causing changes to the Historic Seascape Character as a result of decommissioning activities and the removal of wind farm components indirectly leading to changes to the perceived historic use of the seascape during the decommissioning phase.	Not applicable – no additional mitigation identified	No significant adverse residual effects
<b>Cumulative effects</b>			
16	Direct impact of sediment removal containing undisturbed archaeological contexts or by penetration, compression, and disturbance leading to total or partial loss of marine heritage receptors.	Not applicable – no additional mitigation identified	No significant adverse residual effects
17	Indirect impact causing disturbance of sediment containing potential marine heritage receptors (material and contexts) exposing the receptors to natural, chemical or biological processes and causing or accelerating loss of the same.	Not applicable – no additional mitigation identified	No significant adverse residual effects
18	Indirect impact causing changes to the Historic Seascape Character as a result of cumulative effects indirectly leading to changes to the perceived historic use of the seascape.	Not applicable – no additional mitigation identified	No significant adverse residual effects



## 11.19 NEXT STEPS

11.19.1 The following steps will be undertaken in order to progress the offshore archaeology and cultural heritage topic from PEIR stage to DCO Application stage:

- > **Consultation with statutory advisors:** Regular engagement will continue in order to ensure that the assessment proceeds according to the regulators' recommendations and requirements;
- > **Production of an Environmental Statement (ES):** An ES will be produced to present the full findings of the Environmental Impact Assessment and the results of the potential impacts of VE on marine heritage receptors;
- > **Production of an updated outline marine WSI document:** An updated Outline Marine WSI will be developed based on the Outline Marine WSI (Volume 4, Annex 11.2) submitted with this chapter, which will outline future archaeological work and mitigation measures embedded into the project design



## 11.20 REFERENCES

- Ancient Monuments and Archaeological Areas Act 1979 (c.53) Available at: <https://www.legislation.gov.uk/ukpga/1979/46> [Accessed 25 August 2021].
- Burial Act 1857 (c.25) Available at: <https://www.legislation.gov.uk/ukpga/Vict/20-21/81/section/25> [Accessed 25 August 2021].
- Brown and Russell. (2019). *Mesolithic Geoarchaeological Investigations in the Outer Thames Estuary*, Kent Archaeological Society website. Available at <https://www.kentarchaeology.org.uk/publications/archaeological-reports/mesolithic-geoarchaeological-investigations-outer-thames>.
- Bynoe, R. (2018), 'The submerged archaeology of the North Sea: Enhancing the Lower Palaeolithic record of northwest Europe', *Quaternary Science Reviews*, 191: 1-14.
- ClfA (2014a). *Code of conduct: professional ethics in archaeology*. Reading, Chartered Institute for Archaeologists. [revised October 2019, October 2020, October 2021] Available at: <https://www.archaeologists.net/sites/default/files/Code%20of%20conduct.pdf>.
- ClfA (2014b). *Standard and guidance for the collection, documentation, conservation and research of archaeological materials*. Reading, Chartered Institute for Archaeologists. [updated October 2020] Available at: [https://www.archaeologists.net/sites/default/files/ClfAS%26GFinds\\_2.pdf](https://www.archaeologists.net/sites/default/files/ClfAS%26GFinds_2.pdf).
- ClfA (2014c). *Standard and guidance for commissioning work on, or providing consultancy advice on, archaeology and the historic environment*. Reading, Chartered Institute for Archaeologists. [updated October 2020] Available at: [https://www.archaeologists.net/sites/default/files/ClfAS&GCommissioning\\_1.pdf](https://www.archaeologists.net/sites/default/files/ClfAS&GCommissioning_1.pdf).
- ClfA (2019). *Regulations for professional conduct*. Reading, Chartered Institute for Archaeologists. [revised July 2021] Available at: <https://www.archaeologists.net/sites/default/files/Regulations%20for%20professional%20conduct.pdf>.
- Cohen, K.M., Westley, K., Erkens, G., Hijma, M.P. and Weerts, H.J.T. (2017), 'The North Sea', in Flemming, N.C., Harff, J., Moura, D., Burgess, A. and Bailey, G.N. (eds.), *Submerged Landscapes of the European Continental Shelf*. Quaternary Palaeoenvironments (Oxford: Wiley). 147-186.
- Cornwall Council (2008). *England's Historic Seascapes: HSC Method Consolidation* York: Archaeology Data Service. Available at: <https://doi.org/10.5284/1000033>.
- COWRIE (2007). *Historic Environment Guidance for the Offshore Renewable Energy Sector*. Salisbury: Wessex Archaeology. Available at: [https://www.wessexarch.co.uk/sites/default/files/field\\_file/COWRIE\\_2007\\_Wessex%20-%20archaeo%20guidance\\_Final\\_1-2-07.pdf](https://www.wessexarch.co.uk/sites/default/files/field_file/COWRIE_2007_Wessex%20-%20archaeo%20guidance_Final_1-2-07.pdf).



- COWRIE (2008). Guidance for Assessment of Cumulative Impacts on the Historic Environment from Offshore Renewable Energy. Oxford: Oxford Archaeology. Available at: <https://www.biofund.org.mz/wp-content/uploads/2018/11/F1349.Cowrie-Ciarch-Web.pdf>.
- COWRIE (2011). *Offshore Geotechnical Investigation and Historic Environment Analysis: Guidance for the Offshore Renewable Energy Sector*. Newbury: COWRIE Ltd. Available at: [2011-01-offshore-geotechnical-investigations-and-historic-environment-analysis-guidance-for-the-renewable-energy-sector.pdf](https://www.historicenvironment.scot/uploads/2011-01-offshore-geotechnical-investigations-and-historic-environment-analysis-guidance-for-the-renewable-energy-sector.pdf) (historicenvironment.scot).
- Department for Culture Media & Sport (DCMS) (2013). *Scheduled Monuments & nationally important but non-scheduled monuments*. [online]. Available at: [https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/249695/SM\\_policy\\_statement\\_10-2013\\_2.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/249695/SM_policy_statement_10-2013_2.pdf) [Accessed: 25 January 2022].
- Department of Energy and Climate Change (2011). Overarching National Policy Statement for Energy (EN-1). Available at: [https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/47854/1938-overarching-nps-for-energy-en1.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/47854/1938-overarching-nps-for-energy-en1.pdf).
- Department of Energy and Climate Change (2021). Draft Overarching National Policy Statement for Energy (EN-1). Available at: [https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/1015233/en-1-draft-for-consultation.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1015233/en-1-draft-for-consultation.pdf).
- Department of Energy and Climate Change (2011). National Policy Statement for Renewable Energy Infrastructure (EN-3). Available at: [https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/47856/1940-nps-renewable-energy-en3.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/47856/1940-nps-renewable-energy-en3.pdf).
- Department of Energy and Climate Change (2021). Draft National Policy Statement for Renewable Energy Infrastructure (EN-3). Available at: [https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/1015236/en-3-draft-for-consultation.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1015236/en-3-draft-for-consultation.pdf).
- Department for Environment, Food & Rural Affairs (DEFRA) (2009). Our Seas – A shared resource: High level marine objectives.
- Emu, *et al.* (2009). *The Outer Thames Estuary Regional Environmental Characterisation* Published by Marine Aggregate Levy Sustainability Fund.
- Flemming, N.C. (2002), 'The scope of Strategic Environmental Assessment of North Sea areas SEA3 and SEA2 in regard to prehistoric archaeological remains', Department of Trade and Industry.
- English Heritage. (2011). *Environmental Archaeology: A Guide to the Theory and Practice of Methods, from Sampling and Recovery to Post-excavation* (second edition).



August 2011. Available at: [https://historicengland.org.uk/images-books/publications/environmental-archaeology-2nd/environmental\\_archaeology/](https://historicengland.org.uk/images-books/publications/environmental-archaeology-2nd/environmental_archaeology/).

English Heritage. (2013). Marine Geophysical Data Acquisition, Processing and Interpretation. English Heritage. Available at: <https://historicengland.org.uk/images-books/publications/marine-geophysics-data-acquisition-processing-interpretation/mgdapai-guidance-notes/>.

Harwich Haven Authority (2022) <https://hha.co.uk/channel-deepening-project-blog/navigation-and-archaeology/>. [Accessed October 2022].

Historic England. (2020). Deposit Modelling and Archaeology. Guidance for Mapping Buried Deposits. Available at: <https://historicengland.org.uk/images-books/publications/deposit-modelling-and-archaeology/heag272-deposit-modelling-and-archaeology/>.

Historic England. (2021). Commercial Renewable Energy Development and the Historic Environment Advice Note 15. Available at: <https://historicengland.org.uk/images-books/publications/commercial-renewable-energy-development-historic-environment-advice-note-15/heag302-commercial-renewable-energy-development-historic-environment/>.

HM Government (2011) UK Marine Policy Statement. Available at: [https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/69322/pb3654-marine-policy-statement-110316.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/69322/pb3654-marine-policy-statement-110316.pdf).

HM Government (2014) *East Inshore and East Offshore Marine Plans*. Available at: [https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/312496/east-plan.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/312496/east-plan.pdf).

HM Government (2021) *South East Inshore Marine Plan*. Available at: [https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/1004493/FINAL\\_South\\_East\\_Marine\\_Plan\\_1.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1004493/FINAL_South_East_Marine_Plan_1.pdf)

Joint Nautical Archaeology Policy Committee (JNAPC) (2006). Joint Nautical Archaeology Policy Committee Code for Practice for Seabed Development. The Crown Estate. Available at: [http://www.jnapc.org.uk/jnapc\\_brochure\\_may\\_2006.pdf](http://www.jnapc.org.uk/jnapc_brochure_may_2006.pdf).

LUC (Land Use Consultants) (2018). National Historic Seascape Characterisation Consolidation. York: Archaeology Data Service. <https://doi.org/10.5284/1046273>.

Marine Archaeology Ltd. (2005a). *Greater Gabbard Windfarm – Phase One: Offshore Turbine Area – Archaeological Desk Based Assessment*.

Maritime Archaeology Ltd. (2005b) *Greater Gabbard Windfarm – Phase Two: Export Cable Route and Onshore Works – Archaeological Desk Based Assessment*.

Maritime Archaeology Ltd. (2021) *Five Estuaries Offshore Wind Farm – Method Statement – Archaeological review of geophysical data*.



Marine and Coastal Access Act 2009 (c.2) Available at:

<https://www.legislation.gov.uk/ukpga/2009/23/contents> [Accessed 25 August 2021].

Merchant Shipping Act 1995 (part 9, c.2) Available at:

<https://www.legislation.gov.uk/ukpga/1995/21/part/IX/chapter/II> [Accessed 25 August 2021].

Oxford Archaeology (South) (2007) England's Historic Seascapes: Southwold to Clacton. York: Archaeology Data Service <https://doi.org/10.5284/1000277>.

Parfitt, S.A., Ashton, N.M., Lewis, S.G., Abel, R.L., Coope, R., Field, M.H., Gale, R., Hoare, P.G., Larkin, N.R., Lewis, M.D., Karloukovski, V., Maher, B.A., Peglar, S.M., Preece, R.C., Whittaker, J.E. and Stringer, C.B. (2010), 'Early Pleistocene occupation at the edge of the boreal zone in northwest Europe', *Nature*, 466: 229-233.

Parfitt, S.A., Barendregt, R.W., Breda, M. Candy, I., Collins, M.J., Coope, R., Durbridge, P., Field, M.H., Lee, J.R., Lister, A.M., Mutch, R., Penkman, K.E.H., Preece, R.C., Rose, J., Stringer, C.B., Symmons, R., Whittaker, J.E., Wymer, J.J. and Stuart, A.J. (2005), 'The earliest record of human activity in northern Europe', *Nature*, 438: 1008-1012

Peeters, H., Murphy, P. and Flemming, N. (eds.) (2009) North Sea Prehistory Research and Management Framework (NSPRMF). Historic England. Available at: <https://historicengland.org.uk/images-books/publications/ns-prehistory-research-manage-framework/>

Protection of Wrecks Act 1973 (c.33) Available at:

<https://www.legislation.gov.uk/ukpga/1973/33> [Accessed 25 August 2021].

Ransley, J. and Sturt, F. with Dix, J., Adams, J., and Blue, L. (eds.) (2013) People and the Sea: a maritime archaeological research agenda for England. Council for British Archaeology: York [https://doi.org/10.1111/1095-9270.12071\\_3](https://doi.org/10.1111/1095-9270.12071_3)

SeaZone Solutions Limited (2011). England's Historic Seascapes: Demonstrating the Method. York: Archaeology Data Service <https://doi.org/10.5284/1000144>

Sturt, F. and Van de Noort, R. (2022), The Neolithic and Early Bronze Age. A Maritime Archaeological Research Agenda for England. Available at: [The Neolithic and Early Bronze Age - A Maritime Archaeological Research Agenda for England \(researchframeworks.org\)](https://www.researchframeworks.org/) [Accessed 30 September 2022].

The Crown Estate. (2014). Protocol for Archaeological Discoveries: Offshore Renewables Project. Salisbury: Wessex Archaeology. Available at:

[https://www.wessexarch.co.uk/sites/default/files/field\\_file/2\\_Protocol%20For%20Archaeological%20Discoveries.pdf](https://www.wessexarch.co.uk/sites/default/files/field_file/2_Protocol%20For%20Archaeological%20Discoveries.pdf).

The Crown Estate (2017). Good Practice Guidance Extraction by Dredging of Aggregates from England's Seabed. London: British Marine Aggregate Producers Association Available at:



[https://www.bmapa.org/documents/BMAPA\\_TCE\\_Good\\_Practice\\_Guidance\\_04.2017.pdf](https://www.bmapa.org/documents/BMAPA_TCE_Good_Practice_Guidance_04.2017.pdf)

The Crown Estate. (2021). Archaeological Written Schemes of Investigation for Offshore Wind Farm Projects. Salisbury: Wessex Archaeology. Available at: <https://www.thecrownestate.co.uk/media/3917/guide-to-archaeological-requirements-for-offshore-wind.pdf>.

The Protection of Military Remains Act 1986 (c.1) Available at: <https://www.legislation.gov.uk/ukpga/1986/35/section/> [Accessed 25 August 2021].

The Town and Country Planning (Environmental Impact Assessment) Regulations 2017

The Treasure Act 1996 (c.8) Available at: <https://www.legislation.gov.uk/ukpga/1996/24/crossheading/coroners-jurisdiction> [Accessed 25 August 2021].

The Treasure (Designation) Order 2002 Available at: [The Treasure \(Designation\) Order 2002 \(legislation.gov.uk\)](https://www.legislation.gov.uk/ukpga/2002/24/crossheading/coroners-jurisdiction) [Accessed 25 August 2021]

Tizzard, L., Bicket, A.R., Benjamin, J. and De Loecker, D. (2014). A Middle Palaeolithic site in the southern North Sea: investigating the archaeology and palaeogeography of Area 240. *Journal of Quaternary Science*. Volume 29: 7. October 2014. Available at: <https://doi.org/10.1002/jqs.2743>

Wessex Archaeology (2011). *Galloper Wind Farm Project-Environmental Statement – Chapter 19: Archaeology and Cultural Heritage*

Wessex Archaeology. (2016). Nemo Link: *Archaeological Stage 4 Analysis*. Wessex Archaeology. <https://doi.org/10.5284/1082709>



**F I V E**   
**ESTUARIES**  
OFFSHORE WIND FARM

PHONE  
EMAIL  
WEBSITE  
ADDRESS

COMPANY NO

0333 880 5306

[fiveestuaries@rwe.com](mailto:fiveestuaries@rwe.com)

[www.fiveestuaries.co.uk](http://www.fiveestuaries.co.uk)

Five Estuaries Offshore Wind Farm Ltd

Windmill Hill Business Park

Whitehill Way, Swindon, SN5 6PB

Registered in England and Wales

company number 12292474

