Outer Dowsing Offshore Wind

Preliminary Environmental Information Report

Volume 2, Appendix 13.1 Marine and Intertidal Archaeology Technical Report

Date: June 2023

Outer Dowsing Document No: 6.2.13.1
Internal Reference: PP1-ODOW-DEV-CS-REP-0055

Rev: V1.0

OUTER DOWSING OFFSHORE WIND

Company:	**Outer Dowsing Offshore Wind**	Asset:	**Whole Asset**
Project:	**Whole Wind Farm**	Sub Project/Package:	Whole Asset
Document Title or Description:	Marine and Intertidal Archaeology Technical Report		
Document Number:	6.2.13.1	3rd Party Doc No (If applicable):	N/A

Outer Dowsing Offshore Wind accepts no liability for the accuracy or completeness of the information in this document nor for any loss or damage arising from the use of such information.

Rev No.	Date	Status / Reason for Issue	Author	Checked by	Reviewed by	Approved by
V1.0	June 2023	Final	Maritime Archaeology	GoBe	Shepherd and Wedderburn	Outer Dowsing Offshore Wind

Table of Contents

List of tables

List of figures

Abbreviations

Acronym	Expanded name
AD	Anno Domini
AEZ	Archaeological Exclusion Zone
ANS	Artificial Nesting Structures
BEIS	Business, Energy and Industrial Strategy
BGS	British Geological Survey
BP	Before Present
BSF	Below Seafloor
CIfA	Chartered Institute for Archaeologists
CITiZAN	Coastal and Intertidal Zone Archaeological Network
COWRIE	Collaborative Offshore Wind Energy Research into the Environment
DCO	Development Consent Order
DECC	Department of Energy & Climate Change, now the Department for Energy Security and Net Zero (DESNZ)
Defra	Department for Environment, Food & Rural Affairs
DESNZ	Department for Energy Security and Net Zero, formerly Department of Business, Energy and Industrial Strategy (BEIS), which was previously Department of Energy & Climate Change (DECC)
dML	deemed Marine Licence
ECC	Export Cable Corridor (Offshore ECC or indicative onshore ECC)
EIA	Environmental Impact Assessment
ES	Environmental Statement
GT R4 Ltd	The Applicant. The special project vehicle created in partnership between Corio Generation (a wholly owned Green Investment Group portfolio company), Gulf Energy Development and TotalEnergies
HLC	Historic Landscape Character
HSC	Historic Seascape Characterisation
JNAPC	Joint Nautical Archaeology Policy Committee
ka	Kiloannum (one thousand years)
LAT	Lowest Astronomical Tide
LGM	Last Glacial Maximum
MA	Maritime Archaeology Ltd.
MAG	Magnetometer
MBES	Multi-Beam Echo Sounder
MHWS	Mean High Water Springs
MLWS	Mean Low Water Springs
MMO	Marine Management Organisation
MS	Method Statement
MSL	Mean Sea Level
NPS	National Policy Statement
NRHE	National Record of Historic Environment
NSPRMF	North Sea Prehistory Research and Management Framework
nT	nanotesla

Acronym	Expanded name
NPS	National Policy Statement
NSPRMF	North Sea Prehistory Research Management Framework
O&M	Operation and Maintenance
ODOW	Outer Dowsing Offshore Wind (The Project)
ORCP	Offshore Reactive Compensation Platforms
OSS	Offshore Substation
PAD	Protocol for Archaeological Discoveries
PAS	Portable Antiquities Scheme
PEIR	Preliminary Environmental Information Report
RAF	Royal Airforce
ROV	Remotely Operated Vehicle
SBP	Sub-bottom Profiler
SoS	Secretary of State
SSS	Side Scan Sonar
SSSI	Site of Special Scientific Interest
TCE	The Crown Estate
UHRS	Ultra-high Resolution Seismic
UKHO	United Kingdom Hydrographic Office
UXO	Unexploded ordnance
WGS84	World Geodetic System 1984
WSI	Written Schemes of Investigation
WTG	Wind Turbine Generator
WWI	World War One
WWII	World War Two

Terminology

Term	Definition
Archaeological Exclusion Zone (AEZ)	A spatially defined zone around a known marine archaeological and cultural heritage receptors 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 considered in the planning of operations.
Archaeological Interest	Refers to a site, find or anomaly of anthropogenic origin that has the potential to contribute to our knowledge and understanding of the past.
Archaeological Potential	Refers to the likelihood a site, find or anomaly is considered to map material of archaeological interest such as wreck or aviation crash sites, buried and confirmed palaeolandscapes and their margins, and the potential that such evidence would reveal a greater understanding of the past through expert investigation.
Archaeological Significance	Refers to the potential of a site or find to contribute to our knowledge and understanding of the past based on its period, rarity,

Term	Definition
	documentation, group value, condition, vulnerability, diversity, and potential, as defined by DCMS, 2013.
Array area	The area offshore within the PEIR Boundary within which the generating stations (including wind turbine generators (WTG) and inter array cables), offshore accommodation platforms, offshore transformer substations and associated cabling are positioned.
Baseline	The status of the environment at the time of assessment without the development in place.
Before Present	Time scale referring to 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 work. It is subdivided in the Early, Middle and Late Bronze Age.
Decommissioning	The period during which a development and its associated processes are removed from active operation.
deemed Marine Licence (dML)	A licence administered under the Marine and Coastal Access Act 2009. The licence set out within a Schedule within the Development Consent Order (DCO).
Development Consent Order (DCO)	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 Department for Energy Security and Net Zero (DESNZ).
Early Medieval	Archaeological period lasting from AD 410 to 1066. This dates from the breakdown of the Roman rule in Britain to the Norman invasion in 1066 and is o be used for sites, monuments and finds of post Roman, Saxon and Viking date.
Early Prehistoric	Archaeological period lasting from 52,000 to 6,000 BP. For sites, monuments and finds which are characteristic of the Palaeolithic to Mesolithic but cannot be specifically assigned.
Effect	Term used to express the consequence of an impact. The significance of an effect is determined by correlating the magnitude of an impact with the sensitivity of a receptor, in accordance with defined significance criteria.
Environmental Impact Assessment (EIA)	A statutory process by which certain planned projects must be assessed before a formal decision to proceed can be made. It involves the collection and consideration of environmental information, which fulfils the assessment requirements of the Environmental Impact Assessment (EIA) Regulations, including the publication of an Environmental Statement (ES).
Environmental Statement (ES)	The suite of documents that detail the processes and results of the Environmental Impact Assessment (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.

Term	Definition
Historic England	The public body that champions and protects England's historic places.
Historic England National Record of the Historic Environment	National database of known wrecks and reported losses held by Historic England. Currently (March 2023) being developed into the National Marine Heritage Record (NMHR).
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	An impact to the receiving environment is defined as any change to its baseline condition, either adverse or beneficial.
Intertidal	Area where the ocean meets the land between high and low tides.
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.
Landfall	The location at the land-sea interface where the offshore export cable will come ashore.
Last Glacial Maximum	Most recent time during the last glacial period that the ice sheets were at their greatest extents, approximately 26,500 – 19,000 BP.
Magnetometer	A device used to measure direction, strength, or relative change of magnetic field at a particular location.
Marine archaeological and cultural heritage receptors	Physical resources such as shipwrecks, remains of aircraft, archaeological sites, archaeological finds, and material including pre-historic deposits as well as archival documents and oral accounts recognised as historical/archaeological or cultural significance.
Marine archaeology study area	Defined as the PEIR array area and ECC areas up to MHWS and surrounded by a 1km buffer.
Marine Written Schemes of Investigation (WSI)	A document forming the agreement between the client, the appointed archaeological, contractors, and the relevant stakeholders. The document sets out methods to mitigate the effects on all the known and potential marine archaeological and cultural heritage receptors within the marine archaeology study are. An Outline Marine WSI, specific for the offshore area and developed during the EIA process will 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).
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.

Term	Definition
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 fisher-hunter-gatherer society towards food producing society.
Mitigation	Mitigation measures, or commitments, are commitments made by the Project to reduce and/or eliminate the potential for significant effects to arise as a result of the Project. Mitigation measures can be embedded (part of the project design) or secondarily added to reduce impacts in the case of potentially significant effects.
Multi-beam Echo Sounder (MBES)	A type of sonar survey used to map the seabed by emitting acoustic waves in a fan shape beneath its transceiver. The time it takes for the sounds 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 Policy Statement (NPS)	A document setting out national policy against which proposals for Nationally Significant Infrastructure Projects (NSIPs) will be assessed and decided upon
Nanotesla	Measurement describing the magnetic field (flux) of ferrous materials as measured by a magnetometer. (One nanotesla equals 10-9 tesla).
Neolithic	Archaeological period lasting from 6,000 – 4,200 BP. This period follows on from the Palaeolithic and the Mesolithic and is itself succeeded by the Bronze Age. This period is characterised by the practice of a farming economy and extensive monumental constructions.
Outer Dowsing Offshore Wind (ODOW)	The Project.
Offshore Export Cable Corridor (ECC)	The Offshore Export Cable Corridor (Offshore ECC) is the area within the Preliminary Environmental Information Report (PEIR) Boundary within which the export cable running from the array to landfall will be situated.
Offshore Substation (OSS)	Platforms located within the array area which house electrical equipment and control and instrumentation systems. They also provide access facilities for work boats and helicopters.
Palaeolithic	Archaeological period lasting from 52,000 – 12,000 BP. The period is defined by the practice of hunting and gathering and the use of chipped flint tools. This period is usually divided up into the Lower, Middle and Upper Palaeolithic.
Preliminary Environmental Information Report (PEIR)	The PEIR is written in the style of a draft Environmental Statement (ES) and provides information to support and inform the statutory consultation process in the pre-application phase. Following that consultation, the PEIR documentation will be updated to produce the Project's ES that will accompany the application for the Development Consent Order (DCO).

Term	Definition
PEIR Boundary	The PEIR Boundary is outlined in Figure 3.1 of Volume 1, Chapter 3: Project Description and comprises the extent of the land and/or seabed for which the PEIR assessments are based upon.
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.
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 is used where known.
Pre-construction and post-construction	The phases of the Project before and after construction takes place.
Protocol for Archaeological Discoveries	A document detailing how unexpected finds or sites made during the lifetime of the Project should be reported.
Receiver of Wreck	Official of the British Government whose main task is to administer the law in relation to Wreck and Salvage.
Receptor	A distinct part of the environment on which effects could occur and can be the subject of specific assessments. Examples of receptors include species (or groups) of animals or plants, people (often categorised further such as 'residential' or those using areas for amenity or recreation), watercourses etc.
Roman	Archaeological period lasting from AD 43 – 410. Traditionally begins with the Roman invasion of Britain 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.
study area	Area(s) within which environmental impact may occur – to be defined on a receptor-by-receptor basis by the relevant technical specialist.
Sub-bottom Profiler	An acoustic system used to determine physical properties of the seafloor and to image and characterise geological information a few meters below the seafloor.
Subsea	Subsea comprises everything existing or occurring below the surface of the sea.
The Applicant	GT R4 Ltd. The Applicant making the application for a DCO. The Applicant is GT R4 Limited (a joint venture between Corio Generation, TotalEnergies and Gulf Energy Development (GULF)), trading as Outer Dowsing Offshore Wind. The project is being

Term	Definition
	developed by Corio Generation (a wholly owned Green Investment Group portfolio company), TotalEnergies and GULF.
The Project	Outer Dowsing Offshore Wind including proposed onshore and offshore infrastructure.
United Kingdom Hydrographic Office database	Database of known wrecks and obstruction held and maintained by the UKHO.
Ultra-High Resolution Seismic	An acoustic system used to image submerged buried features shallow water.
Wind turbine generator (WTG)	All the components of a wind turbine, including the tower, nacelle, and rotor.

13 Marine and Intertidal Archaeology Technical Report

13.1 Introduction

13.1.1 This Marine and Intertidal Archaeology Technical Report identifies known and potential marine archaeology and cultural heritage receptors within the offshore part of Outer Dowsing Offshore Wind (ODOW) ('the Project') and the marine archaeology study area and suggests an approach to mitigation measures to avoid or minimise impact on those receptors. This Technical Report accompanies Volume 1, Chapter 13: Marine and Intertidal Archaeology (Preliminary Environment Impact Report (PEIR document reference 6.1.13).

Project Background

13.1.2 GT R4 Ltd (trading as Outer Dowsing Offshore Wind) hereafter referred to as 'the Applicant', is proposing to develop the Project. The Project will be located approximately 54km from the Lincolnshire coastline in the southern North Sea. The Project will include both offshore and onshore infrastructure including an offshore generating station (windfarm), export cables to landfall, onshore cables, and connection to the electricity transmission network, and ancillary and associated development. Full description outlined in Volume 1, Chapter 3: Project Description (PEIR document reference 6.1.3).

13.1.3 Maritime Archaeology Ltd. (MA) was commissioned to undertake this Technical Report encompassing the offshore part of the PEIR boundary for the Project.

Aims and Objectives

13.1.4 The key objectives of the marine archaeology assessment are to:

- Undertake ongoing consultation with Historic England and other key stakeholders, as required, in order to develop all aspects of the approach and identify marine archaeology and cultural heritage receptors and mitigate impacts;
- Undertake a review of the known marine archaeology and cultural heritage receptors within the marine archaeology study area;
- Summarise the environmental context and archaeological potential of the marine archaeology study area;
- Assess and review geophysical data to identify previously unknown sites of archaeological potential;
- Provide an impact assessment and recommendation for embedded mitigation measures for all identified marine archaeological and cultural heritage receptors (included in Volume 1, Chapter 13);
- Develop an agreed Outline Marine Written Scheme of Investigation (WSI) setting out the archaeological requirements pre- and post-consent (see document 8.5 Marine Archaeological WSI); and

- Provide a Project-specific Outline Protocol for Archaeological Discoveries (PAD) outlining the protocol and reporting chain to be followed during the pre-construction, construction, operation and maintenance, and decommissioning phases in case of any unexpected archaeological finds (see Annex A of document 8.5).

13.2 Methodology

Introduction

13.2.1 MA is a Registered Organisation with the Chartered Institute for Archaeologists (CIfA); all work conducted by MA is in accordance with the guidance and principles set out in CIfA's Code of Conduct (2014a) and Code of Professional Conduct (2019).

13.2.2 The following legislation, guidance and best practice has been consulted as part of this assessment:

- Archaeological Written Schemes of Investigation for Offshore Wind Farm Projects (The Crown Estate, 2021);
- Commercial Renewable Energy Development and the Historic Environment: Historic England Advice Note 15 (Historic England, 2021);
- Deposit Modelling and Archaeology: Guidance for Mapping Buried Deposits, (Historic England, 2020);
- East Inshore and East Offshore Marine Plans (HM Government, 2014);
- Environmental Archaeology: A guide to the theory and practice of methods from sampling and recovery to post-excavation (Historic England, 2011); and
- Historic Environment Guidance for Offshore Renewable Energy Sector, Collaborative Offshore Wind Research into the Environment (COWRIE, 2007);
- Historic Seascape Characterisation (HSC): Demonstrating the Method (SeaZone, 2011);
- JNAPC Code of Practice for Seabed Development, Joint Nautical Archaeology Policy Committee (JNAPC, 2006);
- Marine Geophysical Data Acquisition, Processing and Interpretation (English Heritage, 2013).
- Offshore Geotechnical Investigation and Historic Environment Analysis: Guidance for the Offshore Renewable Energy Sector (COWRIE, 2011);
- Protocol for Archaeological Discoveries: Offshore Renewables Projects (The Crown Estate 2014);
- Standard and Guidance for Commissioning Work on, or Providing Consultancy Advice on, Archaeology and the Historic Environment (CIfA, 2014c);
- Standard and Guidance for Historic Environment Desk-Based Assessment, Chartered Institute for Archaeologists (CIfA, 2014b);

- The Role of the Human Osteologist in an Archaeological Fieldwork Project (Historic England, 2018);
- National Policy Statement for Renewable Energy Infrastructure (EN-3) (Department of Energy and Climate Change, 2011); and
- UK Marine Policy Statement (Department for environment food rural affairs, 2011).

Marine Archaeology Study Area

13.2.3 A marine archaeology study area has been established for the purposes of collating a characterising baseline data as part of this Technical Report. The marine archaeology study area is defined as the array area, the Offshore Export Cable Corridor (ECC), and a 1km buffer up to Mean High Water Springs (MHWS) (Figure 13.1).

13.2.4 The additional 1km buffer 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 positions and the strong tides which can cause the scattering of shipwreck artefacts and eroded archaeological material over considerable distances.

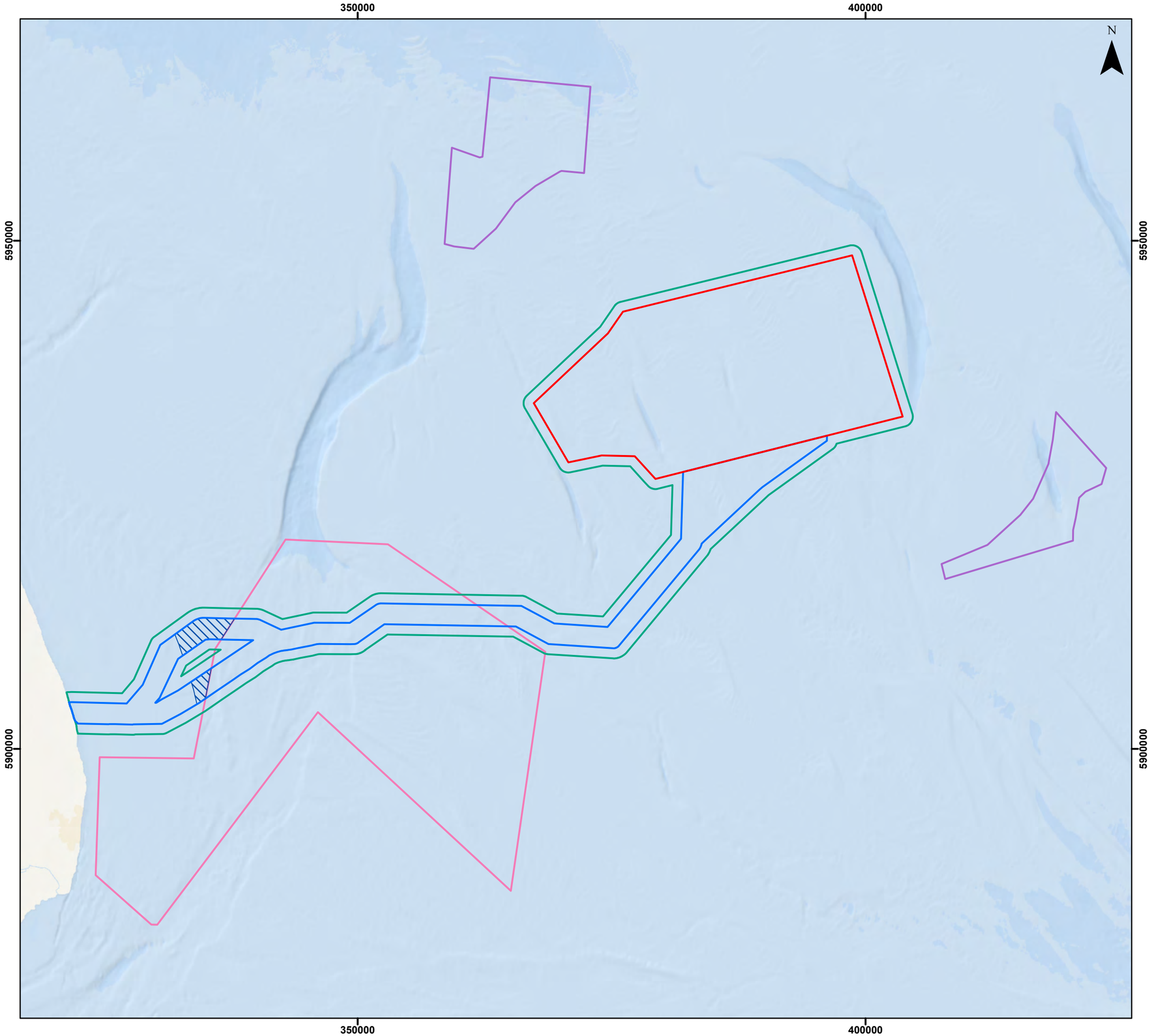
13.2.5 Shipwrecks located in the array area and/or Offshore ECC may have been recorded as lost outside the area or they may have been lost and drifted or dragged before settling on the seabed. While no impact of the Project is expected outside the array area and/or Offshore ECC, Volume 1, Chapter: 7 Marine Processes (PEIR document reference 6.1.7), outlines how tidal ranges and seabed movements can be affected by the Project. This is further discussed in terms of impact on marine archaeological and cultural heritage receptors in Volume 1, Chapter: 13.

13.2.6 The area from MHWS landward is covered by the onshore archaeology chapter, Volume 1, Chapter 20: Onshore Archaeology and Cultural Heritage (PEIR document reference 6.1.20).

13.2.7 It is important to note that the marine archaeology study area may be reviewed and amended for the Environmental Statement (ES) in response to such matters as refinement of the Offshore ECC, feedback from consultees, and/or the identification of additional constraints (environmental and/or engineering).

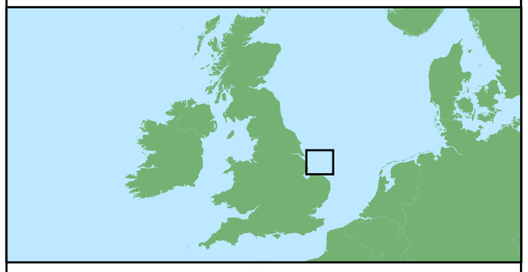
Compensation Areas

13.2.8 There are three compensation areas which include, an offshore reactive compensation platforms (ORCPs) search area, a compensation area for benthic (biogenic reef) and compensation areas for offshore ornithology (artificial nesting structures (ANS)). These compensation areas are shown in Figure 13.1 and have not been assessed as part of the baseline but will be assessed within the ES following refinement of the proposed areas and once details of the works to be undertaken have been finalised.



Legend

- Array Area
- Offshore Export Cable Corridor
- Marine Archaeology Study Area
- ORCP Search Area
- Artificial Nesting Structure Search Area
- Biogenic Reef Restoration Search Area



Coordinate System: WGS 1984 UTM Zone 31N

0 10 20 km

Scale:1:350,000

Preliminary Environmental Information Report

Marine Archaeology Study Area

Figure 13.1

OUTER DOWSING OFFSHORE WIND

Date: 25/05/2023
Produced By: LN
Revision: 2.0

GoBe

Baseline Assessment Methodology

13.2.9 A baseline review of the marine archaeology and cultural heritage receptors located within the marine archaeology study area is presented in Section 13.3. The data sources used to collate the information for this Technical Report are detailed in Table 13.1.

Table 13.1: Key Sources used for the Marine and Intertidal Archaeology Assessment

Source	Summary	Coverage of 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.
United Kingdom Hydrographic Office (UKHO) wrecks and obstructions (Admiralty Maritime Data Solutions) (wrecksite.eu)	Records of known wrecks and obstructions held by the UKHO and available via Admiralty Maritime Data Solutions: Marine Data Portal (2022) and wrecksite.eu.	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.
Lincolnshire Historic Environment Record (HER)	Point data derived from Historic Environment Record held by Lincolnshire HER Office.	Limited coverage of the marine archaeology study area, though the detailed study provides useful characterisation of the directly adjacent subzone.
North Sea Palaeolandscape Project (NSPP) (University of Birmingham, 2011).	Palaeolithic and Mesolithic landscape mapping of the North Sea.	Partial 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.
Europe's Lost Frontiers (Gaffney and Fitch, 2022)	A continuation of the NSPP. Building on the mapping of Palaeolithic and Mesolithic landscapes of the North Sea, using paleoenvironmental	Volume 1 of this project has been published and has partial coverage of the marine archaeology study area with useful characterisation of the

Source	Summary	Coverage of study area
	data and ancient DNA. Potential submerged Neolithic landscapes will also be explored.	directly adjacent subzone and palaeoenvironmental context of the region.
Technical Report for Strategic Environmental Assessment (SEA) Area 3 (Flemming, 2002).	Description of palaeolandscape potential of the North Sea basin.	Broadscale data with regional coverage.
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.	Limited data within the marine archaeology study area, though peats have been found along the Lincolnshire coast and to the south along the Norfolk coast. Ten records are listed along the Lincolnshire coast within the marine archaeology study area, with an additional 33 records with unspecified locations within the North Sea.
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 mapping work or provided by third parties.	Full coverage of the marine archaeology study area. No records of peat are found within the marine archaeology study area, however there are six within relative proximity of the marine archaeology study area, with the closest located 2km south of the Offshore ECC.
National Historic Seascape Characterisation (NHSC) Database	Database and thesaurus of all intertidal and offshore historic seascapes in the UK.	Full coverage of the marine archaeology study area up to mean low water springs (MLWS).
England's Historic Seascapes: Withernsea to Skegness Pilot Study (Museum of London Archaeology Service, 2009)	Description of palaeolandscape and marine archaeological potential in the offshore zone from Southwold to Clacton.	Broadscale data with regional coverage.
ODOW geophysical and geotechnical survey data from	Geophysical surveys which include Multi-Beam Echo	Full geophysical survey coverage of the marine

Source	Summary	Coverage of study area
the ODOW array area and Offshore ECC (2021/2022)	Sounder (MBES), Side Scan Sonar (SSS), magnetometer (MAG) and Sub-bottom profiler (SBP) data collection and geotechnical works which include boreholes and vibrocoring.	archaeology study area. Initial geotechnical works will mainly be designed around engineering requirements, with archaeological input provided during the planning stages of site investigation works. Geoarchaeological campaigns utilising both the already collected material as well as archaeologically specific cores will be undertaken following submission of specific Method Statement (MS) to Historic England.

13.2.10 Where there are spatial data discrepancies between different sources, the coordinates provided by UKHO are used (as per Dellino-Musgrave and Heamagi, 2010). Datasets that were provided in the British National Grid co-ordinate system were transformed to World Geodetic System 1984 (WGS84) using the OSTN02 v7 transformation, the most appropriate transformation for working with marine data (Dellino-Musgrave and Heamagi, 2010).

13.2.11 Known and identified features within the marine environment typically fall into two categories: wrecks and obstructions. Definitions of these terms, as used by the UKHO, are provided below:

- Wreck: The remains of a stranded or sunken vessel or aircraft which has been rendered useless; and
- Obstruction: In marine navigation, anything that hinders or prevents movement, particularly anything that endangers or prevents passage of a vessel. The term is usually used to refer to an isolated danger to navigation. 'Fouls' (areas safe to navigate over but which should be avoided for anchoring, taking the ground, or ground fishing) listed by the UKHO are included within this category.

13.2.12 Wrecks and obstructions are further 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 that 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.

13.2.13 The record of England's archaeological and architectural sites held by the NRHE is being developed into the National Marine Heritage Record but is not complete at time of writing (March 2023).

13.2.14 The NRHE data utilised for the assessment of known marine archaeological and cultural heritage receptors within this PEIR contains data classified as:

- Wreck: Remains of vessels and aircraft;
- Fishermen's fasteners: Unidentified obstructions reported by fishermen;
- Named locations: Locations where a wrecking event has been reported but not confirmed; and
- Site/find and event: Find spots and locations for historical events such as battles.

13.2.15 Protective legislation for heritage features includes the Protection of Wrecks Act 1973, which seeks to secure the protection of known wrecks and wreck sites in territorial waters from interference by unauthorised persons; and the Ancient Monuments and Archaeological Areas Act 1979 which seeks to protect monuments and sites of national importance and public interest due to historic, architectural, traditional, artistic, or archaeological significance.

13.2.16 The significance of a site is not defined by the protection it is currently under, as knowledge and data of wrecks and sites is constantly evolving. See Volume 1, Chapter 13 for details.

Geophysical Data Collection Methodology

13.2.17 Enviros Survey & Consultancy Ltd (Enviros) was contracted by the Applicant to acquire shallow geophysical and Ultra-High Resolution Seismic (UHRS) data across areas being considered for development at the Project's array area and associated Offshore ECC.

13.2.18 The offshore portion of the survey was undertaken by the survey vessel MV Guard Celena for Phase I and Phase II (geophysical and Unexploded ordnance (UXO) surveys) during the survey period of 15 August 2021 to 2 January 2022. The shallow water portion (less than 10m depth) of the survey within Area A was conducted by the DSV Curtis Marshall as a part of Phase I (geophysical and UXO surveys) between 17 October and 20 November 2021.

13.2.19 The survey programme covered an area of approximately 600km^3 which has been divided into 3 Areas; A, B and C. This division was done to aid with data management and the issuance of deliverables. The geophysical survey comprised 656 mainlines and 47 crosslines that vary in length from 6 -17km.

13.2.20 The survey was conducted in a single pass mode with the UHRS, MBES, SSS, SBP and MAG were acquired concurrently.

13.2.21 The data quality, for archaeological purposes, of the SSS, MBES and SBP was assessed as Good, the exception to this was the MAG data, which was assessed as Adequate, as described below.

- Good: Clear data which has been unaffected or only slightly affected by conditions such as weather, sea state or background noise in which anomalies can be clearly identified and interpreted. Upstanding or partially buried wrecks, debris fields and small, isolated anomalies as well as subtle reflectors within the SBP data are clearly discernible. Data of this quality provide the highest probability for marine archaeological and cultural heritage receptors to be identified;

- Adequate: Data which has been moderately affected by conditions such as weather, sea state or background noise, in which anomalies can been seen but are difficult to identify and interpret. Upstanding wrecks and larger debris fields are discernible, however the identification and interpretation of dispersed or partially buried wrecks, small, isolated anomalies, and continuous reflectors within SBP datasets may be difficult. Data of this quality is considered usable, but the clear identification of marine archaeological and cultural heritage receptors may be impaired;
- Dissatisfactory: Data which has been significantly affected by conditions such as weather, sea sate or background noise, in which only large anomalies such as relatively intact upstanding wrecks can be suitably identified and interpreted. The identification and interpretation of dispersed or partially buried wrecks, small, isolated anomalies and small palaeogeographic features will be impaired; and
- Variable: Where the quality of data between individual lines varied leading to a variation in confidence in the identification and interpretation of marine archaeological and cultural heritage receptors within the dataset.

Side Scan Sonar Data

13.2.22 An Edgetech 4200 dual-frequency SSS towfish system was used to collect SSS data simultaneously on both port and starboard of the ship. The SSS was run at a low and high frequencies of 300 and 600 kHz with a range of 50 m to provide 100% coverage via the Edgetech Discover SSS acquisition software. Data were recorded in XTF format and was processed in the SonarWiz software package.

13.2.23 Following processing, the SSS data quality was considered Good (as defined above), and seabed anomalies could be clearly identified and interpreted.

13.2.24 The SSS data were reviewed on a line-by-line basis by a qualified marine archaeologist. All anomalies were identified and assessed for archaeological potential as per Table 13.2. Target reports were developed and exported as ESRI shapefiles into ArcGIS Pro for synthesis with other data sets.

13.2.25 All SSS anomalies were assigned feature IDs ranging between MA2000 – MA2222.

Echo Sounder (Multi-Beam System) Data

13.2.26 A Dual Teledyne RESON 7125 (400 kHz) hull mounted MBES was used to provide MBES. The system was run in a 190 - 400 kHz configuration. The MBES data was processed with a cell size of 0.25 x 0.25 m.

13.2.27 During survey operations multibeam settings were constantly monitored to ensure optimal performance. Swath angle and vessel speed were monitored and reduced in deeper waters to focus the same number of receive beams over a smaller seabed area to ensure hit count was maintained.

13.2.28 MBES data were received as ungridded ASCII files, and .asc grids reduced to LAT. The data were visualised using the Fledermaus 7 suite; DMagic to produce a digital terrain model (DTM) gridded at 0.25m according to the highest resolution xyz data received and hillshaded. These were exported for interpretation into Fledermaus with a 32-step colour map overlaid to aid interpretation and later into ArcGIS Pro for synthesis with other data.

13.2.29 Following processing, the MBES data quality was considered Good (as defined above), and seabed anomalies could be clearly identified and interpreted.

13.2.30 Backscatter (BS) data have also been recorded, measuring the intensity of the echo sounder pings which are assigned a grey-scale value and gridded. This provides an acoustic intensity map that is similar in appearance to side scan sonar data, but without shadows to highlight relief. The data are useful for the interpretation of bathymetric anomalies and enables an understanding of material type for discrete features, and sediment classification of shallow deposits.

13.2.31 The MBES and BS data were reviewed by a qualified marine archaeologist for targets identified during the assessment of other datasets and information regarding the length, width and anomaly height above the seabed was cross-referenced with side scan and SBP results where these features possessed a surface expression.

13.2.32 Target imagery was captured, and feature IDs were assigned, ranging between MA4000 – MA4086.

Magnetic Data

13.2.33 For the MAG data a Geometrics G882 (piggyback on the SSS) was used, this has a sensitivity of 1 nanotesla (nT). The data were acquired using the Maglog lite software.

13.2.34 Magnetic data were then assessed using the Geosoft Montaj and MagPick software packages. Raw xyz profile text files were assessed on a line-by-line basis and only smoothed using low and/or high pass filters where necessary. Data were also gridded from the analytic signal to produce a spatial distribution map of anomalies. Interpreted magnetic targets were identified by combining a manual assessment of the magnetic profiles with a visual assessment of the gridded data.

13.2.35 Following processing, the magnetic data quality was considered adequate (as defined above) due to being moderately affected by conditions such as the weather, sea state and background noise. Magnetic anomalies could be seen but identification and interpretation were more difficult.

13.2.36 Magnetic anomalies greater than 5nT have been accepted as a standard for the smallest change in magnetic field reliably detected (Dix *et al.*, 2008). It has been argued that a minimum detectable deflection of 5nT may be on the conservative side and that, where the data are relatively noise free, 3nT or even 2nT may be practical depending on noise levels, instrument type, data rate and purpose of investigation (Camidge *et al.*, 2010).

13.2.37 Objects giving a 5nT return from a six-metre distance are likely to be ferrous objects of around 100kg (for example, a small anchor) (Camidge *et al.*, 2010). Anomalies smaller than this are not likely to be discernible from signal noise unless passed over directly by the fish at extremely short range (c. 2m). Such signals are not expected to be of archaeological interest, constituting isolated debris or single instances of ferrous anthropogenic material.

13.2.38 These surveys, like most MAG surveys of large areas, are of variable sensitivity (Camidge *et al*., 2010:62). At 6m range, run lines directly over targets are able to detect a target with a mass of around 100kg, whereas the line spacing for this survey varies with the average line spacing at 75 or 150m. At 150m line spacing the slant range can be up to 80m, which means that only objects of more than 100 tonnes will be discernible at 5nT deflection at this range. Benefiting the data collection for this case is that the run lines were cross lined which can reduce the large differential sensitivity (Camidge *et al*., 2010:63).

13.2.39 All magnetic targets over 5nT were exported into ArcGIS Pro for comparative analysis with other geophysical datasets and data identified during the baseline review.

13.2.40 Target reports were developed for all magnetic anomalies correlating with high and medium potential SSS anomalies. Feature IDs for all magnetic anomalies were as-signed IDs ranging between MA5000 – MA6006.

Sub-bottom Profiler Data

13.2.41 An Innomar SES-2000 side mounted parametric SBP was used onboard the survey vessels MV Guard Celena and DSV Curtis Marshall for Phase I and Phase II. The SBP was operated on a frequency of 100kHz Primary and 4-15kHz Secondary. The parametric system has a narrow beam and is based on low frequency sound generation from two high-intensity sound beams at emitting at higher frequencies.

13.2.42 Interpretation of SBP data was undertaken on a line-by-line basis by a qualified marine archaeologist using the SonarWiz software package.

13.2.43 The data were received in SEGY format and imported and visualised using SonarWiz. Lines were bottom tracked and gain corrected, and then reviewed in numerical order with features digitised continuously. Features were picked by digitising reflectors and horizons of potential archaeological interest. Discrete reflectors consist of point hyperbolae and blanking effects indicative of potential buried archaeological deposits, such as wreck and debris.

13.2.44 Following processing, the SBP data quality was considered Good (as defined above), and channels and sub seafloor features could be identified and interpreted.

13.2.45 Feature IDs for all SBP anomalies were assigned ID's ranging between MA3000 – MA3007.

Methodology Geophysical Data Interpretation

13.2.46 The archaeological assessment of geophysical data has been undertaken by a qualified and experienced marine archaeologist. Following delivery of the survey data as specified above, the raw data were processed and interpreted as per guidance in Marine Geophysics Data Acquisition, Processing and Interpretation (English Heritage, 2013).

13.2.47 All anomalies of archaeological potential were assessed against the criteria in Table 13.2 and the results of the assessment of all datasets were further reviewed against the baseline data collated for the marine archaeology study area, as detailed in Section 13.3.

Table 13.2: Definition of Archaeological Potential

Archaeological Potential	Archaeological Definition
High	Anomalies considered to map material of archaeological interest such as wreck or aviation crash sites, buried and confirmed palaeolandscapes and their margins.
Medium	Anomalies that consist of defined structural outlines or coherent material distributions with strong backscatter, or clearly upstanding objects with shadow, or pronounced scour features; or a combination of these, interpreted as of possible archaeological interest but where further investigation would be required for more detailed interpretation.
Low	Anomalies considered to be of anthropogenic origin but likely related to modern activity with little or no archaeological significance such as modern debris, ropes, chains or fishing gear.

Embedded Mitigation Methodology

13.2.48 Mitigation measures that were identified and adopted as part of the development of the Project design (embedded into the Project design) and that are relevant to Offshore and Intertidal Archaeology, listed in Table 13.3, include project design measures. Compliance with elements of good practice and use of standard protocols. It is expected that these will evolve over the development process as the Environmental Impact Assessment (EIA) progresses and in response to consultation. This approach is further detailed in Volume 1, Chapter 13 and is expected to be reflected in the DCO requirements and/or deemed Marine Licence (dML) conditions.

13.2.49 The embedded mitigation measures for the Project are formulated where marine archaeology and cultural heritage receptors and anomalies are identified in the desk-based assessment and/or geophysical assessments. The embedded mitigation measures are based on guidance set out in Historic Environment Guidance for Offshore Renewable Energy Sector (COWRIE, 2007) and Archaeological Written Schemes of Investigation for Offshore Wind Farm Projects (The Crown Estate, 2021).

Table 13.3: Embedded Mitigation Relating to Marine and Intertidal Archaeology

Mitigation Measure Embedded into the Project Design	Description of Mitigation
Marine Written Schemes of Investigation	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 for the Draft Marine WSI followed by the final Agreed Marine WSI.
Archaeological Exclusion Zones (AEZ)	All intrusive activities undertaken during the life of the Project will be routed and microsited to avoid any identified marine archaeological and cultural heritage receptors pre-construction, with AEZs as detailed in the Outline Marine WSI unless other mitigation is agreed with Historic England.

Mitigation Measure Embedded into the Project Design	Description of Mitigation
Protocol for Archaeological Discoveries (PAD)	Additional unknown or unexpected archaeological and cultural 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.
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 archaeology and cultural heritage receptors that may have occurred during the construction phase.

13.3 Baseline Review

Environmental Context

13.3.1 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). 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 repeat (re)colonization and abandonment of these landscapes.

13.3.2 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 which 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). The environmental context and the results of the geoarchaeological assessments are further discussed in section 13.5.

13.3.3 A wide variety of monuments and artefacts representing the period of time since the last glaciation have potential to be found within the marine archaeology study area and wider regional context. These may include maritime related features such as fish weirs, jetties, fish and shellfish tanks, revetments, piers, harbour installations, lifeboat stations, coastguard buildings, wreck sites, as well as others relating to agricultural practices, residential or leisure activity, and industrial processes. Similarly, artefacts may be found which relate to shipping, fishing, hunting, domestic activity, or craft/industrial occupations, covering many periods (Humber Field Archaeology, 2009). These have been described, and examples included where possible, in the sections below and a gazetteer taken from the Historic England Peat Database of the 10 peat deposits recorded in the marine archaeology study area as well as 33 from an offshore context within the North Sea which provide regionally contextual relevance has been included as Annex C (Historic England, 2023).

Maritime Activity

Introduction

13.3.4 The following sections provide a broad contextual overview of the past human activity within the region, focusing on maritime activity. This enables an assessment of the potential for archaeology within the marine archaeology study area and an assessment of significance of any sites that may be within it.

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

- Submerged prehistoric landscapes related to fluctuations in past sea-level. Such landscapes may contain significant evidence of prehistoric human occupation and/or environmental change;
- Archaeological remains of vessels deposited after a wrecking event at sea or abandoned in an intertidal context;
- Thousands of aircraft are likely to have been lost in UK territorial waters during the 20th century primarily during the World Wars. A high proportion of these losses are likely to be combat losses or accidental losses of military aircraft that occurred during WWII, but aviation remains could also include aircraft, airships, and other dirigibles dating to WWI, although these rarely survive in the archaeological record;
- Structural remains other than watercraft, such as defensive structures, lighthouses or sites lost to the sea as a result of coastal erosion, may be found within the intertidal zone (between MLWS and MHWS); and
- Historic Seascape Character: the historic cultural influences which shape present perception of seascape, its use and its ability to accommodate change.

13.3.6 There are a wide range of heritage sites without formal protection which have been identified and outlined below and in Section 13.3.

13.3.7 The baseline assessment has also determined that:

- There are currently no marine archaeological and cultural heritage receptors within the marine archaeology study area that are designated under the Protection of Wrecks Act 1973, or any other site designation or statutory protection;

- There are currently no Marine Antiquities Scheme finds recorded within the marine archaeology study area (The Crown Estate, 2016); and
- There are currently no conservation areas within the marine archaeology study area. However, where the Offshore ECC makes landfall there is one site that is designated as a Site of Special Scientific Interest (SSSI), while there are currently no recorded archaeological sites or finds at Chapel Point to Wolla Bank SSSI, but preserved palaeoenvironmental deposits that consist of Holocene sediments and special geological features have been recorded.

Palaeolithic (c. 800,000 To 12,000 BP)

13.3.8 The potential for submerged landscapes within the marine archaeological study area is high. To the south of the marine archaeology study area, at Happisburg and Pakefield, the earliest evidence of hominin occupation of northern Europe (c. 900 kiloannum (ka) to 800 ka) comes from sites, features, and finds within the coastal and marine zone (Parfitt *et al*., 2005, 2010; Bynoe, 2018).

13.3.9 The Quaternary (Pleistocene and Holocene) was a period of fluctuating climate corresponding with oscillations in sea level. During interglacial periods sea levels were relatively high, sometimes comparable to the present day.

13.3.10 There have been numerous glacial cycles resulting in periods of lower and higher sea-level compared to today. 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 more than likely from periods when the sea level was lower.

13.3.11 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 had not yet been eroded or reworked by younger landscapes (Cohen *et al*., 2017).

13.3.12 The deposits laid down in the marine zone during glacial cycles during the last 500,00 years are of great importance for understanding the localised geomorphological changes of the Lincolnshire coastline. The archaeological and palaeoenvironmental potential of the offshore deposits from 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.

Mesolithic (c. 12,000 To 6,000 BP)

13.3.13 During the Early Mesolithic (approximately 10,000 BP) the melting northern ice sheet caused sea levels to rise cutting of Britain's dry-land connections with continental Europe and causing a flourishing forested environment to spread throughout the region. Human settlement and behaviour had to adapt to the changing conditions. Human settlement patterns around the North Sea and associated river inlets suggest the use of vessels. Examples of this include evidence of wood clearing and settlements close to rivers such as the Little Ouse. Although there is currently no archaeological evidence for boat building at this time within this region, there is contemporary evidence in the Netherlands and France that wood working took place for a variety of equipment, such as watercraft (Limpenny *et al*., 2011).

13.3.14 Most early prehistoric finds from the North Sea will be from the late Upper Palaeolithic and earlier Mesolithic, post-dating the Last Glacial Maximum (LGM) (Devensian) and representing the period of recolonisation of southern Britain by anatomically modern humans from c. 12,500 BP. This followed a period of approximately 10,000 years of glaciation (during which there is no current evidence of human habitation or continuity - Jacobi, 2004).

13.3.15 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 development such as aggregate dredging Area 240 approximately 98km south 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.

Neolithic (c. 6,000 To 4,600 BP)

13.3.16 Neolithic watercraft, much like their Mesolithic counterparts, are likely to comprise skin/hide boats or logboats (summary in McGrail, 2004: 172-183). In general, the former craft are more likely to be capable of open water journeys, whereas the latter were likely restricted to sheltered waters.

13.3.17 The rate of sea-level change had slowed considerably by c. 6,000 Before Present (BP) for much of the British Isles and much of the land mass connecting the UK and continental Europe was permanently inundated.

13.3.18 There are two types of boats known from England during the Neolithic, however there are currently no known examples from the Neolithic. Logboats, or monoxylous craft, are made from hollowed-out tree trunks, often with rounded ends, but sometimes the stern included a fitted transom. Logboats would have been paddled and suitable for travelling along the North Sea coast and deltas under favourable circumstances. It is probable that Prehistoric settlers exploited the landscape using craft such as logboats.

13.3.19 The second type of craft known archaeologically is the sewn-plank boat which are constructed from large oak timbers with bevelled edges; planks are sewn or stitched together using twine or withies made of fibres from the yew tree. The planked hull was caulked with moss, making it relatively watertight and a system of cleats, which were integral to the keel- and side-strake planks, or isle planks, through which transverse timbers were passed, provided rigidity to the hull (Sturt and Van Noort via Research Framework, 2022).

13.3.20 Sewn-plank boats were more likely to have been used for seafaring journeys than logboats and would also have been paddled. Designed to be more capable at sea, and due to their size of up to 18m they had the capacity for a crew of 20 or more. The find locations of sewn-plank boats, exclusively on the coast or in estuarine situations, supports the argument that this type of craft was used for coastal journeys and sea crossings (Van de Noort, 2006). Examples of sewn-plank boats have been found near Brigg in Lincolnshire's Ancholme valley, North Ferriby in the intertidal Humber, and Kilnsea.

13.3.21 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. In particular, 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).

13.3.22 The landscape of the region from the Neolithic through to the Bronze Age encompassed the clearing of broad areas of woodland with settlement amongst the rich marshlands and estuarine environments (Limpenny *et al*., 2011).

Bronze Age (c. 4,600 To 2,200 BP)

13.3.23 The earliest examples of British Middle to Late Bronze Age watercraft represent a functional development of adapting timber into planks to utilise the varying environments for the owners' benefits, either for ferrying within fast-flowing estuaries or simply searching for foodstuffs within quiet upper reaches and creeks (McGrail, 2004). Examples of log boats within the region include the Appleby logboat dated to 3,500 BP and one found in the Witham River dated to 4,000 BP.

13.3.24 The potential for substantial submerged landscape deposits offshore is further reduced in the Bronze Age due to the increasing stability in sea levels. However, with increasingly sedentary populations, both on the coast and inland, there came an inevitable rise in increased communications along the coast and waterways of the region.

13.3.25 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.

Iron Age (c. 1,800 BP To AD 43)

13.3.26 By the Iron Age, sea level change no longer had a significant effect on the geomorphology of the coastline and was replaced by coastal erosion as the key factor in coastline changes. Maritime trade networks were further developed, with evidence of cross-channel, coastal and inland trade. From the late Iron Age there is much clearer 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, France and Belgium, and a range of other traded and imported Roman material.

13.3.27 The Iron Age that followed (700 BC to Anno Domini (AD) 43) would see a similar structure of lifestyle to that of the Late Bronze Age, with a low density of activity along river valleys and sustained woodland clearance around the east coast (Bryant, 1997). Late Iron Age artefacts of European significance from the La Tène I to III cultures that were deposited as offerings have all been discovered within wet contexts to the west (Bryant, 1997). This not only represents a further connection to the Continent through trade, but also a community motivated towards water environments for more than simply transport and subsistence (Hegarty and Newsome, 2004).

Roman (c. 43 To 410)

13.3.28 A closer unity between Britain and the southern North Sea margin was established during the Romano-British period (AD 43 – AD 410), which expanded and further diversified trade with the Continent. By AD 50 the port of Londinium attracted a vast density of shipping and merchant carriers (Merrifield, 1983).

13.3.29 The Roman occupation of the British Isles had an inherent maritime aspect due to the cross-Channel contact and connectivity that occurred both before and after the conquest. There is some uncertainty about the extent of coastal regression and transgression on the British coastline during the Roman period, however along the north and northeast coasts of Norfolk, to the south of the marine archaeology study area. A Roman coast extending approximately 2km further seawards has been theorised (Walsh and Brockman *et al*., via Research Frameworks, 2022), increasing the potential of Roman artefacts to be found across the marine archaeology study area. Caistor and Lincoln were towns developed during the Roman occupation, with evidence of overseas trade. To the south, Brancaster housed a possible 'Saxon Shore Fort'. Two pot sherds recorded in the Lincolnshire HER (MLI41602 and MLI41607) are recorded within the intertidal zone of the marine archaeology study area.

13.3.30 Direct maritime archaeological evidence also represents diverse cultural impacts and impressions during the Romano-British period, exemplified by a number of vessels discovered around England which illustrate cross-Channel contacts through the manner of the constructional traditions utilised.

13.3.31 As the Roman dominance of Europe diminished, opportunistic seafaring communities from the east began to threaten vulnerable areas along the coast. This saw the establishment of Roman garrisons along the Norfolk and Suffolk coast, known as the "Saxon Shore" sea defence. Indeed, the fortified sites of Caister and Burgh Castle are well documented (Darling and Gurney, 1993; Gurney, 2005). A network of trade and migration routes that extended throughout the southern North Sea was introduced by the Saxon settlers who established themselves after the Roman occupation. This is evidenced by Scandinavian-style clinker-built vessels during the Early Medieval period (AD 410–1066).

13.3.32 Examples of vessels during this period include a wooden boat discovered in an old watercourse close to Ashby Dell thought to be from the 4th or 5th century and similar in type to the Nydam 2 ship from Jutland (AD 310 and AD 350); the Sutton Hoo 2 dated to approximately AD 630, which is similar the Norwegian Kvalsund Ship (AD 700) (McGrail, 2004). The Nydam 2 boat and the Sutton Hoo 2 boat may not be representative of ocean-going cargo vessels, however, they represent the shipbuilding technology of the time and ability of shipwrights to build strong sailable vessels.

Medieval (c. 410 To 1540)

13.3.33 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 until 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.

13.3.34 Viking raids during the Early Medieval period let to settlements forming along the eastern shores of England, bringing new cultural influences on the vibrant Saxon communities of East Anglia.

13.3.35 Ship and casualty losses from this period were documented and indicate the international nature of shipping networks from the Baltic to Mediterranean passing through the southern North Sea area. This proximity to rich marine resources led to Norfolk and Suffolk establishing the largest fleet of ships compared to any other region of England at this time, with the towns of Dunwich, Southwold, Lowestoft, and Great Yarmouth as particular examples of this prosperity (Williams, 1988).

13.3.36 New trans-oceanic networks between the North Sea and the East and West Indies became established during the late 15th and early 16th centuries. Within a century the advance in shipbuilding technological capabilities and cheap ordnance meant that conflicts at sea became organised, larger in scale and more destructive.

13.3.37 Within the marine archaeology study area, there is one record of a potsherd (MLI41601) from the medieval period listed in the Lincolnshire HER.

Post-Medieval (c. 1540 To 1901)

13.3.38 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.

13.3.39 Towards the end of the post-medieval period the Agricultural Revolution followed by the Industrial Revolution led to great expansion of trading and economy. Local industries of ironworks, lime works (for building and fertilising) and brickworks emerged in order to supply the demand for local developments. Much of this had to be transported by water, until a reliable railway network was developed by the 1860s (Gould, 1997). The established ports of Grimsby and Hull along with the newly developed rail system played roles in the growth of fishing and shipping industries, leading to a greater inland accessibility to fresh fish and other maritime imports.

13.3.40 Generally, timber-built vessels continued to be dominant, with iron structural elements and fittings becoming more popular as the nineteenth century progressed. Fundamental changes in shipbuilding traditions occurred through the technological innovations of the Industrial Revolution with the development of steam propulsion together with iron and steel constructed hulls (Greenhill, 1993). Two sailing vessels (UKHO9339, *SV Excelsior* and UKHO9341 *SV Dauntless*) within the marine archaeological study area are dated to the post-medieval period.

Modern (c. 1901 To Present)

13.3.41 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 innovation 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.

13.3.42 During WWI the necessary continuation of the movement of cargo to and from London meant the east coast was *en route* from the industrial heartland and northern coalfields throughout WWI and WWII. Different strategies with which to disrupt shipping, based around the available technologies of the time, were adopted during each conflict.

13.3.43 The east coast witnessed a large proportion of maritime wartime casualties during both conflicts. During WWI, German U-Boat and minefields were the primary cause of shipping losses, compared with the natural elements of weather and navigational hazards. The British Navy established convoy networks with escorting minesweepers that were usually local fishing trawlers acquired and customised by the Admiralty to combat these losses (Limpenny *et al*., 2011).

13.3.44 Recorded losses from WWI are predominantly recorded along the UK coastline, and in particular the major ports, and potentially reveal the German strategy in the southern North Sea (Limpenny *et al*., 2011).

13.3.45 During WWII, convoy vessels were lost by torpedoes from submarines, with the additional threat of German motor torpedo boats, known as E-Boats, and fighter/bomber aircraft (Larn and Larn, 1997). There are a high number of aviation losses attributed to WWII from the Royal Airforce (RAF), American and German aircraft along the east coast.

13.3.46 The archaeological record of the east coast has a disproportionate focus towards twentieth-century shipping losses that, although important, are not representative of the technological advances of shipbuilding made in the previous century. Within the marine archaeology study area, there are 12 recorded wrecks attributed to the modern period.

Date Unknown

13.3.47 There are 24 recorded losses of unknown dates within the marine archaeology study area recorded in the UKHO and NRHE (there were none recorded within the Lincolnshire HER). Two of these 24 records are within the array area and associated 1km buffer. These are further detailed in Section 13.3.

Known Wrecks and their Archaeological Significance

13.3.48 Known wrecks are listed in order of their UKHO or NRHE number and are described in the following sections (illustrated in Figure 13.2).

13.3.49 The assessment of archaeological significance has been completed for the records within the array area and associated 1km buffer, outlined below. For the records in the Offshore ECC and associated buffer, where the geophysical data is still undergoing archaeological assessment, the archaeological significance assessment will be updated within the ES.

13.3.50 The significance assessment guidance (DCMS, 2013) has been used where there is enough available data to assess the wreck and is based on the criteria for the assessment of archaeological significance, as set out by the Department for Culture Media and Sport (DCMS, 2013). In instances where all criteria is UNKNOWN the significance table has not been included, however; there is potential that further information may change this assessment during ES phases in which case the significance tables will be updated or added.

13.3.51 There are 21 LIVE wrecks, five DEAD wrecks, and 12 UNKNOWN or unconfirmed, within the marine archaeology study area. Unless otherwise indicated, the size of each wreck is presented as: length x width x depth m. The recorded sites, wrecks and obstructions within the marine archaeology study area and their locations where known, are listed in Annex B.

13.3.52 Two wrecks, *SS Ahamo* a British tanker (NRHE943166, UKHO9328) and *SS Fireglow* an English collier (NRHE1456746, UKHO9313), are both NRHE records located within the marine archaeology study area but are associated with UKHO records that are both located outside of the marine archaeology study area (1.47km and 23.29km away from their NRHE locations, respectively). The locations listed within the UKHO data has been used as per Section 13.2.8 and these wrecks have not been included in the assessment below.

13.3.53 There are total of 10 High significance, 3 Medium significance, 3 Low significance and 22 Unknown significance marine archaeological and cultural heritage receptors which are further detailed below.

Archaeological Significance of Known Wrecks within the Array Area

UKHO9339 SV Excelsior

13.3.54 A 64-ton sailing vessel which sank on 26 August 1882 after a collision with the smack *Scottish Chief*. No other details are listed about the life or loss of *SV Excelsior*.

13.3.55 The wreck is currently listed as DEAD and was not identified in the Project's geophysical data.

Baseline Archaeological Significance

13.3.56 Sailing vessels in the 1800's were going through technical advancements alongside the development of contemporary steam powered ships but sail was still commonly used, especially for quicker transport of cargo using ships of the Clipper type. As limited information is available on *SV Excelsior*, and the vessels has never been located in this position, it is deemed to be of MEDIUM archaeologically significance (Table 13.4). However, there is the potential that further information may change this assessment.

Table 13.4: Archaeological Significance of UKHO9339 SV *Excelsior*

Criteria (DCMS 2013)	Archaeological Significance
Period	Medium
Rarity	Medium
Documentation	Medium
Group value	High
Survival/condition	Unknown
Fragility/vulnerability	Unknown
Diversity	Medium

Criteria (DCMS 2013)	Archaeological Significance
Potential	Medium
Overall	MEDIUM

UKHO9341 *SV Dauntless* (possibly)

13.3.57 A British sailing vessel with a gross tonnage of 54 was lost on 1 August 1892. No further details are listed about its life or loss. The wreck was recorded in the 1980's and confirmed as lying in 19m of water with debris 100m southeast but has not been seen since.

13.3.58 The wreck is currently listed as LIVE and was not identified in the Project's geophysical data.

Baseline Archaeological Significance

13.3.59 Sailing vessels in the 1800's were going through technical advancements alongside the development of contemporary steam powered ships but sail was still commonly used, especially for quicker transport of cargo using ships of the Clipper type. As limited information is available on *SV Dauntless*, and the vessel has not been seen since 1989 when it was measured as 12m x 4m with no magnetic signature, it is deemed to be of MEDIUM archaeologically significance (Table 13.5), despite the likelihood that the measurements would indicate a smaller vessel, possibly used for fishing. However, there is the potential that further information may change this assessment.

Table 13.5: Archaeological Significance of UKHO9341 SV *Dauntless* (possibly)

Criteria (DCMS 2013)	Archaeological Significance
Period	Medium
Rarity	Medium
Documentation	Medium
Group value	Medium
Survival/condition	Unknown
Fragility/vulnerability	Unknown
Diversity	Medium
Potential	Medium
Overall	MEDIUM

UKHO9417 *MV Basto*

13.3.60 An Antiguan and Barbudan steel motor cargo ship built in 1965 by Schiffswerft Niederelbe (Hugo Peters & Co.), Wewelsfleth, Germany with dimensions of 64.6 x 10.1 x 3.7m with a diesel engine, single shaft and screw, and a gross tonnage of 499. Owned at the time of loss by Arn Thielen.

13.3.61 On 8 January 1988 on passage from Kalundborg for Guinness with a cargo of wheat, *MV Basto* took on a severe list and was abandoned, then later sank while under tow to Humber.

13.3.62 The wreck is currently listed as LIVE and was identified in the Project's geophysical data (MA0005).

Baseline Archaeological Significance

13.3.63 The position and identity of the wreck has been confirmed and the site has been investigated multiple times, it was located and swept clear at 9m in 1988 and again at 12.9m in 1989 when it was described as broken up into two parts. In 1990 it was commissioned to be dispersed and was following dispersal swept at 16.5m. It is not surprising therefore that the wreck remains visible in the geophysical data and is noted as scattered debris and sheathing of a large wreck.

13.3.64 Despite its clear remains on the seabed and the information available the wreck is assessed as of LOW archaeological potential (Table 13.6). However, there is the potential that further information may change this assessment.

Table 13.6: Archaeological Significance of UKHO9417 *MV Basto*

Criteria (DCMS 2013)	Archaeological Significance
Period	Low
Rarity	Low
Documentation	Medium
Group value	Low
Survival/condition	Medium
Fragility/vulnerability	Medium
Diversity	Low
Potential	Low
Overall	LOW

UKHO9426 Unknown

13.3.65 An unknown vessel originally detected in 1989 with no further detail listed about its life or loss. Measured during surveys in 1989 as having dimensions of 120 x 15 x 2.1m. In 1995 the location was interpretated as an area of boulders, however the report also notes that the mound visible may be sediment build-up around a wreck.

13.3.66 The wreck is currently listed as LIVE and was identified in the Project's geophysical data (MA0018).

Baseline Archaeological Significance

13.3.67 As an unknown vessel the archaeological significance cannot be determined based on the information available. When and if further information becomes available it may be possible to undertake a full assessment of its archaeological significance.

UKHO9440 Unknown

13.3.68 An unknown fishing trawler with a single boiler of 300 gross tonnage originally detected in 1989 with no further details listed about its life or loss.

13.3.69 The wreck is currently listed as LIVE and was identified in the Project's geophysical data (MA0003).

Baseline Archaeological Significance

13.3.70 As an unknown fishing trawler vessel with limited information available, this vessel is deemed to be of MEDIUM archaeologically significance (Table 13.7). However; there is the potential that further information may change this assessment.

Table 13.7: Archaeological Significance of UKHO9440 Unknown

Criteria (DCMS 2013)	Archaeological Significance
Period	Medium
Rarity	Unknown
Documentation	Medium
Group value	Low
Survival/condition	High
Fragility/vulnerability	Medium
Diversity	Low
Potential	High
Overall	MEDIUM

UKHO93010 Unknown

13.3.71 An unknown vessel originally detected in 2019 with no further details listed about its life or loss. Measured during a survey as having dimensions of 8.7 x 1.9 x 0.6m.

13.3.72 The wreck is currently listed as UNKNOWN and is located within the 1km buffer around the array area so was not covered by the Project's geophysical data which was only collected in the array area.

Baseline Archaeological Significance

13.3.73 As an unknown vessel the archaeological significance cannot be determined based on the information available. When and if further information becomes available it may be possible to undertake a full assessment of its archaeological significance.

Archaeological Significance of Known Wrecks within the Offshore ECC

UKHO8614 Unknown

13.3.74 An unidentified wreck or obstruction with no further details about its life or loss.

13.3.75 The wreck is currently listed as LIVE, the assessment of data covering this record is ongoing.

Baseline Archaeological Significance

13.3.76 As an unknown vessel the archaeological significance cannot be determined based on the information available. When and if further information becomes available it may be possible to undertake a full assessment of its archaeological significance.

UKHO8617 *MV Arduity*

13.3.77 A British steel motor coaster of 304 tons with dimensions of 35.4 x 7.9 x 2.7m was built in 1935 by George Brown & company, Greenock for F T Everard & Sons. *MV Arduity* was powered with a three-cylinder diesel powered oil engine of 84HP, and a single shaft, built by Newbury Diesel Co. Ltd. Recorded in the NHRE database (NRHE913040).

13.3.78 On the 16 May 1942 while carrying a cargo of coal MV *Arduity* was mined and sunk five miles off Mablethorpe while on passage from Keadby to Cantley.

13.3.79 The wreck is currently listed as LIVE, the assessment of data covering this record is ongoing.

Baseline Archaeological Significance

13.3.80 *MV Arduity* is one of many cargo and transport vessels lost at sea during the WWII. The site has the potential to be of HIGH archaeological significance based on the time period (Table 13.8). However, there is the potential that further information may change this assessment.

Table 13.8: Archaeological Significance of UKHO8617 *MV Arduity*

Criteria (DCMS 2013)	Archaeological Significance
Period	High
Rarity	Medium
Documentation	High
Group value	Medium
Survival/condition	Unknown
Fragility/vulnerability	Unknown
Diversity	Medium
Potential	High
Overall	HIGH

UKHO8626 *SS Argo*

13.3.81 The Norwegian iron steam cargo ship of 1,261 tons and dimensions of 234.9 x 34.1 x 16.8m was built in 1883 by Martens, Olsen & Co. and owned at the time of loss by Wrangell H. M. & Co. *SS Argo* was powered by a two-cylinder compound steam engine and two single boilers, with one shaft and one screw and a 142HP engine. Recorded in the NHRE dataset (NRHE913042).

13.3.82 On 28 January 1917 when on a voyage from Hull to Rouen with a cargo of coal, *SS Argo* was struck by a mine from the German submarine UC-26 (Matthias Graf von Schmettow), 1.5 miles southeast of the Inner Dowsing Light Vessel. The crew abandoned the ship and the vessel drifted with the tide before going down. Nine persons were lost.

13.3.83 The wreck is currently listed as LIVE, the assessment of data covering this record is ongoing.

Baseline Archaeological Significance

13.3.84 As a WWI vessel with an international crew and substantial human loss, the site has the potential to be of HIGH archaeological significance (Table 13.9). However, there is the potential that further information may change this assessment.

Table 13.9: Archaeological Significance of UKHO8626 SS *Argo*

Criteria (DCMS 2013)	Archaeological Significance
Period	High
Rarity	Medium
Documentation	Medium
Group value	High
Survival/condition	Unknown
Fragility/vulnerability	Unknown
Diversity	Medium
Potential	High
Overall	HIGH

UKHO8629 Unknown

13.3.85 The wreck of an unknown vessel with no further details about its loss, however UKHO survey data reports it as large vessel, partially buried measuring 100 x 15 x 8m, lying in an area of sand waves.

13.3.86 The wreck is currently listed as LIVE, the assessment of data covering this record is ongoing.

Baseline Archaeological Significance

13.3.87 As an unknown vessel the archaeological significance cannot be determined based on the information available. When and if further information becomes available it may be possible to undertake a full assessment of its archaeological significance.

UKHO8630 SS Konstantinos Hadjipateras

13.3.88 A Greek steel steam cargo ship of 5,962 tons built in 1913 by J. L. Thompson & Sons Ltd., North Sands, Sunderland as the *Den of Ewne*. Renamed in 1916 as *Pinemore*, in 1923 as *Lesreaulx*, in 1927 *Calandplein*, and in 1935 *Konstantinos Hadjipateras* for John C. and Adamantios C. Hadjipateras, Piræus, Greek. Recorded in the NHRE dataset (NRHE913043).

13.3.89 On the 24 October 1939 SS *Konstantinos Hadjipateras* was mined by German submarine U-19 near the Inner Dowsing Light Vessel, when *en route* from Boston for Tyne carrying 8,412 tons of scrap iron. All survivors along with those onboard *MV Deodata* (UKHO8641, below) and *SS Capitaine Edmond Laborie* (UKHO8635, below) who all struck the same minefield, were picked up by *Louise Stephens*, a Gorleston lifeboat. Four persons were lost.

13.3.90 The wreck was dispersed by Admiralty salvage in July 1947 using 600 depth charges. *SS Konstantinos Hadjipateras* is currently listed as LIVE, the assessment of data covering this record is ongoing.

Baseline Archaeological Significance

13.3.91 As part of the WWII narrative this site has the potential to be of HIGH archaeological significance (Table 13.10). However, there is the potential that further information may change this assessment.

Table 13.10: Archaeological Significance of UKHO8630 SS *Konstantinos Hadjipateras*

Criteria (DCMS 2013)	Archaeological Significance
Period	High
Rarity	Medium
Documentation	Medium
Group value	High
Survival/condition	Unknown
Fragility/vulnerability	Unknown
Diversity	Medium
Potential	High
Overall	HIGH

UKHO8632 *SS Fane*

13.3.92 A Norwegian steel steam cargo collier vessel with dimensions of 69.6 x 10.8 x 4.8m built by Bergens Mekaniske Verksteder A/S., Bergen in 1901 with a gross tonnage of 1,119. Powered by a three-cylinder triple expansion steam engine of 101HP with a single shaft and screw. Owned at the time of loss by Torkildsen Vilhelm, Bergen. Recorded in the NHRE dataset (NRHE1459776).

13.3.93 On 6 August 1917 on a voyage from Rouen to Sunderland in ballast, *SS Fane* was sunk by a mine from the German submarine UC-63.

13.3.94 The wreck is currently listed as LIVE, the assessment of data covering this record is ongoing.

Baseline Archaeological Significance

13.3.95 As part of the WWII narrative this site has the potential to be of HIGH archaeological significance (Table 13.11). However, there is the potential that further information may change this assessment.

Table 13.11: Archaeological Significance of UKHO8632 *SS Fane*

Criteria (DCMS 2013)	Archaeological Significance
Period	High
Rarity	Medium
Documentation	Medium
Group value	High
Survival/condition	Unknown
Fragility/vulnerability	Unknown
Diversity	Medium
Potential	High
Overall	HIGH

UKHO8633 SS *Costanza*

13.3.96 An Italian iron sail and steam cargo ship built in 1883 by Oswald Mordaunt & co., Southampton with dimensions of 94.8 x 11.9 x 8.2m, a two-cylinder compound steam 307 HP engine, two single boilers, six corrugated furnaces, GS 128, a single shaft, one screw and a schooner rigging. Originally named *Test* from 1883 to 1885, then renamed to *Caxton* from 1885 to 1895, to *Mendota* from 1895 to 1990, to *Angiolina* from 1900 to 1905, to *Citta Di New York* from 1905 to 1908, and finally to *SS Costanza* in 1908. Owned at the time of loss by Palazio G. – Soc. Anon. Marittima La Platense, Genoa.

13.3.97 Lost on 14 August 1917 on a voyage from Tyne to Livorno with a cargo of coal, when torpedoed and sunk by German submarine UC-63 (Karsten von Heydebreck) 3.5 miles southeast of the Inner Dowsing Light Vessel. There were no casualties.

13.3.98 The wreck is currently listed as LIVE, the assessment of data covering this record is ongoing.

Baseline Archaeological Significance

13.3.99 As a WWI vessel with an international crew and circumstance of loss the site has the potential to be of HIGH archaeological significance (Table 13.12). However, there is the potential that further information may change this assessment.

Table 13.12: Archaeological Significance of UKHO8633 SS *Costanza*

Criteria (DCMS 2013)	Archaeological Significance
Period	High
Rarity	Medium
Documentation	Medium
Group value	High
Survival/condition	Unknown
Fragility/vulnerability	Unknown
Diversity	Medium
Potential	High
Overall	HIGH

UKHO8635 SS Capitaine Edmond Laborie

13.3.100 A French steel steam cargo vessel built in 1923 by Ateliers & Chantiers de la Seine Maritime with dimensions of 95.6 x 14.2 x 6.1m a 149HP triple expansion engine and one screw. Owned at the time of loss by Etablissements Odon De Lubersac.

13.3.101 On 21 October 1939 on passage from Bordeaux for the Tyne, SS *Capitaine Edmond Laborie* struck a mine laid on October 17th by U-19 (Meckel) two miles east of the Inner Dowsing Light Vessel and sank. All survivors were picked up by the lifeboat *Louise Stephens*, along with those of the *MV Deodata* and *Konstantinos Hadjipateras*.

13.3.102 The wreck is currently listed as LIVE, the assessment of data covering this record is ongoing.

Baseline Archaeological Significance

13.3.103 As part of the WWII narrative this site has the potential to be of HIGH archaeological significance (Table 13.13). However, there is the potential that further information may change this assessment.

Table 13.13: Archaeological Significance of UKHO8635 SS *Capitaine Edmond Laborie*

Criteria (DCMS 2013)	Archaeological Significance
Period	High
Rarity	Medium
Documentation	Medium
Group value	High
Survival/condition	Unknown
Fragility/vulnerability	Unknown
Diversity	Medium
Potential	High
Overall	HIGH

UKHO8636 MFV *Lindy Sue*

13.3.104 A small fishing motor vessel with a length of 10.7m, a diesel engine, single shaft and screw. Lost on 31 August 1965 with no further details about its life or loss.

13.3.105 The wreck is currently listed as DEAD, the assessment of data covering this record is ongoing.

Baseline Archaeological Significance

13.3.106 As a relatively modern vessel with limited information available, this vessel is deemed to be of LOW archaeologically significance (Table 13.14). However, there is the potential that further information may change this assessment.

Table 13.14: Archaeological Significance of UKHO8636 *MFV Lindy Sue*

Criteria (DCMS 2013)	Archaeological Significance
Period	Medium
Rarity	Low
Documentation	Low
Group value	Low
Survival/condition	Unknown
Fragility/vulnerability	Unknown
Diversity	Low
Potential	Low
Overall	LOW

UKHO8638 Unknown

13.3.107 A sailing ship lost in April 1917 with no further details about its life or loss.

13.3.108 The wreck is currently listed as LIVE, the assessment of data covering this record is ongoing.

Baseline Archaeological Significance

13.3.109 As an unknown vessel the archaeological significance cannot be determined based on the information available. When and if further information becomes available it may be possible to undertake a full assessment of its archaeological significance.

UKHO8639 Unknown

13.3.110 Previously thought to be the wreck of *SS Fane* before the location of said wreck was confirmed. Measured as having dimensions of 74 x 32 x 2.9m, with no further details about its life or loss.

13.3.111 The wreck is currently listed as LIVE, the assessment of data covering this record is ongoing.

Baseline Archaeological Significance

13.3.112 As an unknown vessel the archaeological significance cannot be determined based on the information available. When and if further information becomes available it may be possible to undertake a full assessment of its archaeological significance.

UKHO8641 *MV Deodata*

13.3.113 A Norwegian four-masted steel barque tanker built in 1897 by Laporte & Compagnie, Rouen, France. Launched as SV *Le Quevilly* on 20 March 1897 for H. Prentout-Leblond & E. Boniface, Rouen, with a gross tonnage of 3,272, royal sails over double top and topgallant sails, and dimensions of 98.14 x 13.83 x 7.36m. Owned at time of loss by Skibs A/S.

13.3.114 On 25 November 1903 *SV Le Quevilly*, saved the crew of the America schooner *Ira Bliss* that had sprung a leak in a storm and sank when on voyage from Norfolk to New York with a cargo of lumber, 82 miles east of Delaware Breakwater.

13.3.115 Equipped from 1910-1911 with two auxiliary six-cylinder oil engines and driving twin propellers.

13.3.116 Sold in 1915 to Leroux & Heizey, and was later run into by *USS Sampson* on 26 January 1917, then laid up at Rouen in 1921.

13.3.117 In 1923 SV *Le Quevilly* was purchased by A/S Sørlandske Llyod (K. A. Thorbjørnsen) Oslo. In 1926 it was derigged, converted to a whale tanker with new oil engines of 209HP and renamed as *MV Deodata*.

13.3.118 On 21 October 1939 when on passage from Constant to Grangemouth, *MV Deodata* was hit by a mine laid by German submarine U-19 and foundered. The crew were picked up by lifeboat, *Louise Stephens*, along with those onboard *SS Konstantinos Hadjipateras* and *SS Capitaine Edmond Laborie.*

13.3.119 The wreck is currently listed as LIVE, the assessment of data covering this record is ongoing.

Baseline Archaeological Significance

13.3.120 As part of the WWII narrative and the vessels colourful past, this site has the potential to be of HIGH archaeological significance (Table 13.15). However, there is the potential that further information may change this assessment.

Table 13.15: Archaeological Significance of UKHO8641 *MV Deodata*

Criteria (DCMS 2013)	Archaeological Significance
Period	High
Rarity	Medium
Documentation	Medium
Group value	High
Survival/condition	Unknown
Fragility/vulnerability	Unknown
Diversity	Medium
Potential	High
Overall	HIGH

UKHO8646 *SS Carrier*

13.3.121 A Norwegian steel steam cargo vessel built in 1921 with the dimensions of 70 x 14.1 x 6.3m, a triple-cylinder triple expansion steam engine of 266 HP, two single boilers, six corrugated furnaces, and a single shaft and screw as *Capitaine Bonelli* at Ateliers & Chantiers de la Seine Maritime, Le Trait, France for the French Government.

13.3.122 Sold in 1923 to Soc. Anon. De Nav. Les Armateurs Français, Le Havre, and to Anglo D/S A/S (Vlademar Skogland), Haugesund in November 1936 and renamed *SS Carrier*.

13.3.123 On 19 January 1945 while on voyage from London to Tyne, *SS Carrier* was mined and sunk. The crew of 33 were saved by the escort vessel *HMS Blencathra*.

13.3.124 The wreck is currently listed as LIVE, the assessment of data covering this record is ongoing.

Baseline Archaeological Significance

13.3.125 As part of the WWII narrative and the vessels international connections, this site has the potential to be of HIGH archaeological significance (Table 13.16). However, there is the potential that further information may change this assessment.

Table 13.16: Archaeological Significance of UKHO8646 *SS Carrier*

Criteria (DCMS 2013)	Archaeological Significance
Period	High
Rarity	Medium
Documentation	Medium
Group value	High
Survival/condition	Unknown
Fragility/vulnerability	Unknown
Diversity	Medium
Potential	High
Overall	HIGH

UKHO8998 Unknown

13.3.126 An unknown vessel originally detected in 1980 with no further details about its life or loss. Recorded in the NHRE dataset (NRHE913207).

13.3.127 The wreck is currently listed as LIVE, the assessment of data covering this record is ongoing.

Baseline Archaeological Significance

13.3.128 As an unknown vessel the archaeological significance cannot be determined based on the information available. When and if further information becomes available it may be possible to undertake a full assessment of its archaeological significance.

UKHO8999 Unknown

13.3.129 An unknown vessel originally detected in 1980 with no further details about its life or loss. Recorded in the NHRE dataset (NRHE913203).

13.3.130 The wreck is currently listed as LIVE, the assessment of data covering this record is ongoing.

Baseline Archaeological Significance

13.3.131 As an unknown vessel the archaeological significance cannot be determined based on the information available. When and if further information becomes available it may be possible to undertake a full assessment of its archaeological significance.

UKHO9093 Tanker Trailers

13.3.132 Two of four road tanker trails that were lost overboard from the Swedish Ro-Ro *MV Nordic Pride* one mile north east of Dudgeon Shoals while proceeding to Immingham. No further details about the tankers' life or loss. Two of the four were washed ashore on Norfolk Beach.

13.3.133 The wreck is currently listed as DEAD, the assessment of data covering this record is ongoing.

Baseline Archaeological Significance

13.3.134 As modern tanker trailers, with limited information available, they are deemed to be of LOW archaeologically significance (Table 13.17). However, there is the potential that further information may change this assessment.

Table 13.17: Archaeological Significance of UKHO9093 Tanker Trailers

Criteria (DCMS 2013)	Archaeological Significance
Period	Low
Rarity	Low
Documentation	Medium
Group value	Low
Survival/condition	Unknown
Fragility/vulnerability	Unknown
Diversity	Low
Potential	Low
Overall	LOW

UKHO9171 Unknown

13.3.135 An unknown vessel originally detected in 1993 with no further details about its life or loss. Measured in survey as having dimensions of 70 x 20 x 1m.

13.3.136 The wreck is currently listed as LIVE, the assessment of data covering this record is ongoing.

Baseline Archaeological Significance

13.3.137 As an unknown vessel the archaeological significance cannot be determined based on the information available. When and if further information becomes available it may be possible to undertake a full assessment of its archaeological significance.

UKHO9314 Unknown

13.3.138 An unknown vessel originally detected in 1963 with no further details about its life or loss. Measured in survey as having dimensions of 23.8 x 17.7 x 2.1m.

13.3.139 The wreck is currently listed as LIVE, the assessment of data covering this record is ongoing.

Baseline Archaeological Significance

13.3.140 As an unknown vessel the archaeological significance cannot be determined based on the information available. When and if further information becomes available it may be possible to undertake a full assessment of its archaeological significance.

UKHO9320 *SS Chatwood* (possibly)

13.3.141 A British steel steam cargo vessel built in 1929 by Austin S. P. & Son Ltd., Sunderland with dimensions of 93 x 13.4 x 5.8m with a three-cylinder triple expansion 220HP engine, single shaft. Single screw, two boilers and machinery aft. Owned at time of loss by Tyne & Wear Shipping – W. France, Fenwick & Co. Coastwise Colliers Ltd., London.

13.3.142 Lost *en route* from Tyne for London with a cargo of 3950 tons of coal when mined. In 1994. The *Desert Star* attempted salvage.

13.3.143 The wreck is currently listed as LIVE, the assessment of data covering this record is ongoing

Baseline Archaeological Significance

13.3.144 As part of the WWII narrative, this site has the potential to be of HIGH archaeological significance (Table 13.18). However, there is the potential that further information may change this assessment.

Table 13.18: Archaeological Significance of UKHO9320 SS Chatwood (possibly)

Criteria (DCMS 2013)	Archaeological Significance
Period	High
Rarity	Medium
Documentation	Medium
Group value	High
Survival/condition	Unknown
Fragility/vulnerability	Unknown
Diversity	Medium
Potential	High

Criteria (DCMS 2013)	Archaeological Significance
Overall	HIGH

UKHO9324 Unnamed

13.3.145 An unnamed French iron steam powered destroyer with a listed length of 85m. Originally *HMS Haldon*, a hunt-class destroyed before being loaned to the French forces.

13.3.146 Lost on 23 February 1945 when mined.

13.3.147 The wreck is currently listed as LIVE, the assessment of data covering this record is ongoing.

Baseline Archaeological Significance

13.3.148 As part of the WWII narrative and the vessels international connections and military past, this site has the potential to be of HIGH archaeological significance (Table 13.19). However, there is the potential that further information may change this assessment.

Table 13.19: Archaeological Significance of UKHO9324 Unnamed

Criteria (DCMS 2013)	Archaeological Significance
Period	High
Rarity	Medium
Documentation	Medium
Group value	High
Survival/condition	Unknown
Fragility/vulnerability	Unknown
Diversity	Medium
Potential	High
Overall	HIGH

UKHO9502 Unknown

13.3.149 An unknown vessel originally detected in 1992 with no further details listed about its life or loss. The wreck was however located and investigated in 1992, 1993 and 2016 when the position was amended by 17m.

13.3.150 The wreck is currently listed as LIVE, the assessment of data covering this record is ongoing.

Baseline Archaeological Significance

13.3.151 As an unknown vessel the archaeological significance cannot be determined based on the information available. When and if further information becomes available it may be possible to undertake a full assessment of its archaeological significance.

UKHO81902 Unknown

13.3.152 An unknown vessel originally detected in 2014 with no further details listed about its life or loss. Described during survey as a small craft having dimensions of 15 x 3.5 x 2m.

13.3.153 The wreck is currently listed as UNKNOWN, the assessment of data covering this record is ongoing.

Baseline Archaeological Significance

13.3.154 As an unknown vessel the archaeological significance cannot be determined based on the information available. When and if further information becomes available it may be possible to undertake a full assessment of its archaeological significance.

UKHO85316 Unknown

13.3.155 An unknown vessel originally detected in 2016 with no further details listed about its life or loss. Measured during a survey as having dimensions of 48 x 16.4 x 1.5m.

13.3.156 The wreck is currently listed as UNKNOWN, the assessment of data covering this record is ongoing.

Baseline Archaeological Significance

13.3.157 As an unknown vessel the archaeological significance cannot be determined based on the information available. When and if further information becomes available it may be possible to undertake a full assessment of its archaeological significance.

UKHO92149 Unknown

13.3.158 An unknown vessel originally detected in 2019 with no further details listed about its life or loss. Measured during a survey as having dimensions of 7.6 x 4.8 x 1.2m.

13.3.159 The wreck is currently listed as UNKNOWN, the assessment of data covering this record is ongoing.

Baseline Archaeological Significance

13.3.160 As an unknown vessel the archaeological significance cannot be determined based on the information available. When and if further information becomes available it may be possible to undertake a full assessment of its archaeological significance.

UKHO92757 Unknown

13.3.161 An unknown vessel originally detected in 2019 with no further details listed about its life or loss. Measured during a survey as having dimensions of 33 x 15 x 1.7m with two cylindrical structures.

13.3.162 The wreck is currently listed as UNKNOWN, the assessment of data covering this record is ongoing.

Baseline Archaeological Significance

13.3.163 As an unknown vessel the archaeological significance cannot be determined based on the information available. When and if further information becomes available it may be possible to undertake a full assessment of its archaeological significance.

UKHO93354 Unknown

13.3.164 An unknown vessel originally detected in 2020 with no further details listed about its life or loss. Measured during a survey as having dimensions of 21.5 x 6.2 x 0.9m.

13.3.165 The wreck is currently listed as UNKNOWN, the assessment of data covering this record is ongoing.

Baseline Archaeological Significance

13.3.166 As an unknown vessel the archaeological significance cannot be determined based on the information available. When and if further information becomes available it may be possible to undertake a full assessment of its archaeological significance.

UKHO93355 Unknown

13.3.167 An unknown vessel originally detected in 2020 with no further details listed about its life or loss. Measured during a survey as having dimensions of 14.9 x 14.8 x 2.6m.

13.3.168 The wreck is currently listed as UNKNOWN, the assessment of data covering this record is ongoing.

Baseline Archaeological Significance

13.3.169 As an unknown vessel the archaeological significance cannot be determined based on the information available. When and if further information becomes available it may be possible to undertake a full assessment of its archaeological significance.

UKHO93359 Unknown

13.3.170 An unknown vessel originally detected in 2020 with no further details listed about its life or loss. Measured during a survey as having dimensions of 25.2 x 5.7 x 1.7m.

13.3.171 The wreck is currently listed as UNKNOWN, the assessment of data covering this record is ongoing.

Baseline Archaeological Significance

13.3.172 As an unknown vessel the archaeological significance cannot be determined based on the information available. When and if further information becomes available it may be possible to undertake a full assessment of its archaeological significance.

UKHO93634 Unknown

13.3.173 An unknown vessel originally detected in 2020 with no further details listed about its life or loss. Measured during a survey as having dimensions of 71.9 x 17.5 x 2.6m.

13.3.174 The wreck is currently listed as UNKNOWN, the assessment of data covering this record is ongoing.

Baseline Archaeological Significance

13.3.175 As an unknown vessel the archaeological significance cannot be determined based on the information available. When and if further information becomes available it may be possible to undertake a full assessment of its archaeological significance.

UKHO93877 Unknown

13.3.176 An unknown vessel originally detected in 2020 with no further details listed about its life or loss. Measured during a survey as having dimensions of 22 x 4.8 x 0.5m.

13.3.177 The wreck is currently listed as UNKNOWN, the assessment of data covering this record is ongoing.

Baseline Archaeological Significance

13.3.178 As an unknown vessel the archaeological significance cannot be determined based on the information available. When and if further information becomes available it may be possible to undertake a full assessment of its archaeological significance.

UKHO93878 Unknown

13.3.179 An unknown vessel originally detected in 2020 with no further details listed about its life or loss. Measured during a survey as having dimensions of 4.5 x 1.9 x 1.5.

13.3.180 The wreck is currently listed as UNKNOWN, the assessment of data covering this record is ongoing.

Baseline Archaeological Significance

13.3.181 As an unknown vessel the archaeological significance cannot be determined based on the information available. When and if further information becomes available it may be possible to undertake a full assessment of its archaeological significance.

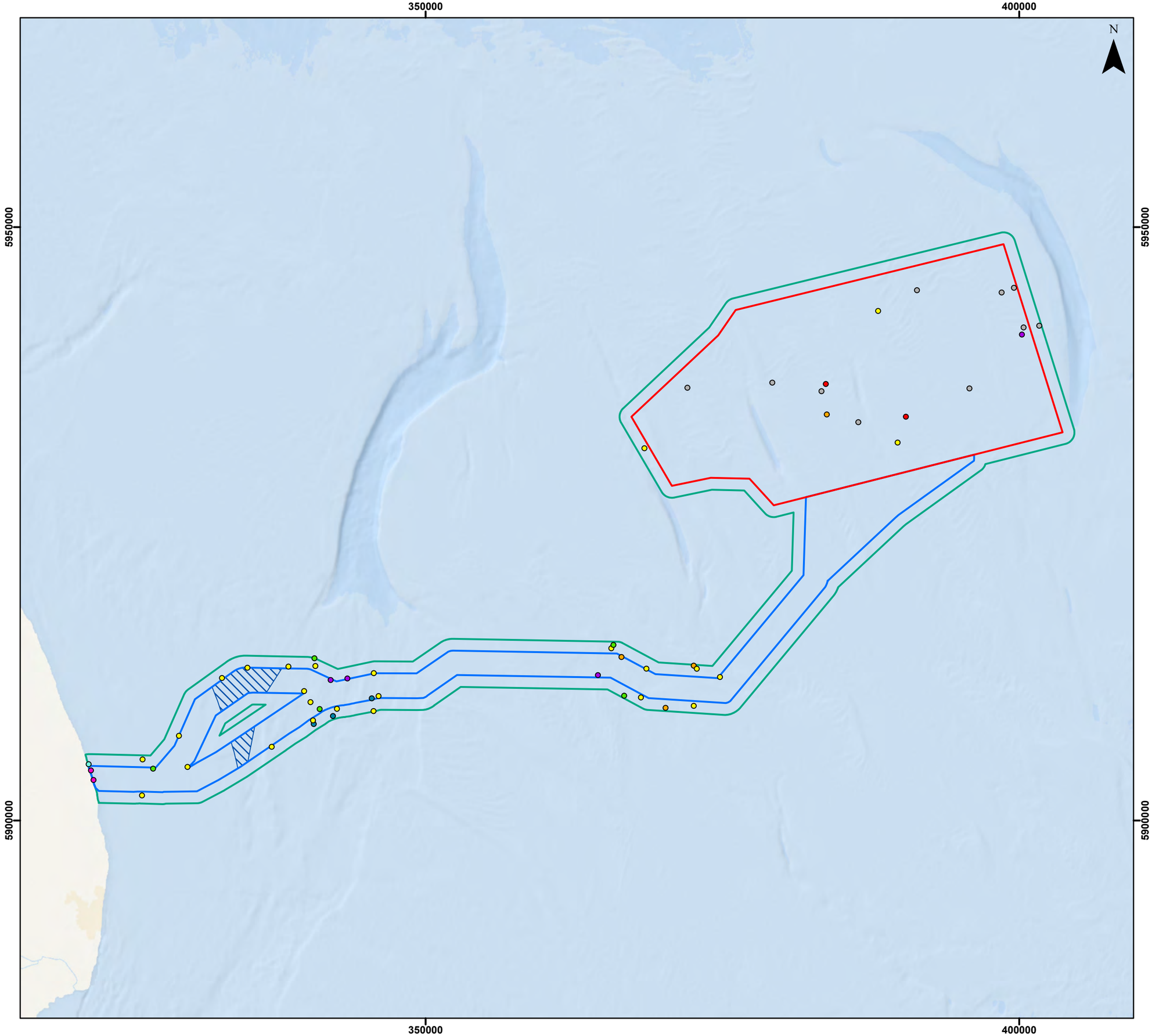
UKHO94444 Unknown

13.3.182 An unknown vessel originally detected in 2020 with no further details listed about its life or loss. Measured during a survey as having dimensions of 6.1 x 3.4 x 0.7m.

13.3.183 The wreck is currently listed as UNKNOWN, the assessment of data covering this record is ongoing.

Baseline Archaeological Significance

13.3.184 As an unknown vessel the archaeological significance cannot be determined based on the information available. When and if further information becomes available it may be possible to undertake a full assessment of its archaeological significance.

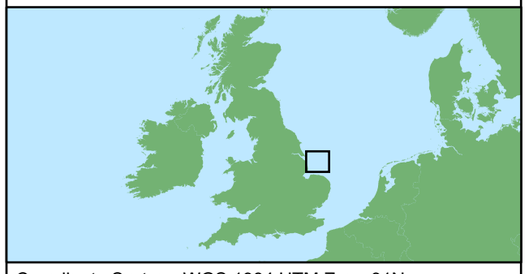


Legend

- Array Area
- Offshore Export Cable Corridor
- Marine Archaeology Study Area
- ORCP Search Area

Period

- Post-WWII (4)
- WWII (5)
- WWI (3)
- Post-Medieval (2)
- Medieval (1)
- Roman (2)
- Unknown (25)
- Foul Ground (10)
- Obstruction (4)



Coordinate System: WGS 1984 UTM Zone 31N

0 5 10 km

Scale:1:300,000

Preliminary Environmental Information Report

Known Wrecks and Obstructions within the Marine Archaeology Study Area

Figure 13.2

OUTER DOWSING OFFSHORE WIND

Date: 25/05/2023
Produced By: LN
Revision: 2.0

GoBe

Aviation Remains

13.3.185 Aviation remains include aircraft, airships, other dirigibles deriving from crash sites as either coherent assemblages or scattered material. Remains located in the offshore environment are often the result of WWII or passenger air casualties, particularly during the peak of seaplane activity during the inter-war period.

13.3.186 Considering the well-documented record of military air force activity in the United Kingdom (UK) throughout the 20th century, the exact number and positioning of such a significant heritage resource is still poorly understood. It is, however, reasonable to estimate that losses from WWII provide the majority of such aviation sites.

13.3.187 The east coast of England has a large potential for aircraft remains, especially with respect to the strategic positioning of airfields in Norfolk and Suffolk for the bombing raids of both combatants during WWII. Despite the low number of known aviation remains located on the seabed, the Lincolnshire coastline has a recorded 118 RAF aircraft losses as further detailed in Aircraft Crash Sites at Sea (Wessex Archaeology, 2008).

13.3.188 Where remains associated with any wartime aviation losses are found, they will be archaeologically significant and protected under the Protection of Military Remains Act 1986.

Recorded Losses

13.3.189 There are currently no additional recorded losses within the marine archaeology study area for which there are no corresponding UKHO records or seabed remains, and for which only a general position is given.

Fishermen's Fasteners

13.3.190 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.

13.3.191 There are currently two records classed as fishermen's fasteners recorded by the UKHO within the marine archaeology study area; UKHO9482 and UKHO9483.

Unlocated Marine Archaeological and Cultural Heritage Receptors

13.3.192 There is always a possibility that not yet identified marine archaeological and cultural heritage receptors are located within the marine archaeology study area. Unlocated marine archaeological and cultural 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 several years located previously unknown and unlocated sites of high archaeological significance within the various site boundaries, even after completing pre-construction surveys. Mitigation for unlocated marine archaeological and cultural heritage receptors is further discussed in section 13.6.

Historic Seascape Characterisation

13.3.193 Historic Seascape Characterisation (HSC) has been used as a measure in this assessment to provide a contextual and regional approach to the marine archaeology study area. This narrative and all associated data is drawn from the National Historic Seascape Characterisation Consolidation which was undertaken in eight separate implementations projects dating from 2008 to 2015 (LUC, 2018 via Historic England). The assessment of the HSC data is therefore for contextual purposes and does not contain all modern infrastructure such as the Lincs Wind Farm and Triton Knoll. Historic seascapes cannot be destroyed or damaged but impacts to them can change their historical character and the perception surrounding them.

13.3.194 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 subjective to the public and time. The intertidal and marine zones are ever changing due to physical processes such as currents, tidal range, and sediment mobility, as well as cultural influences. 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. Character is drawn from different elements that make up a landscape or seascape, including not only built heritage but other recognition of human influences, like geography and cultural heritage.

13.3.195 Changes to the character of the sea surface and the perception of the historic seascape as a direct result of the construction, O&M and decommissioning phases will result from the addition of new infrastructure such as foundations and wind turbine generators (WTGs) as well as ongoing activity from installation and maintenance vessels.

13.3.196 It should be noted that changes to the visible elements of the shore and the sea surface have been assessed further in Volume 1, Chapter: 17 Seascape, Landscape and Visual (PEIR document reference 6.1.17) and therefore this section only considers the historic aspects of Seascape Characterisation.

13.3.197 The HSC assessment draws on Historic Seascape Characterisation: England's Historic Seascape: HSC Method Consolidation (Cornwall Council, 2008) and England's Historic Seascape: Demonstrating the Method (SeaZone, 2011), along with the Historic England's National Database (LUC, 2018), the Historic Seascape Characterisation Thesaurus (Historic England, 2017) and the more regionally specific England's Historic Seascapes: Withernsea to Skegness Pilot Study (Museum of London Archaeology Service, 2009).

13.3.198 The marine environment presents some characteristic differences in comparison with the land for historic character assessment. HSC considers the multi-dimensional aspects of the marine environment which is broken down by levels outlined below (Cornwall Council 2008):

- Sub-seafloor HSC: identifying the historic character beneath the seafloor;
- Seafloor HSC: identifying the historic character within or directly on the seafloor;
- Water column HSC: identifying the historic character across the vertical height of the water column;
- Sea surface HSC: identifying the historic character of the surface of the water;

- Coastal land HSC: identifying those areas of coastal land above MLWS which have a distinctly maritime historic character; and
- Previous HSC (where information is available).

13.3.199 The sub-seafloor, seafloor and water column have been assessed for archaeological potential and significance in detail in this report, using a wide suite of geophysical datasets and historical resources.

13.3.200 This HSC uses the marine archaeology study area plus an additional 50km buffer to define the maximum extent of significant visual effect and perceived impact. The extent has been applied as recommended in the Visual Representation of Wind Farms: Guidance (Scottish Natural Heritage, 2017) for WTGs with a total height above 150m.

13.3.201 Further anthropogenic studies have the potential to contribute to our understanding of how people have used and perceived the landscape/seascape in a variety of dynamic ways in the past.

13.3.202 HSC in nearby areas has been undertaken by Museum of London Archaeology Services on behalf of English Heritage (Museum of London Archaeology Services, 2009). A consolidated national database with regional data was completed on behalf of Historic England in 2018 (LUC, 2018). These have been used to inform the assessment below.

13.3.203 The HSC considers the added impact of the Project within the multiple dimensions of the marine environment (sub-seafloor, seafloor, water column, sea surface, coastal land and previous historic character) in combination with the existing activity within the Broad Historic Character Types as further detailed below.

13.3.204 Here impact is defined as any change to the HSC caused by the Project; this may be ephemeral or sustained. Perception is defined as the public's awareness of the character types and how they interact with it, and change is defined as a sustained alteration to the perception of the HSC.

13.3.205 Potential changes to the HSC are expressed as a narrative description of the seascape character, how it is perceived by the public, and how those perceptions could be affected by the Project, the perception of which may or may not be considered important from an historic perspective.

13.3.206 The existing 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, Cultural Topography, Settlements and Recreation.

13.3.207 The study identifies the area as holding the Broad Historic Character Types as summarised below.

Navigation

13.3.208 English waters have been used for navigation since prehistoric times and such activity contributes considerably to the character of the seascape. Even though craft themselves leave no permanent mark on the sea surface, watercraft have a diversity of associated features on and offshore and are responsible for the wrecks and related materials such as debris surviving on the seabed as further discussed in section 13.3. The Navigation character type is seen at all levels, the extent which can be seen in Figure 13.3, Figure 13.4, Figure 13.5, Figure 13.6 and Figure 13.7.

13.3.209 People perceiving the sea from land are unlikely to be aware of the scale of navigation and shipping activities that occur offshore but are often aware of the source of goods, income, and employment it provides.

13.3.210 Historical navigational activity taking place in the Humber Estuary related predominantly to fishing and other cargo trading industries, as well as general transportation. Traffic volume to this area increased during the 1800s with the exponential growth of the trawling trade, due to the development of sail trawling technology consequently leading to the Hull and Grimsby ports to becoming the world's biggest fishing ports by the end of the 1800s (Museum of London Archaeology Services, 2009).

13.3.211 The Humber Estuary is a highly dynamic environment, with heavily sediment movement within its waters. This continuous sediment movement causes the shape of channels in the Estuary to be in constant flux and the creation of semi-permanent islands contributing to its history of being very treacherous. Consequently, the Estuary has many examples of shipwrecks, many of which are clustered in the most historically treacherous locations and are considered navigational hazards. There have been recent attempts to stabilise some of the channels through dredging and training works (Museum of London Archaeology Services, 2009).

13.3.212 Offshore evidence for historic navigation activities has fewer tangible features to contribute to its perception, however in some cases wreck distribution around certain seabed features suggests the use of certain navigational routes.

Navigation Activities

13.3.213 Navigation routes via the sea and rivers, some of which were developed during prehistoric periods, provided chief economical means of transporting large quantities of goods for any significant distance before the creation of effective inland road and railway systems.

13.3.214 English society was built on the maritime movements of goods, people, and ideas. This can be seen expressed in imagery from Roman coins, mosaics, and sculptures. Although there was a decline in maritime trade during the post-Roman period, a resurgence of commercial trading with continental Europe occurred from the late 6th century is reflected in the presence of urban settlements along the east coast (Museum of London Archaeology Services, 2009).

13.3.215 Between the 8th and 11th centuries, Scandinavian influence spread across Europe, reflected in ship design as well as in social, political, and economic impacts. Later, during the medieval period trade networks expanded, trading confederations emerged and an increase in hostilities influenced the development of shipping. England's navigation activities in the post-medieval and early modern periods expanded on a global scale, the evidence and impact of which is still perceived in the character of the UK and especially its coastal regions.

13.3.216 This area along the east coast and out towards the North Sea 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. Historically, the Humber Estuary has been primarily maintained for navigational activities. This usage has been documented by historical sources as far back as the 9th century when Grimsby was founded and first grew into a port. There is also documented evidence for the foundation of Hull as a trading port in the 12th century, at the junction of the rivers Hull and Humber. Examples of changes to the historic seascape throughout time can be through the active management of navigation routes.

13.3.217 Archaeological sources have identified navigational activities within the HSC study area as far back as the Bronze Age through the discovery of the Bronze Age boats on the foreshore at North Ferriby.

13.3.218 Additionally, anchorage areas where vessels and craft frequently anchor, often due to shelter provided by the coast have enhanced archaeological potential as their regular occupation increases the likelihood of finding vessels that have succumbed to bad weather or discarded debris.

13.3.219 The Navigation character type represents human activities directly relating to the passage of shipping traffic, including navigation channels or navigation routes, ferry crossings, and anchorages. There is not always physical demarcation of these areas, and their definition may be largely by legal designation or custom and use. Navigation activities are seen in the sub seafloor, seafloor, water column, sea surface and coastal levels of the seascape as defined in the multi-dimensional aspects of the marine environment.

13.3.220 The effects of navigation on the current landscape and seascape are both historic and ongoing, having played a key role in the social, technological, and political development of the UK. Its patterning has much to contribute to the perception about England's role and relationship with the wider world. Direct evidence for past navigational activity is relatively rare and vulnerable to disturbance from modern developments to accommodate new navigational needs.

13.3.221 The current historical seascape perception of navigation activities as an area of high and continued use for shipping traffic is assessed not to change during the construction, O&M and decommissioning of phases of the Project. The impact of the Project will instead contribute to this existing perception of an area of high use of navigation activities. The impact on perceptions of the HSC of the Project is therefore assessed as neutral. Details of the impacts on the current seascape can be found in Volume 1, Chapter: 15 Shipping and Navigation (PEIR document reference 6.1.15).

Maritime Safety

13.3.222 Maritime safety features include areas containing features usually erected at dangerous or important coastal points to provide warning or guidance for mariners. Some features are found further inland, such as church spires or towers, which can serve as more generalized place-finders and daymarks. These are features not built primarily for use in maritime safety but have been adopted as such. Maritime safety features are commonly seen in the sea surface and coastal and conflated levels of the seascape as defined in the multi-dimensional aspects of the marine environment, an example of which is the Grade II listed lighthouse (1171495) at Hunstanton, south of the marine archaeology study area.

13.3.223 Because of the historic and continued use and importance of maritime safety features, their character 'footprint' is greater than their physical footprint and they are intrinsic to seascape and landscape perceptions. Lighthouses, beacons, and day-marks are iconic markers of place for many people viewing them both from land and sea. They bridge the perceptual boundaries between land and sea. There is often a strong emotional tie to them and have been seen as a source of inspiration and subject matter for many artists.

13.3.224 From the prehistoric into the medieval period, non-instrumental methods were generally used for navigation during sea voyages. Stars were used for course-steering and navigation.

13.3.225 The use of landmarks and navigation aids has helped facilitate the development of surveying techniques and the drafting of maritime charts and coastal profiles. Terrestrial markers are becoming increasingly disused as traditional methods are replaced with radio, satellite navigation, digital marine charts and seismic technologies. They are also vulnerable to coastal erosion processes and extreme weather conditions.

13.3.226 The current historical seascape perception of maritime safety is assessed not to change during the construction, O&M and decommissioning phases of the Project. The perception of maritime safety features tends to look landward while the visual impact of the Project is primarily offshore and will neither contribute nor detract from the perception of maritime safety. The impact on HSC of the Project is therefore assessed as neutral.

Navigation Hazards

13.3.227 Navigational hazards are an integral part of the cultural seascape character of many areas, expressed directly through their records on charts and highly visible maritime safety installations. They are also present culturally in the vast store of myths, legends, traditions and stories of the sea and its dangers that pertain to most coastal communities. Navigation hazards are seen in the seafloor, water column and sea surface levels of the seascape as defined in the multi-dimensional aspects of the marine environment.

13.3.228 Navigation hazards include areas which contain serious risks to watercraft which may lead to their damage or loss, often in the form of wreck hazards or maritime debris, and rock outcrops. The large number of anchorages and long-standing use of navigation routes are also contributors to maritime debris.

13.3.229 Navigation hazards have been prominent in the perception of a seascape due to the danger associated with them. The Humber Estuary is known to be perilous for navigational hazards and contains many wrecks as evidence of these hazards and further contributing to hazardous waters. The creation of nautical and maritime charts helped record hazards and other dangers associated with the sea.

13.3.230 However, as with buried heritage assets on land which may not be readily appreciated by a casual observer, but retain a presence in the landscape, submerged heritage such as wreck sites are not part of the popular seascape perception.

13.3.231 The increased infrastructure built within the seascape as a result of the Project may contribute to safer navigation because of the lights affixed to the WTGs. This new infrastructure will be referred to in new nautical and maritime charts, along with any newly identified wrecks or updated positions of known wrecks, which may contribute to increased awareness of potential navigation hazards (this is detailed further in Volume 1, Chapter 15).

13.3.232 The current historical seascape perception of navigation hazards as areas associated with potential navigational danger is assessed to positively change during the construction, O&M and decommissioning phases of the Project. The potential increase in publicly available data following geophysical surveys and any potential unexpected discoveries reported through the PAD may enhance the perception of local heritage and stories relating to wrecking events, more accurate locations of dangerous wrecks and obstructions, recreational diving, and wrecks as habitats. The Project may therefore have a potentially beneficial impact on HSC through this increase in accurate mapping of potential hazards and increase in safety infrastructure associated with the windfarm construction and operation.

Industry

13.3.233 Industry has been and continues to be one of the dominant influences on the character across coastal, intertidal, and marine areas at all levels around the UK (Figure 13.3). There are many visible and unquantifiable reminders of England's rich and varied mining and industrial past along our coastline, both directly and in the infrastructure. The remains of these industrial processes on the present seascape can generate complex and mixed feelings in different regions and places. The extent of the industry character type can be seen in Figure 13.3, Figure 13.4, Figure 13.5, Figure 13.6 and Figure 13.7.

13.3.234 The banks of the Humber are heavily industrialised, with the offshore area of the HSC study area significantly characterised by activities relating to industry and navigation. There are a number of licensed aggregate dredging areas as well as active channel dredging in the Humber Estuary. Other industrial activity includes important inshore and offshore fisheries; hydrocarbon extraction on the Amethyst, Pickering and Sole Gas Fields with major pipeline terminals at Easington and Theddlethorpe; offshore windfarms including Inner Dowsing Wind Farm and Lynn Wind Farm; and major shipping lanes for craft using the ports of Grimsby, Immingham and Hull.

13.3.235 Listed examples of Industry within the HSC study area include Anton's Gowt Lock (1062085), in Fishtoft and a warehouse (1063112) in Grainthrope, both grade II.

Extractive Industry

13.3.236 Marine aggregate deposits are sands and gravels of economic value found on the seabed after being deposited there through fluctuation in sea-levels over the past two million years. Extractive mineral dredging from the seafloor is a prevalent example of industry in this area. Extractive industries are seen in the sub-seafloor, seafloor and coastal levels of the seascape as defined in the multi-dimensional aspects of the marine environment.

13.3.237 Most of the offshore extractive industry is relatively modern and only occurred on a large scale in the past 50 or so years. These industries have fewer long term historic links with some of the local settlements but have come to dominate the character of coastal areas since the industrial revolution.

13.3.238 In many cases oil and gas pipe directly to terminals on the shore, such as at Easington and Theddlethorpe and, like aggregate dredging are less perceptible components of the seascape to those not directly involved with these industries.

13.3.239 Marine aggregate deposits, such as sand and gravels are used primarily for building and construction, and much of the UK's aggregate resources are extracted from marine areas. The North Sea is one of two main areas identified for their potential within the UK, with 16 active UK aggregate areas within 50km of the Project.

13.3.240 The current historical seascape perception of the extractive industry through the established aggregate dredging enterprises in the area is assessed not to change during the construction, O&M and decommissioning phases as the cultural associations of industry in the area are unlikely to be altered or contributed to by the Project. The impact on HSC of the Project is therefore assessed as neutral.

Energy Industry

13.3.241 The energy industry concerned with the extraction, processing and/or storage of hydrocarbons (oil, oil derivatives, and gas, but not coal) as well as installations relating to all forms of renewable energy generation, by wind, wave or tide, and power stations of all fuels, together with their associated transmission facilities and directly associated transport facilities. The production of hydrocarbons in Lincolnshire dates to the 1940s, however, general policy trends show an expansion of renewable energy with an encouragement of wind power, especially in offshore locations where more consistent strong wind speeds are available. Within this context, recognition of existing historic environment considerations in planning future windfarms is expressed, for example, by the development of the Collaborative Offshore Wind Research Into the Environment (COWRIE) and in Advice Note 15, Commercial Renewable Energy Development and the Historic Environment (Historic England, 2021).

13.3.242 Energy industries are seen in the sub-seafloor, seafloor, sea surface and coastal levels of the seascape as defined in the multi-dimensional aspects of the marine environment.

13.3.243 In recent years there has been an increase in renewable energy projects alongside the established hydrocarbon industry. Wind power is the fastest growing form of global electricity generation and has become increasingly important following government climate commitments.

13.3.244 There are 13 Offshore Energy developments within the HSC study area (nine of these are operational at the time of writing and an additional four are in pre-application through to construction stages) are the closest examples contributing to the growing offshore renewable industry.

13.3.245 Perceptions of renewable energy sources, such as windfarms, are generally more favourable than those of fossil fuels, with the increasing social and political emphasis on sustainable and renewable resources. However, expansion of offshore windfarms raises many concerns about seascape impacts, both visually and physically across the full depth of marine levels, where the material imprints occur which inform our understanding of marine historic character. These considerations are accommodated for particular windfarm proposals by the landscape considerations required to be included in their necessary EIAs, in which the HSC has a particular role in informing on the historic cultural dimension of a seascape.

13.3.246 The perceptions associated with the energy industry tend to be varied and complex due to the essential need for sustainable energy production, and the scale of the high-profile and visually intrusive infrastructure needed to achieve this. The current and potential future visual perception of the seascape is discussed further in Volume 1, Chapter 17. The development of the Project is likely to contribute to this existing perception of energy industry in the area.

13.3.247 The current historical seascape perception of the energy industry as complex but ultimately beneficial, regarding renewable sources, is assessed not to change during the construction, O&M and decommissioning phases of the Project but rather contribute to this existing perception. The impact on HSC of the Project is therefore assessed as neutral.

Processing Industry

13.3.248 The processing industry relates to the transformation of raw materials in the production and manufacture of goods, and more indirectly to their consumption. Areas occupied by processing industries have evolved over time, often leaving traces of earlier technologies, either via material remains or as influences. Remains can include settlements formed around such industries and fields pre-dating the industrial complexes. Processing industries are seen in the sea surface and coastal levels of the seascape as defined in the multi-dimensional aspects of the marine environment.

13.3.249 The condition of coastal processing industry varies considerably from almost total destruction to excellent preservation. Where modern processing plants become redundant, they are generally quickly cleared and re-presented as areas ripe for new development. Historic coastal remains from these industries are prime targets for public-awareness initiatives in the context of the coastal access requirements from the Marine and Coastal Access Act 2009.

13.3.250 Salt production is one of the oldest examples of industry in this area and is known to have taken place along the Lincolnshire coast for millennia and many of the early medieval settlements along the coast have been founded on saltern mounds. The scheduled monument of Medieval salt workings (1004930) at Wainfleet St Mary is a prevailing example of this industry.

13.3.251 Before the 18th century almost all salt used in England was produced by various methods of boiling brine, most derived directly or indirectly from seawater. The resulting coastal bias in salt production was enhanced from the medieval period by the excessive use of salt for preservation of fish for inland markets and export.

13.3.252 The current historical seascape perception of the processing industry varies, for some representing work or future employment, as well as local pride in their industrial history. Conversely the material presence of the processing industry can be perceived as unattractive or polluting. It is assessed here not to change during the construction, O&M and decommissioning phases of the Project as there is no direct impact associated. The impact on HSC of the Project is therefore assessed as neutral.

Shipping Industry

13.3.253 There are many activities relating to the non-recreational use, maintenance, storage and administration of shipping in this area. The shipping industry is seen in the sea surface and coastal levels of the seascape as defined in the multi-dimensional aspects of the marine environment.

13.3.254 Commercial shipping routes adapt as new technologies and commercial competition are introduced. The development of the of ports of Grimsby, Immingham and Hull are examples of this.

13.3.255 Trade networks have existed along the east coast since at least the Bronze Age between Britain and continental Europe and modern commercial routes continue to have a substantial direct socio-economic impact as a trade facilitator across all sectors of the economy.

13.3.256 Major lanes of shipping traffic and high levels of commercial shipping activity are recorded across the area (Figure 13.4). Additional vessel traffic due to the construction and operation of the Project would occur in active commercial shipping routes.

13.3.257 The historic impact of the shipping industry can be seen in the many works inspired by the UK's maritime heritage, as well as the imprints the shipbuilding industry has left on today's landscape. The current historical seascape perception of the shipping industry as commercially significant as well as a means for recreation is assessed not to change during the construction, O&M and decommissioning phases of the Project. One of the dominant character types in the UK and this region, it has the capacity to accommodate the additional traffic resulting from activities relating to the Project. The impact on HSC of the Project is therefore assessed as neutral.

Fishing

13.3.258 The fishing industry of the Eastern England region has been evidenced since prehistoric times. Early methods of fishing include net-fishing and shellfish collection. Oyster consumption around coastal England can be seen from prehistoric evidence of shells found in middens.

13.3.259 The earliest documented date of coastal fishing areas is 1840, but historical sources and archaeological evidence shows that these areas have been in use for as long as communities have lived along the coastline. Although technological advances have altered fishing types, many techniques remain relatively unchanged today such as the crab and lobster potting area of the East Riding coast (Museum of London Archaeology Services, 2009).

13.3.260 Current fishing patterns can be traced back to the advent of commercial trawling in the 1800s, which dramatically increased the yield of catch. This in turn was related to the advent of the railways, which could transport these large amounts of fresh fish around the country quickly. So, although these same fishing areas have been fished for a long period of time, it is only in the past 200 years that they have been commercially fished and affected the nature of development in places like Hull and Grimsby.

13.3.261 The livelihoods of fishing communities are intimately tied to the productivity of the seas, and there are deep cultural attachments associated with fishing. The fishing character types are seen in the sub-seafloor, seafloor, water column, sea surface and coastal levels of the seascape as defined in the multi-dimensional aspects of the marine environment. The extent of the fishing character type can be seen in Figure 13.3, Figure 13.4, Figure 13.5, Figure 13.6 and Figure 13.7.

13.3.262 Many of the inshore fisheries are an important part of the local and national economy and fishing and fishing related industries play an important part in community life in the coastal zone. As a result, these coastal industries have a temporal and historic depth and relate closely to the Settlement character type.

13.3.263 From the advent of steam powered fishing vessels at the beginning of the 1900s to the introduction of diesel-powered boats with powered net-winding drums in the 1930s, row-sail boats began to disappear and the extent of areas available to fish grew.

13.3.264 Offshore fishing is remote from the coast and only visible on clear days, so it does not connect so directly with the local tourist economy. Today, the North Sea continues to be one of the world's more important fishing grounds for both international and UK fishing fleets.

13.3.265 There are four grade II listed buildings within the HSC study area, all processing and smoking factories in Grimsby, which stand as examples of the fishing industry: GH Abernethie Limited (1379882; MTL Medal Fisheries (1379834); Petersons (1379848); and Keith Graham Limited (1379883).

13.3.266 There are several examples of fishing types continue today in this area, however, the fishing industry has seen a decline since WWII, and much of the fishing character is associated with historical perceptions of the seascape. Fishing is still deeply engrained in the perception and economy of some communities in the region, and as such it is valued for the distinctiveness it affords such areas and as an important element in their local economy.

13.3.267 The current historical seascape perception of fishing as a deeply ingrained and traditional economic role for many coastal communities is assessed not to change during the construction, O&M and decommissioning phases of the Project as any restrictions to fishing areas during construction and O&M will be temporary. The impact on HSC of the Project is therefore assessed as neutral.

Ports and Docks

13.3.268 Forming an interface between land and marine transport and distribution system, ports and docks relate to the Navigation, Industry, Fishing and Communication character types. The Ports and Docks character type is seen in the coastal levels of the seascape as defined in the multi-dimensional aspects of the marine environment.

13.3.269 The Eastern England region contains numerous examples of small hards (consolidated loading platforms), quays and landing places and major ports including docks, wet docks and civilian dockyards. 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 extent of the ports and docks character type can be seen in Figure 13.3.

13.3.270 Notable ports include the ports of Grimsby, Immingham and Hull. The Port of Grimsby began development in the late 1700s, and underwent further development in the 1840s onwards, however sea trade out of Grimsby has occurred from at least the medieval period. The Ports of Grimsby and Immingham count as examples of the largest in the UK.

13.3.271 The Port of Hull represents maritime trade dating to at least the 13th century. Originally, trade was mainly conducted at the outfall of the River Hull, known as The Haven, or later as the Old Harbour. In 1773 Hull's first dock was built on the land where the town walls had previously been, followed by a ring of docks around the Old Town on the site of former fortifications over the next 50 years. These were known as the Town Docks, and included The Dock (built in 1778), (or The Old Dock, known as Queen's Dock after 1855), Humber Dock (built in 1809), Junction Dock (built in 1829) and Railway Dock (built in 1846) which was opened to serve the newly built Hull and Selby Railway.

13.3.272 The Port of Immingham was completed in 1912 and served as a base for British D class submarines during WWI and as the Royal Navy's headquarters for the Humber during WWII The port was initially constructed as a modern outlet for the rail system in the east of England and has continued to be used as one of the largest trading ports in the UK.

13.3.273 The current historical seascape perception of ports and docks as an important element in trade and recreation is assessed not to change during the construction, O&M and decommissioning phases of the Project as these industries and their uses will continue without significant impact. The impact on HSC of the Project is therefore assessed as neutral.

Coastal Infrastructure

13.3.274 The modern coastline has been formed by a complicated mix of different coastal processes, which continue to act upon it in specific ways. As a result of this, some parts of the HSC study area consist of land reclaimed from the sea during the medieval and post-medieval periods (specifically around the Humber Estuary). In many other areas villages have been lost to the advancing sea over the last century. The situation is complicated by the fact that some areas that are now being eroded only emerged from the sea or salt marsh during the last five hundred years. In more agricultural areas like Lincolnshire, land use has changed little over the past five hundred years and, as a result of reclamation, many areas which were once coastal with associated coastal land uses are no longer coastal but situated miles inland (Museum of London Archaeology Services, 2009).

13.3.275 Many areas of the east coast within the HSC study area are currently eroding away, such as Holderness and the beaches between Mablethorpe and Skegness, while other areas are accreting, such as between Cleethorpes and Mablethorpe and Skegness to Gibraltar Point.

Flood and Erosion Defences

13.3.276 Sea and flood defences in the region are characteristic for protecting agricultural land and coastal settlements where the coastline has been eroding for hundreds of years, and settlements surrounding those rivers which are prone to flooding. The coastal infrastructure character type is seen in the coastal levels of the seascape as defined in the multi-dimensional aspects of the marine environment. This character type has had an essential role in creating and maintaining areas of reclaimed land, especially in the Fens area of eastern England, from the Roman period.

13.3.277 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, such as beaches and salt marshes which protect the coast.

13.3.278 Following the Great North Sea flood of 1953 there was major investment into the improvement and maintenance of the sea defences between Mablethorpe and Skegness. Hard defences, such as seawalls, and natural sand dunes, in combination with beach nourishment are utilised to manage coastal flood risk.

13.3.279 Most of the shore between Skegness and Mablethorpe has benefited from a series of construction projects in the last half century. In contrast to these areas, there has been little protection with hard defences of the coastline between Whitby and the Norfolk border for non-urban areas. The catalyst for this was the catastrophic flooding of the area following the 1953 storm surge, which affected areas of Lincolnshire up to 15km inland. A 19km concrete sea wall was built between Mablethorpe and Anderby, protected at the base by either concrete or rock armour. The areas to the north and south of the sea wall are protected by clay banks and sand dunes, which are naturally fed in the Donna Nook area from offshore sources, and at Gibraltar Point by southward longshore drift (Humber Field Archaeology, 2009).

13.3.280 Regeneration and defence schemes have included flood defences from river overflow following storms, groynes, rock armour and beach regeneration to protect against both stormy weather and the perpetual erosion of the coastline. Sea walls, such as those in Sutton Bridge, are constantly repaired and maintained throughout their active lifetimes, giving them historical depth. These coastal erosion defences are discussed further in Volume 1, Chapter 20. The extent of the navigation character type can be seen in Figure 13.3.

13.3.281 The current historical seascape perception of coastal infrastructure as a continual element in sustaining the coastline and coastal developments is assessed not to change during the construction, O&M and decommissioning phases of the Project as the development of the Project is unlikely to contribute to any flooding or erosion or impact any existing defences. The impact on HSC of the Project is therefore assessed as neutral.

Communications

Transport

13.3.282 Coastally specific and maritime-related infrastructure such as canals, motorways, main roads, railways and airports which enabled people to settle in and visit coastal regions are covered by this broad character type. The transport character types are seen in the sea surface and coastal levels of the seascape as defined in the multi-dimensional aspects of the marine environment.

13.3.283 The development of the rail system has greatly impacted the cultural and economic heritage of Lincolnshire. The Lincolnshire Wolds Railway opened in 1848 along with the East Lincolnshire Railway as part of the Great Northern Railway. The use of these lines and the railway systems at large led to greater inland accessibility to fresh fish, and maritime imports with cargo travelling inland and around the UK more quickly and easily, as well as increasing the access to coastal towns for tourism and recreation, which continues to this day (see Industry and Recreation character types within this Section).

13.3.284 There are two grade II listed signal boxes within the HSC study area, one at Skegness (1413516) and at Wainfleet (1414000).

13.3.285 Many coastal settlements were established or developed as a direct result of the advent of the railway network, facilitating travel from growing urban areas inland. The construction of railways also initiated the development of coastal resorts on farmland and around pre-existing hamlets. The extent of the communications character type can be seen in Figure 13.3, Figure 13.6 and Figure 13.7.

13.3.286 The current historical seascape perception of transport as a link to and from coastal areas both for leisure and commerce is assessed not to change during the construction, O&M and decommissioning phases of the Project as no impacts to historic or existing transport infrastructure have been identified. The impact on HSC of the Project is therefore assessed as neutral.

Telecommunications

13.3.287 Telecommunications cables have evolved from first carrying written communications, to voice communications, and now to data communication. All modern cables use optical fibre technology to carry telephone traffic, internet, and private data traffic. The telecommunication character types are seen in the sub-seafloor and coastal levels of the seascape as defined in the multi-dimensional aspects of the marine environment.

13.3.288 Due to the character of submarine telecommunications cables, their presence in the marine environment is likely to be known only to those who were involved in laying them, and to people involved in communications infrastructure. Although highly dependent on them, the wider public are likely to know little about their location. However, their importance on public and private life cannot be underestimated due to the impact they have made for millions of internet and phone users.

13.3.289 The current historical seascape perception of telecommunications as a vital yet physically unnoticed element in modern life and communications is assessed not to change during the construction, O&M and decommissioning phases of the Project as their presence is unlikely to enter the perception of those who use them. The impact on HSC of the Project is therefore assessed as neutral.

Military

13.3.290 Military activity has been responsible for deposition of many WWI and WWII wrecks and WWII aircraft wrecks immediately offshore. There are three WWI and five WWII losses within the marine archaeology study area (these are detailed in Section 13.3)

13.3.291 Many features still exist as evidence of the military nature of the coast and seascape from Roman to modern times.

Military Defence and Fortification

13.3.292 Military coastal defences and military bases can be found along the eastern coast of England, although there is a tendency to find them concentrated around the main ports. The Military character type is seen at all levels of the seascape as defined in the multi-dimensional aspects of the marine environment.

13.3.293 In addition to the long-appreciated heritage value of most medieval and earlier fortifications, post-medieval military defences are increasingly being perceived as part of the overall historic legacy of the landscape as well.

13.3.294 Evidence of military activity can be seen from the many scheduled and listed sites and monuments within the coastal area within the HSC study area. Roman examples include two scheduled monument forts (1003983 and 1003903) and a signal station (1003955). However, the majority of examples are from the WWI and WWII, including: a scheduled monument WWI acoustic mirror 335m north east of Kilnsea Grange (1020989); the grade II listed pillbox Howden's Pullover (1445083); WWI pillbox and associated WWII anti-tank cubes at Sea View, Saltfleetby (1445091); and the grade II listed WWI pillbox and WWII pillbox and anti-tank cubes, Merrikin's Pullover (1443966).

13.3.295 There is a large offshore military training area based around the Donna Nook Firing Range, contributing to the continued perception of the military nature of the seascape.

13.3.296 In English waters, there are military vessels (including aircraft) which are protected as war graves under the Protection of Military Remains Act 1986. The primary reason for designation as a 'war grave' is to preserve the site as the last resting place of UK servicemen (or other nationals). There are several documented aircraft crash losses recorded in the area further detailed in section 13.3. The extent of the military character type can be seen in Figure 13.3, Figure 13.4, Figure 13.5, Figure 13.6 and Figure 13.7.

13.3.297 The current historical seascape perception of military as an integral part of the formation of England's cultural narrative and heritage across many generations is assessed to positively change during the construction, O&M and decommissioning phases of the Project as the identification of wartime losses of military vessels within the Project's survey data may impact public awareness and the perception of this area and its historic military role.

Settlements

13.3.298 Coastal settlements are where most people in the coastal region live and base their visits. As such, they are where most people develop their coastal perceptions. Some see the larger port cities as places of economic growth that support many local jobs and provide local income, contrasting with 'more tranquil' smaller fishing villages and the coastal resorts as areas of entertainment and holiday destinations. Coastal settlements hold a differing range of functions and historical trajectories which contribute to their present form. They are defined by both their capacity to accommodate change but also their continuity.

13.3.299 Occupation and settlement in this area over thousands of years is evidenced through Palaeolithic and Mesolithic artefacts (discusses below in the Cultural Topography character) through to scheduled monuments: a Roman villa northeast of Eaton (1003169); a Romano-British villa 250m south of Park Farm (1020860); and the Medieval settlement of Babingley (1020766).

13.3.300 Coastal settlements reflect the historic use of the sea, and the east coast of England includes a variety of coastal settlement types including urban settlements, major cities, tourist resorts and smaller fishing towns and villages. The Settlements character type is seen in the coastal levels of the seascape as defined in the multi-dimensional aspects of the marine environment. The extent of the settlement character type can be seen in Figure 13.3.

13.3.301 The current HSC perception of settlements as dynamic and multifaceted character types encompassing everything from cultural to economic elements is assessed to positively change during the construction, O&M and decommissioning phases of the Project as the potential for impact to residential, commercial, and industrial functions during the construction of the Project due to the increase in labour may lead to a positive impact to the local economy. The impact on HSC of the Project is therefore assessed as positive.

Recreation

13.3.302 The category of recreation dates almost exclusively from the post-medieval period and is linked to the advent of railway travel. The railways allowed people from other areas in the UK to get easy access to the coast for the first time. The coastal areas went from being exclusively characterised as fishing areas to also being identified with a booming tourist industry. Many of the areas where coastal recreation takes place today has a dual use coastal/offshore fishing and mariculture areas. Many of the Recreation and Coastal Industry uses are seasonal in nature.

13.3.303 Recreational enjoyment of the coast has a long history in England with origins in the earliest expressions of the Romantic movement. The growth of industrial towns, the railway network and during the later 19th and early 20th centuries, the increase in public holidays and workers' purchasing power, led to the rise and massive expansion of seaside resorts and their attendant accommodation and entertainment facilities along England's coastline. Later and current themes affecting the expression of 'recreation' include the post-war rise and later decline of the 'holiday park'. Post 1950s, there was a decline of the seaside resort due easier access to international travel, and since then various initiatives aimed at the regeneration of coastal resorts and market towns have been introduced. The recreation character types are seen in the coastal and sea surface levels of the seascape as defined in the multi-dimensional aspects of the marine environment.

13.3.304 Currently tourism is an important source of income and employment in the region. Cleethorpes to Skegness is known for their touristic holiday beaches where visitors are often involved in recreational activities such as walking, sunbathing, and golfing. The coastal flood management through sand replenishment also works to maintain these beaches for local and tourist use.

13.3.305 The coastline attracts people in pursuit of open-air leisure activities, often centred around the scenery and maritime themes. Popular water sport activities involve sea bathing, sailing, surfing, diving, leisure fishing, angling, water, and jet-skiing.

13.3.306 The value of coastal recreation and water related activities has a number of positive outcomes, including health benefits, social inclusion and quality of life, environmental protection and economic benefits. The extent of the recreation character type can be seen in Figure 13.3 and Figure 13.4.

13.3.307 Much of eastern England's foreshore is accessible to the public with the intertidal zone valued for its numerous and varied recreational opportunities. Where unmanaged, this zone is often subject to relatively low levels of visitors who enjoy its quiet and solitude as a source of relaxation and inspiration. Dive trails and virtual dive trails offer a way for the public to experience a greater understanding and connection to heritage while minimising the risk of disturbing them.

13.3.308 The current historical seascape perception of recreation as both socially and economically important to coastal regions is assessed to positively change during the construction, O&M and decommissioning phases of the Project as there is potential for improved public awareness of historic and recreational dive areas following the identification of wreck locations during archaeological surveys. This may lead to a greater understanding, respect, and enjoyment of the seascape. The impact on HSC of the Project is therefore assessed as positive.

Cultural Topography

13.3.309 The North Sea is a large marine basin with numerous tidal rivers flowing into it from all directions: the Elbe and Rhine to the east, the Forth and Humber from the north, and the Thames from the south. Such rivers have commanded the flow and transport of people and their belongings over many thousands of years. These rivers extended beyond present-day shorelines onto the continental shelf for much of the Pleistocene. These river systems are often submerged extensions of presently existing rivers, and would have acted as drainage systems, having potential to contain an array of evidence of past hominin occupation and use.

13.3.310 The east coast of England is known to have some of the earliest known sites and *in situ* remains. Key periods of occupation through the Palaeolithic to Mesolithic are found in deposits and finds particularly from Pakefield and Happisburg, as well as within existing aggregate extraction areas, and inundated and eroded terrestrial sites (Limpenny *et al.*, 2011). Palaeolithic artefacts including hand axes, cores and flakes and peat and wood fragments indicating Mesolithic land surfaces exemplify the occupation and use of the area.

13.3.311 As a result of erosion and coastal sedimentary movement prehistoric land surfaces buried under the boulder clay deposited during the last ice age, or the marine silts deposited during the marine transgression of the Mesolithic and Neolithic periods, are now being uncovered in some areas where coastal erosion is at its more severe. This is particularly evident along the flat Lincolnshire coast where land surfaces are exposed and then become susceptible to erosion. The extent of the cultural topography character type can be seen in Figure 13.3, Figure 13.6 and Figure 13.7.

Palaeolandscape Component

13.3.312 Palaeolandscapes are areas of former human habitat with evidence for past topographical and ecological regimes, shaping much earlier human cultural activity and landscape perceptions. The palaeolandscape character type is seen in the sub-seafloor and seafloor levels of the seascape as defined in the multi-dimensional aspects of the marine environment.

13.3.313 Happisburg and Pakefield on the Norfolk and Suffolk coasts to the south of the HSC study area provide evidence of the earliest occupation in Britain, with evidence including hand axes, flint flakes and large mammals suggesting occupation as early as 970,000 BP (Parfitt *et al*., 2010). These finds are generally associated with fluviatile and estuarine deposits of Early Pleistocene Ancaster and Bytham river systems in both primary and secondary contexts.

13.3.314 Palaeochannels identified through previous research, including the survey work for the Project (Figure 13.9), show evidence for the network of prehistoric landscapes and their changes over time. Submerged prehistoric landscapes often escape public perception because of their inaccessibility to many. However, increasing our understanding of where they are and the evidence for former habitats which they contain may lead to a greater appreciation of their importance.

13.3.315 The entire marine archaeology study area has been dry land at varying points before and since the last glaciation and holds high potential for prehistoric finds. The area contributes significantly to the understanding of the Palaeolithic in the UK as a whole through evidence of patterns of habitation and migration, tool technologies and environmental context.

13.3.316 The potential for survival of palaeolandscape components and submerged archaeology in the marine topography and deposits in the study area is further discussed in section 13.3. The cultural topography landward is discussed in detail in Volume 1, Chapter 20.

13.3.317 The current historical seascape perception of palaeolandscapes as a relict connection to an ancient past and heritage is assessed to positively change during the construction, O&M and decommissioning phases of the Project through an increase in research and awareness following archaeological surveys. The impact on HSC of the Project is therefore assessed as positive.

Woodland

13.3.318 During the Neolithic much of the UK was covered in wild woodland, including clearings and glades created by storms and maintained by grazing animals. The introduction of agricultural practices and development of metal tools during the Bronze Age led to significant clearing, and by the Iron Age woodland of the UK was reduced to half. After WWI a need for woodland as a wartime reserve was recognised and regenerative planting began, with conservation movements to protect ancient woodland sites (woodland areas that have existed continuously since at least 1600) developing in the 1950s. Lincolnshire is home to Britain's largest concentration of traditionally managed small-leaved lime woodland, which dates back over 5,000 years.

13.3.319 Coastal woodlands were often 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 from ships. The woodland character type is seen in the coastal level of the seascape as defined in the multi-dimensional aspects of the marine environment.

13.3.320 Those patterns are culturally defined and combine with variation in topography and other cultural features and aspects to give a sense of place and position to mariners and coastal users alike. The extent of the woodland character type can be seen in Figure 13.3.

13.3.321 The current historical seascape perception of woodland as a distinctive coastal element with both commercial and recreational uses is assessed not to change during the construction, O&M and decommissioning phases of the Project as the windfarm infrastructure will be predominantly offshore and not a site from which to view the coast. The impact on HSC of the Project is therefore assessed as neutral.

Enclosed Land

13.3.322 This character type relates to areas dominated by land enclosure usually for agricultural use, but diverse in its pattern, form and date. The relevance to the HSC is through coastal proximity, however the character type is explored in more detail in the Historic Landscape Characterisation (HLC) (Volume 1, Chapter 20). The extent of the enclosed land character type can be seen in Figure 13.3.

13.3.323 The current historic seascape perception of enclosed land is limited and is more relevant in the perception of the HLC. This is assessed not to change during the construction, O&M and decommissioning phases of the Project as the windfarm infrastructure will be predominantly offshore and not a site from which to view the coast. The impact on HSC of the Project is therefore assessed as neutral.

Unimproved Land

13.3.324 This character type refers to areas of land that have not undergone agricultural improvement to convert their use for livestock, but are often used for grazing, recreation and wildlife conservation designations and un-intensively managed. The relevance to the HSC is through the distinctively coastal character of many areas and maritime connection, however the character type is explored in more detail in the HLC (Volume 1, Chapter 20).

13.3.325 The two main examples of unimproved land within the study area are scrub, which can act as an intermediate stage between grassland and woodland 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. The extent of the unimproved land character type can be seen in Figure 13.3.

13.3.326 The current historical seascape perception of unimproved land is limited and is more relevant in the perception of the HLC. This is assessed not to change during the construction, O&M and decommissioning phases of the Project as the windfarm infrastructure will be predominantly offshore and not a site from which to view the coast. The impact on HSC of the Project is therefore assessed as neutral.

Summary

13.3.327 The value and perception of the above Broad Historic Character Types include the increased attention of the wider public of 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.

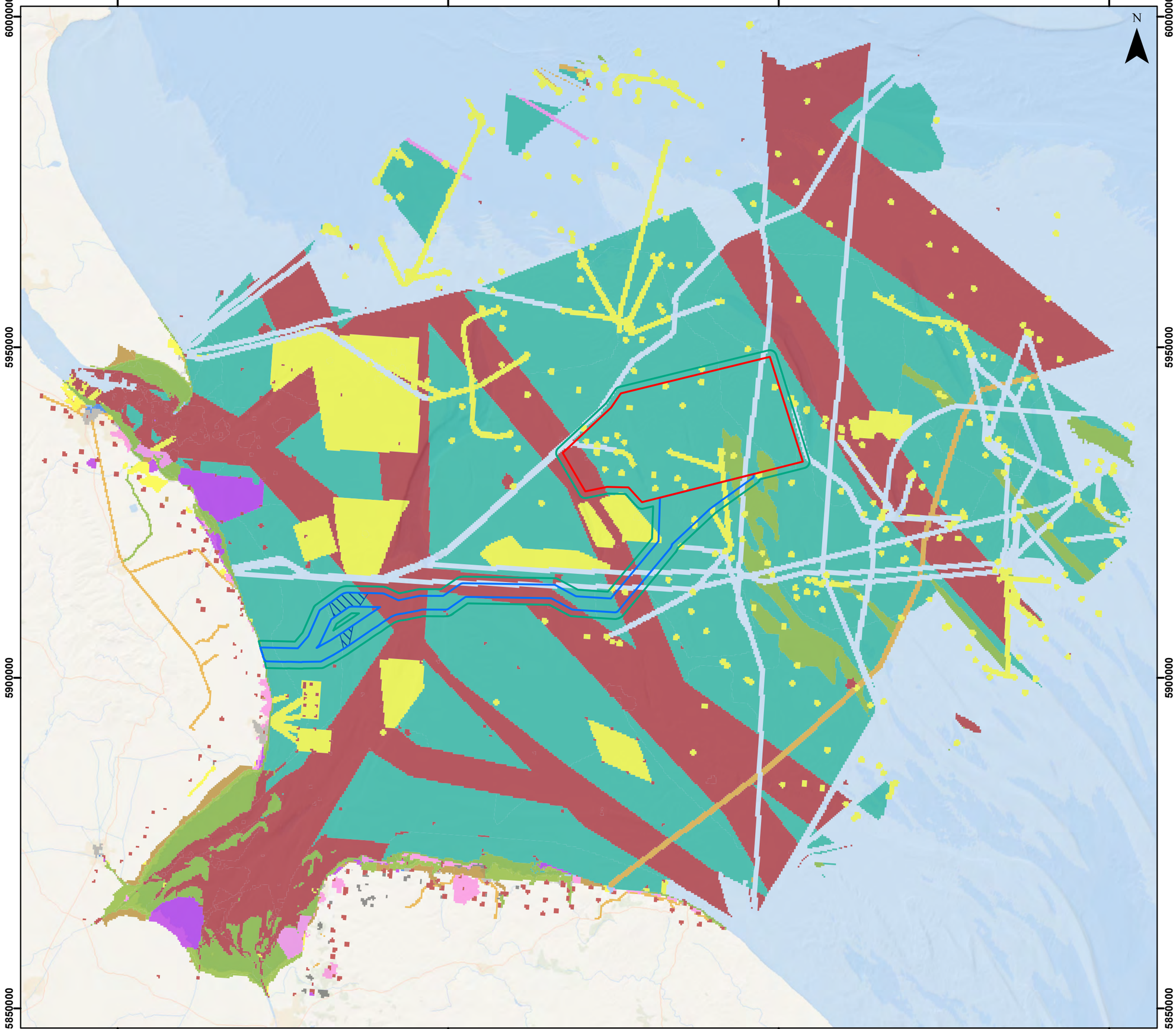
13.3.328 At the coastal level character types include Industry, Navigation, Fishing, Ports and Docks, Communications, Coastal Infrastructure, Military, Settlements, Recreation, Cultural Topography, Woodland, Enclosed Land and Unimproved Land (Figure 13.3). The dominant types are Fishing, Industry and Navigation which relate to the perception of the dominant historic and modern economies. Activities on the coast are varied and are the most easily perceived. The perception of character types within the coastal and conflated level is not assessed to change following the development of the Project. This is discussed further in Volume 1, Chapter 20.

13.3.329 Within the sea surface and water column, character types include Navigation, Industry, Fishing, Military and Recreation (Figure 13.4 and Figure 13.5). Activities on the sea surface and the water column are dominated by Fishing and Industry. 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 in relation to Navigation and Industry is likely to be impacted by the Project following construction due to the presence of navigational aids and the visual impact of the WTGs.

13.3.330 Within the seafloor and sub-seafloor character types include Navigation, Industry, Fishing, Communications, Military and Cultural Topography (Figure 13.6 and Figure 13.7). Activities on the seafloor and sub-seafloor are dominated by Industry, Fishing and Cultural Topography. The sub-seafloor and seafloor are less likely to enter the perceptions of the public due to their remoteness and inaccessibility compared with other dimensions. The perception of use within these levels is often peripheral rather than from participation. The perception of cultural topography and recreation may undergo a positive change with the increase in understanding and awareness of palaeolandscapes, peat deposits as well as artefacts and wrecks identified in the geophysical and geotechnical surveys undertaken for the Project. The impact on identified marine archaeological and cultural heritage receptors is discussed in Volume 1, Chapter 13.

13.3.331 Considering the perception of the above outlined Broad Historic Character Types (as well as the dynamic nature of people's perception of the sea and its value), no significant change in the multiple characters and dimensions of the marine environment as a result of the Project in isolation or cumulatively with neighbouring developments is identified. Rather, the Project will contribute to the existing perceptions of the seascape and use of the marine environment.

13.3.332 It has been established that HSC is value-neutral and was developed to be a positive force in informing change as well as recognising that landscape and seascape are both a product of that inevitable change. Developments should therefore respect and retain cultural distinctiveness and legibility wherever possible (Cornwall Council, 2008).

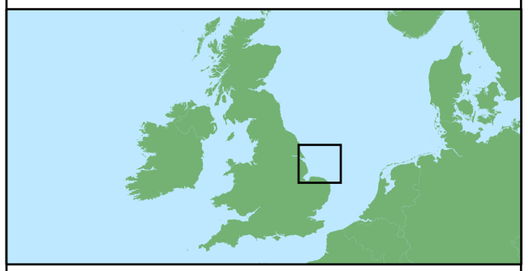


Legend

- Array Area
- Offshore Export Cable Corridor
- Marine Archaeology Study Area
- ORCP Search Area

Type

- Navigation
- Industry
- Fishing
- Ports and Docks
- Coastal Infrastructure
- Communications
- Military
- Settlements
- Recreation
- Cultural Topography
- Woodland
- Enclosed Land
- Unimproved Land



Coordinate System: WGS 1984 UTM Zone 31N

0 10 20 km

Scale:1:550,000

Preliminary Environmental Information Report

Historic Seascape Characterisation of the Coastal Level

Figure 13.3

OUTER DOWSING OFFSHORE WIND

Date: 25/05/2023
Produced By: LN
Revision: 2.0

GoBe

Document Path: O:\Active Tenders\1900 - GoBe GIG-Total Outer Dowsing OWP\GIS\ODOW PEIR\ODOW PEIR.aprx

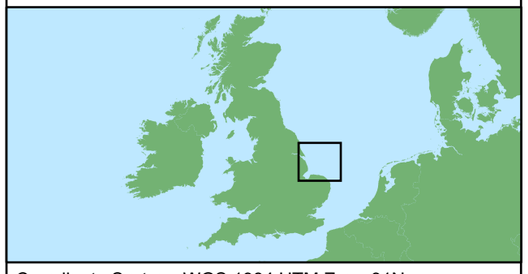
300000
350000
400000
450000
6000000
5950000
5900000
5850000
N

Legend

- Array Area
- Offshore Export Cable Corridor
- Marine Archaeology Study Area
- ORCP Search Area

Type

- Navigation
- Industry
- Fishing
- Military
- Recreation



Coordinate System: WGS 1984 UTM Zone 31N

0 10 20 km

Scale:1:550,000

Preliminary Environmental Information Report

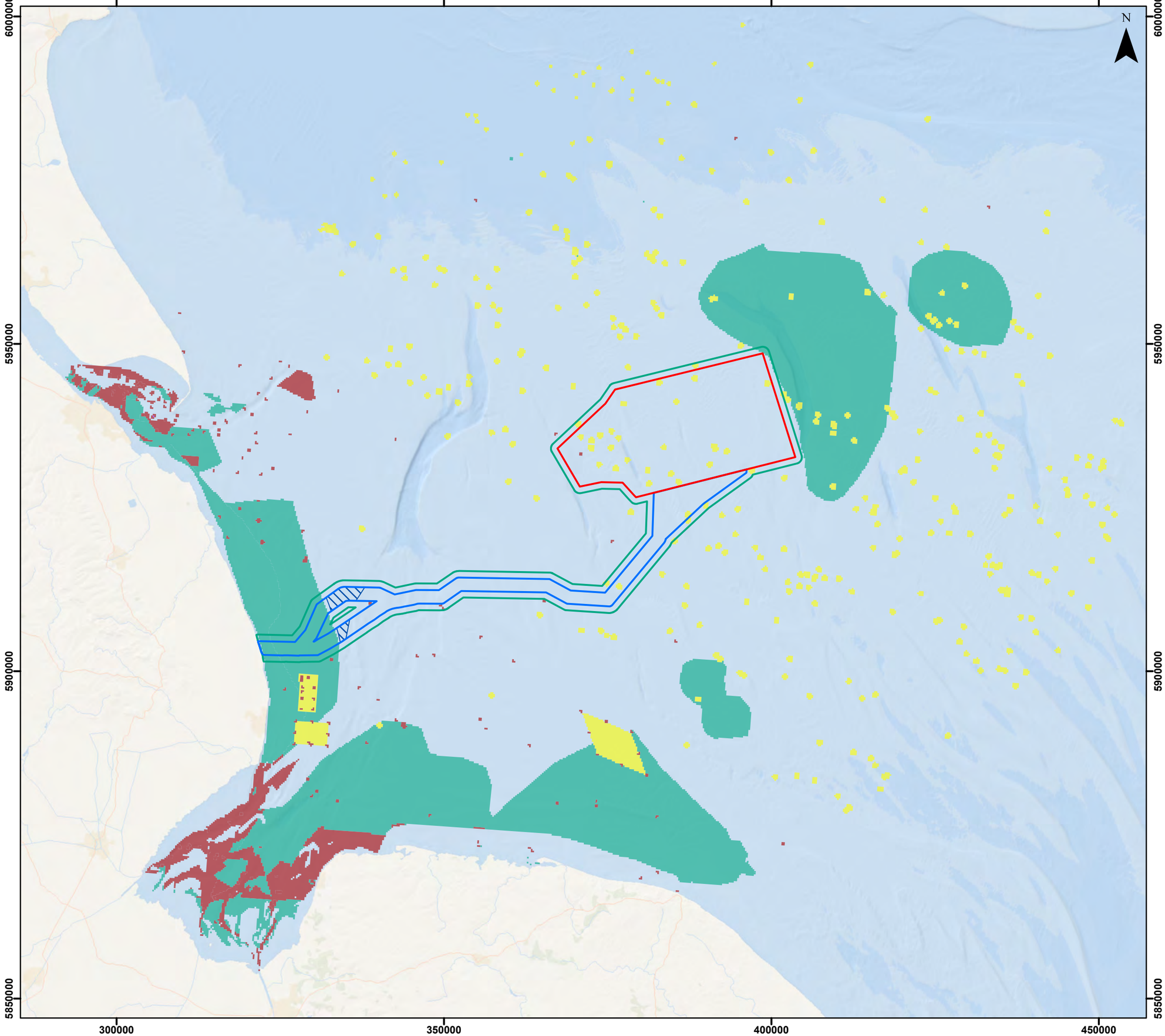
Historic Seascape Characterisation of the Sea Surface Level

Figure 13.4

OUTER DOWSING OFFSHORE WIND

Date: 25/05/2023
Produced By: LN
Revision: 2.0

GoBe

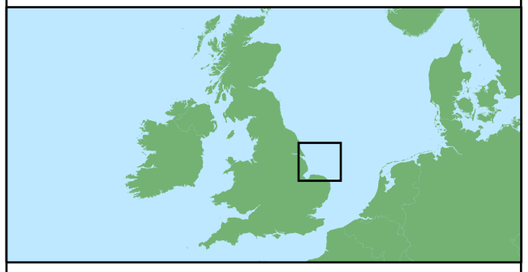


Legend

- Array Area
- Offshore Export Cable Corridor
- Marine Archaeology Study Area
- ORCP Search Area

Type

- Navigation
- Industry
- Fishing
- Military



Coordinate System: WGS 1984 UTM Zone 31N

0 10 20 km

Scale:1:550,000

Preliminary Environmental Information Report

Historic Seascape Characterisation of the Water Column Level

Figure 13.5

OUTER DOWSING OFFSHORE WIND

Date: 25/05/2023
Produced By: LN
Revision: 2.0

GoBe

300000 350000 400000 450000

6000000 5950000 5900000 5850000

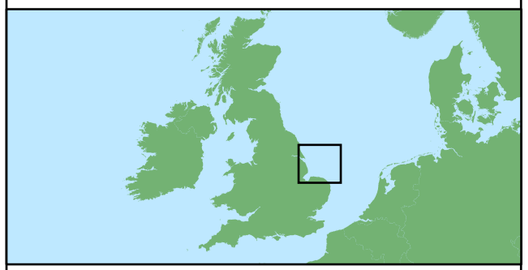
N

Legend

- Array Area
- Offshore Export Cable Corridor
- Marine Archaeology Study Area
- ORCP Search Area

Type

- Navigation
- Industry
- Fishing
- Communications
- Military
- Cultural Topography



Coordinate System: WGS 1984 UTM Zone 31N

0 10 20 km

Scale:1:550,000

Preliminary Environmental Information Report

Historic Seascape Characterisation of the Seafloor Level

Figure 13.6

OUTER DOWSING OFFSHORE WIND

Date: 25/05/2023
Produced By: LN
Revision: 2.0

GoBe

Document Path: O:\Active Tenders\1900 - GoBe GIG-Total Outer Dowsing OWP\GIS\ODOW PEIR\ODOW PEIR.aprx

300000 350000 400000 450000

6000000 5950000 5900000 5850000

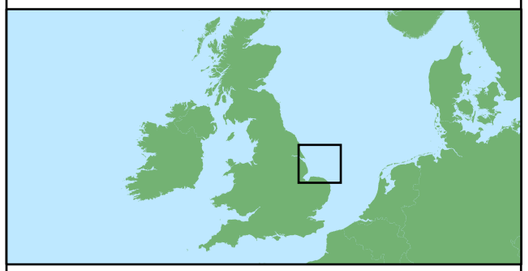
N

Legend

- Array Area
- Offshore Export Cable Corridor
- Marine Archaeology Study Area
- ORCP Search Area

Type

- Navigation
- Industry
- Fishing
- Communications
- Military
- Cultural Topography



Coordinate System: WGS 1984 UTM Zone 31N

0 10 20 km

Scale:1:550,000

Preliminary Environmental Information Report

Historic Seascape Characterisation of the Sub Seafloor Level

Figure 13.7

OUTER DOWSING OFFSHORE WIND

Date: 25/05/2023
Produced By: LN
Revision: 2.0

GoBe

13.4 Archaeological Assessment of Geophysical Data

13.4.1 The archaeological assessment of geophysical data of the array area and associated 1km buffer is presented below and summarised in Table 13.20. All geophysical anomalies have been cross-referenced with records of marine archaeological and cultural heritage receptors identified during the baseline assessment (see above). The archaeological potential of the anomalies identified was determined following the methodology and criteria stated in Table 13.2.

13.4.2 Shallow geophysical and Ultra-High Seismic (UHSR) data was collected across the array area and Offshore ECC. The assessment of the Offshore ECC is ongoing, with the full assessment to be presented in ES, and the results of the geophysical assessment of the array area are summarised below.

13.4.3 All anomalies could represent archaeological materials and will continue to be a key factor in all future planning for this project. The location of the anomalies identified in geophysical assessments will be considered for future surveys and seabed impacts (Table 13.20).

Table 13.20: Summary of Archaeological Anomalies within the Marine Archaeology Study Area as Seen in the Geophysical Data

Number of Geophysical Anomalies	Archaeological Potential
13	High
33	Medium
1,107	Low
1,153	**Total**

High Potential Anomalies

13.4.4 13 anomalies have been assessed as having High archaeological potential, as seen in SSS, MBES and MAG data, or correlating with recorded locations of wrecks.

13.4.5 The 13 anomalies with High archaeological potential are summarised below (Table 13.21) and detailed in Annex A. Of the 13 anomalies summarised below, 10 correlate with UKHO/NRHE/Lincolnshire HER records (see Section 13.3).

Table 13.21: High Potential Anomalies Identified within the Geophysical Data

MA ID	Geophysical ID	Description
MA0001	SSS: MA2007 MBES: MA4002 MAG: MA5001	Potential wreck debris seen in SSS as two linear reflectors measuring 13.5m and 10.7m, with additional debris visible on other lines; seen in MBES as a raised linear feature measuring 14 x 1.5m; magnetic return of 1340.36nT.
MA0002	SSS: MA2014 MBES: MA4004 MAG: MA5006	The remains of an uncharted wreck found during geophysical survey in 2022, seen in SSS as a strong linear reflector with extended shadow; seen in MBES as an ovate raised feature measuring 13 x 4m.; magnetic return of 695.56nT.

MA ID	Geophysical ID	Description
MA0003	SSS: MA2101 MBES: MA4030 MAG: MA5035	Wreck of an unknown vessel (UKHO9440), seen in SSS as an ovate hard reflector, apparent outline of a small wreck with small hard and linear reflectors seen in area surrounding it; seen in MBES as the outline of ovate raised feature measuring 35.5 x 5.5m with greater height seen at apparent stern of wreck, with a small, raised features 18m NW and 10m SE; magnetic return of 136.8nT.
MA0004	SSS: MA2102 MBES: MA4031 MAG: MA5228	Debris from the unknown UKHO9440 wreck, seen in SSS as linear hard reflectors; seen in MBES as a raised feature measuring 2.5x5m; magnetic return of 68.86nT (19.78m north east).
MA0005	SSS: MA2220 MBES: MA4072 MAG: MA5000	Wreck of the *Basto* (UKHO9417), seen in SSS as an assemblage of linear hard reflectors, apparent scattered debris and sheathing of a large wreck; seen in the MBES as a long ovate raised feature measuring 55 x 8m with small, raised features in surrounding area; magnetic return of 4522.38nT (100m west, however there is currently a data gap for MAG data in area covering wreck).
MA0014	SSS: MA2126 MBES: MA4035	Obstruction (UKHO9441), seen in the SSS as a linear reflector and raised seabed, potential debris or seabed feature, and seen in the MBES as a raised feature measuring 3x2.5m with scour.
MA0017	MBES: MA4077	Obstruction (UKHO9424), seen in the MBES as a small feature with scour around it.
MA0018	MBES: MA4078	Unknown Wreck (UKHO9426), seen in the MBES as an ovate raised feature measing 8.5m x 0.85m.
MA0020	MBES: MA4079	Obstruction (UKHO9429), seen in the MBES as a debris field, potential rock dump.
MA0022	MBES: MA4080	Obstruction (UKHO9443), seen in the MBES as a raised feature measuring 3.6x4.5m surrounded by scour.
MA0023	MBES: MA4081	Obstruction (UKHO9445), seen in the MBES as a small feature measing 1.5m x 1.5m with scour.
MA0024	MAG: MA5680	Fisherman's Fastener (UKHO9482), with a magnetic return of 25.68nT (133.7m east).
MA0025	MAG: MA5016	Fisherman's Fastener (UKHO9483), with a magnetic return of 209.2nT (116m south).

Medium Potential Anomalies

13.4.6 33 anomalies of Medium archaeological potential are summarised below (Table 13.22) and detailed in Annex A. These did not correlate with any known UKHO/NRHE/Lincolnshire HER records but may represent debris associated with the recorded wrecks above.

Table 13.22: Medium Potential Anomalies Identified within the Geophysical Data

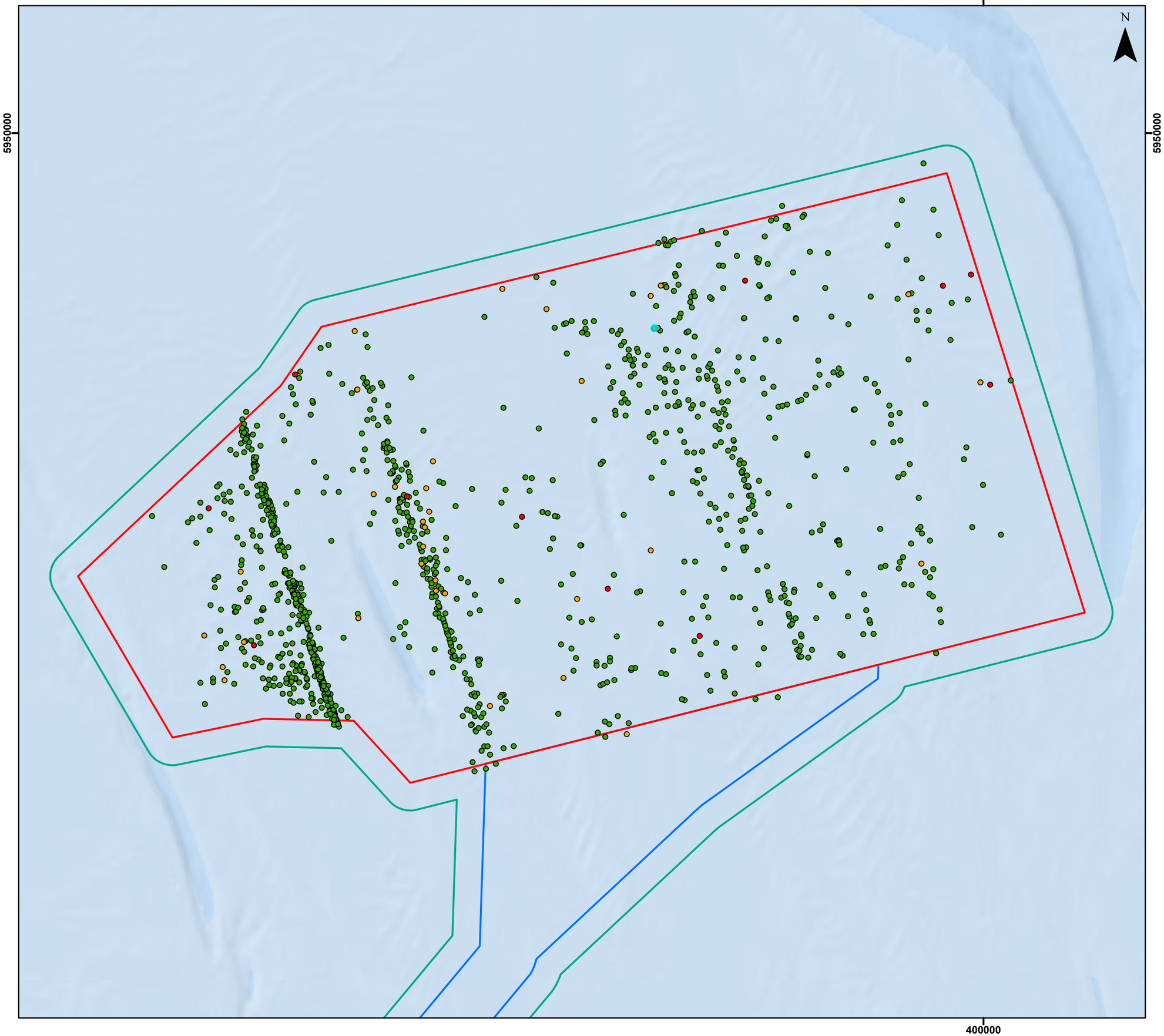
MA ID	Geophysical ID	Description
MA0006	SSS: MA2027 MBES: MA4006 MAG: MA5574	Potential anthropogenic assemblage or debris seen in SSS as an irregular reflector; seen in the MBES as a pair of raised features surrounded by scour; magnetic return of 32.85nT (163.34m south).
MA0007	SSS: MA2028 MBES: MA4007 MAG: MA5946	Potential anthropogenic assemblage or debris seen in SSS as multiple linear and curvilinear reflectors; seen in the MBES as a raised feature measuring 6m x 2m; magnetic return of 14.4nT (5.17m south).
MA0008	SSS: MA2048 MBES: MA4075	Potential wreck debris seen in the SSS as an angular reflector and in the MBES as a small, raised feature with scour.
MA0009	SSS: MA2096 MBES: MA4027	Potential wreck material and debris seen in the SSS as complex hard reflectors and shadow; seen in the MBES as a raised feature measuring 3.5m x 1.5m.
MA0010	SSS: MA2099 MBES: MA4028	Potential wreck debris or a large boulder cluster, seen in the SSS as large hard reflectors and shadow; seen in the MBES as a pair of raised features in area measuring 6 x 2m.
MA0011	SSS: MA2103 MBES: MA4032	Potential wreck material seen in the SSS as curvilinear debris; seen in the MBES as a pair of raised linear features measuring 4.5m x 1.5m arranged perpendicular to each other with slight scour.
MA0012	SSS: MA2200 MBES: MA4065	Potential anthropogenic assemblage or concentrated debris seen in the SSS as multiple reflectors; seen in the MBES as a pair of small, raised features in scour measuring 6.5m x 4m.
MA0013	SSS: MA2218 MBES: MA4071	Potential wreck debris seen in the SSS as a complex assemblage of reflectors associated with the *Basto* (UKHO9417); seen in the MBES as a raised feature measuring 7.5m x 8.5m.
MA0027	MAG: MA5003	Magnetic anomaly with a magnetic return of 847nT.
MA0028	MAG: MA5005	Magnetic anomaly with a magnetic return of 724.87nT.
MA0031	MAG: MA5011	Magnetic anomaly with a magnetic return of 286.63nT.
MA0032	MBES: MA4082 MAG: MA5012	Magnetic anomaly seen in the MBES as a small feature measuring 1.5m x 0.5m with scour; magnetic return of 268.14nT.
MA0033	MAG: MA5013	Magnetic anomaly with a magnetic return of 249.8nT.
MA0034	MAG: MA5014	Magnetic anomaly with a magnetic return of 229.55nT.
MA0035	MAG: MA5015	Magnetic anomaly with a magnetic return of 222.3nT.
MA0038	MBES: MA4084 MAG: MA5020	Magnetic anomaly seen in the MBES as an area with many raised features, potential rock dump; magnetic return of 199.07nT.
MA0046	MAG: MA5028	Magnetic anomaly with a magnetic return of 159.94nT.

MA ID	Geophysical ID	Description
MA0047	MBES: MA4083 MAG: MA5030	Magnetic anomaly seen in the MBES as a small feature measuring 1.3m x 1.3m in scour; magnetic return of 148.43nT.
MA0048	MAG: MA5032	Magnetic anomaly with a magnetic return of 144.12nT.
MA0050	MAG: MA5034	Magnetic anomaly with a magnetic return of 139.97nT.
MA0051	MAG: MA5036	Magnetic anomaly with a magnetic return of 135.24nT.
MA0056	MBES: MA4085 MAG: MA5042	Magnetic anomaly seen in the MBES as a small feature measuring 1m x 1m; magnetic return of 126.52nT.
MA0057	MAG: MA5043	Magnetic anomaly with a magnetic return of 125.74nT.
MA0058	MAG: MA5044	Magnetic anomaly with a magnetic return of 125.2nT.
MA0063	MAG: MA5049	Magnetic anomaly with a magnetic return of 120.71nT.
MA0067	MAG: MA5053	Magnetic anomaly with a magnetic return of 117.2nT.
MA0069	MBES: MA4086 MAG: MA5055	Magnetic anomaly seen in the MBES as two small reflectors in scour one located 10 m to the NE and one located 26m to the SE; magnetic return of 112.64nT.
MA0071	MAG: MA5057	Magnetic anomaly with a magnetic return of 109.98nT.
MA0074	MAG: MA5060	Magnetic anomaly with a magnetic return of 108.75nT.
MA0082	MAG: MA5068	Magnetic anomaly with a magnetic return of 105.43nT.
MA0083	MAG: MA5069	Magnetic anomaly with a magnetic return of 105.37nT.
MA0084	MAG: MA5070	Magnetic anomaly with a magnetic return of 104.12nT.
MA0085	MAG: MA5071	Magnetic anomaly with a magnetic return of 103.67nT.

Low Potential Anomalies

13.4.7 There are 1,096 Low potential anomalies have been characterised as a mixture of isolated small features, often boulder-like, or isolated linear features and potentially modern debris such as rope, chain, fishing gear or lost equipment.

13.4.8 Magnetic anomalies between <5nT and >100nT with no corresponding records or data in any of the assessed geophysical datasets or research resources have also been assigned low archaeological potential (Figure 13.8).

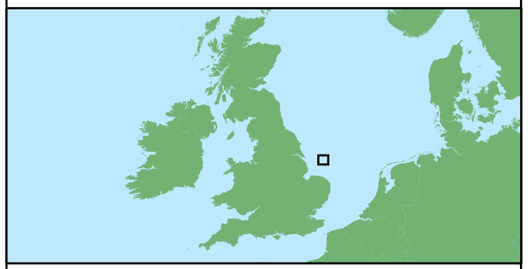


Legend

- Array Area
- Offshore Export Cable Corridor
- Marine Archaeology Study Area

Archaeological Potential

- High (13)
- Medium (33)
- Low (1107)



Coordinate System: WGS 1984 UTM Zone 31N

0 2.5 5 km

Scale:1:130,000

Preliminary Environmental Information Report

Geophysical Anomalies of Archaeological Potential

Figure 13.8

OUTER DOWSING OFFSHORE WIND

Date: 25/05/2023
Produced By: LN
Revision: 2.0

GoBe

13.5 Geoarchaeological Assessment of Geophysical Data

13.5.1 This section presents a preliminary deposit model which is to be refined following the further assessment of geotechnical data. The SBP data was assessed as per methodology outlined in section 13.2. The results are presented in the context of current understanding of the complex prehistoric landscapes and the correlation between the marine and terrestrial sediment phases.

13.5.2 Knowledge of, as well as our understanding of, submerged prehistory is developing rapidly as a positive outcome of collaboration and data sharing between offshore developers, curators and researchers. Research included in the North Sea Prehistory Research Management Framework (NSPRMF) (March 2023), will be utilised and referenced where relevant when available.

13.5.3 The nature, extent and distribution or 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. This will continue to be assessed as per the phased approach outlined in Offshore Geotechnical Investigations and Historic Environment Analysis (COWRIE, 2011) and per the themes and research questions within the forthcoming NSPRMF.

Current Understanding

13.5.4 The assessment of SBP data within the array area shows that the seafloor morphology is made up of bedforms including, mega ripples, sand waves and sandbanks as well as deeper areas such as bathymetric depressions, also known as tunnel valleys.

13.5.5 One of the prominent features within the submerged landscape in the area is the Outer Silver Pit which lies east of the marine archaeology study area. The Outer Silver Pit is a significant depression probably formed during quaternary sub glacial processes (Praeg 2003), or as a result of a catastrophic drainage event (Wingfield 1990). While not within the area of focus for the PEIR report, the landscape around Outer Silver Pit is dominated by channels flowing into the feature and other smaller valleys. The landscape is thought to have been a wetland or peatland with the Outer Silver Pit representing an estuarine environment from the end of the Pleistocene until the early Holocene, when the area was flooded at around 10,000BP (Gaffney and Fitch, 2022).

13.5.6 One tunnel valley is partly visible (MA3007). The tunnel valleys are assessed within the Europe's Lost Frontiers project and are thought to contain lacustrine features during the Mesolithic. The tunnel valleys, also visible in the bathymetric data across the array area are likely to be deeper than suggested and contain Pleistocene materials. During the Holocene these could also have contained lakes (Gaffney and Fitch, 2022). The Inner Silver Pit glacial tunnel valley is located approximately 15km west of the array area with the Offshore ECC crossing the valley at its shallowest part as it stretches from the Wash out towards the North Sea. Sediments within the Inner Silver Pit are known for their ecological importance on a surface level and have further shown that sediments collected from cores within the Inner Silver Pit feature have the potential to contain preserved foraminifera which indicate a Middle Pleistocene (MIS 9) environment. Demonstrating glaciomarine shallow water conditions, followed by a transitional zone with slightly higher temperatures, however still subarctic climate, followed by a true interglacial succession (also known as the Inner Silver Pit Interglacial) where increased faunal diversity and a high content of warm water species is noted. The topography gets shallower towards the end of the interglacial succession. Followed by a return to high arctic glacial marine conditions (Kudsen and Sejru, 1998).

13.5.7 The internationally important Europe's Lost Frontiers project is the largest, directed archaeological research project undertaken in Europe to investigate the inundated landscapes of the early Holocene North Sea and as part of the Project 78 vibrocores were collected in the southern North Sea.

13.5.8 While none of the cores are located within the array area, one (ELF002) is located within the Offshore ECC and others were taken outside the marine archaeology study area, south towards the Norfolk coast (Gaffney and Fitch, 2022). The results of the assessment of the core material shows that while ELF002 contained reddish brown silty fine sand and clay, ELF007 and ELF2009 both contained dark brown/black peat of high geoarchaeological potential illustrating the importance of early archaeological involvement in geotechnical campaigns at large infrastructure projects.

13.5.9 Therefore, further discussion on recommended sampling strategies, based on previous research and results as well as aiming to answer research questions outlined by the newly published NSPRMF will be presented in the forthcoming phased geoarchaeological reports, and relevant archaeological MSs.

13.5.10 Cores collected to date as part of the Project, within the array area are summarised below where they have spatial overlap or are likely to be associated with the channel systems identified.

Archaeological Assessment of Sub-bottom Data

13.5.11 The archaeological assessment of the SBP data collected for the array area has aimed to:

- Locate and map channel and valley features present within the marine archaeology study area;
- Identify and describe stratigraphic units within these channels and valleys;
- Link the features identified from the SBP data to known offshore and terrestrial landscape features; and
- Develop an outline deposit model based on the information gathered.

Results

13.5.12 The sediments identified within the array area from the SBP data geoarchaeological assessment include Holocene gravely sand, silt and clays (Unit A) and Quaternary sediments, Unit B, Unit C and Unit D (Table 13.23). The features are described in detail below and illustrated in Figure 13.9

13.5.13 Further, a clear palaeochannel system was identified, the palaeochannels are cut into the base of Unit A and seen incising the underlying Quaternary sediments, Unit B and Unit C (Table 13.23).

13.5.14 The Paleochannel systems are generally stretching across the marine archaeology study area in the array area in a north north-west to south south-east direction and can reach depths up to 32m Below Seafloor (BSF). No blanking, indication of peat or shallow gas was noted.

MA3000

13.5.15 MA3000 is a channel, 15km long and 4.5km at the widest point with possible narrower tributaries running in a north north-west to south south-east direction. While not overlapping previous data, it is located perpendicular to a fluvial Lower Palaeolithic, possibly Holocene channel identified by NSPP (University of Birmingham, 2011) and parallel to wetlands identified by NSPP (University of Birmingham, 2011) as well as a tunnel valley. The channel has mostly sloping sides that in places are straight and a flat uneven base, the channel depth varies from 2m to 12m. One vibrocore was collected within the channel feature (VC-07R). The core penetrated down to 3.3m and recovered 0.20m of gravels and 3.1m of dark CLAY, probably Unit B.

MA3001

13.5.16 MA3001 is an area of 1.5km by 0.5km stretching in a north north-west to south south-east direction, west of MA3000. This could be an extension of a fluvial Lower Palaeolithic, possibly Holocene channel identified by NSPP (University of Birmingham, 2011) which comes in from the east and thus connecting MA3000 and MA3001 to the wider channel systems previously identified in the area. The feature is up to eight meters deep with shallow sloping sides and uneven slightly rounded base. No vibrocores were collected within this feature.

MA3002

13.5.17 MA3002 covers an area of 3.6km by 2.8km in an area of sandbanks and does not overlap with the data from NSPP (University of Birmingham, 2011) but shows similar character to a wetland or lake environment as seen both north and south of MA3002. The feature shows gently sloping sides and a slight rounded base. The feature is generally 2 to 8 meters deep but has a dip in the middle which stretches down 16m. One vibrocore was collected within the feature (VC-15) which penetrated down to 3.2m and recovered 0.5m of Unit A and 2.7m of Unit B.

MA3003

13.5.18 MA3003 is 4km by 4.2km, west of the southernmost part of MA3000 in an area of sand waves. The feature does not overlap with the data from NSPP (University of Birmingham, 2011) but shows similar character to a wetland or lake environment as seen both north and south of MA3003. The feature is up to 20m deep but has mostly sloping banks and is only between 2m and 8m deep around the perimeter. The eastern side of the feature is shallower than the western. No vibrocore have been collected within this feature.

MA3004

13.5.19 MA3004 is a channel 9km long and 0.6km wide. The channel is located north north-west to south south-east to the west of MA3005 and a fluvial Lower Palaeolithic, possibly Holocene channel identified by NSPP (University of Birmingham, 2011). The channel is approximately 6m deep with relatively steps banks. No cores were collected within the channel; however, one core (VC- 13) was collected 600m north, it should be noted that this does not indicate penetration of any channel infill material.

MA3005 and MA3006

13.5.20 MA3006 stretches over 12km by 1.3km NNW to SSE and overlays perfectly with a fluvial Lower Palaeolithic, possibly Holocene channel identified by NSPP (University of Birmingham, 2011). However, the project data extends this channel feature another 5.6km south (MA3005). The channel system has relatively steep banks but is in places very shallow and seen close to the seafloor. The channel base is mostly rounded but in deeper sections uneven reflectors are noted indicating a change in sediments. The channel system can be up to 20m deep but is in the majority approximately 4m deep. One vibrocore (VC-20) was collected in the northern part of MA3005. The core penetrated down to a depth of 5.5m and contained only dark grey and brown SAND. The area presents large sandbanks, and the interpretation is therefore that no infill material was collected but only Unit A.

MA3007

13.5.21 MA3007, while not overlying geographically with previously identified channels, this feature seems to be a northern extension of a shallow lake or wide river. It also partly overlies one of the tunnel valleys within the marine archaeology area and is therefore likely to contain material of geoarchaeological interest, however the SBP data does not penetrate the infill sediment within the tunnel valley, but it is likely that the southern extension of this feature (Figure 13.9) is present deeper within the sediments. One vibrocore was collected within the tunnel valley but not where the paleochannel was visible. VC-07 showed Unit A, SAND with bands of clay overlaying brown gravelly SAND, reaching Unit B at 2m BSB which stretches until the end of the vibrocore at 2.60 BSB.

Outline Deposit Model

13.5.22 A full assessment of the geoarchaeological potential of the vibrocores collected to date are presented in the forthcoming Stage 1 geoarchaeological report. The outline deposit model will be further refined following a phased geoarchaeological assessment (see document 8.5).

Table 13.23: Outline Deposit Model

Unit	Stratigraphy	Description	Epoch	Geoarchaeological potential
Unit A	Holocene mobile sands	Mobile loose to medium gravelly sand overlying stiff CLAY with silt and Sand, in places Loose to medium dense gravelly sand overlying stiff CLAY with silt and sand	Holocene	Sedimentary low geoarchaeological potential, however archaeological artefacts may be located within these sediments.
Unit B	Bolders Bank formation	Stiff CLAY with silt and sand with inclusions of chalk, mudstone and/ or sandstone.	Quaternary Isotope Stage 3-2	Potential to contain material of geoarchaeological interest.
Unit C	Bolders Bank formation	Medium dense to dense SAND and gravels with clay and silt	Quaternary, Isotope Stage 3-2	Potential to contain material of geoarchaeological interest.
Unit D	Swarte bank	Stiff to very stiff CLAY	Quaternary Marine Isotope Stage 12	Potential to contain material of geoarchaeological interest.
Unit E	Bedrock formation	Probable Mudstone	Mesozoic	Not of geoarchaeological potential.

400000

5950000

N

MA3006

MA3000

MA3001

MA3004

MA3007

MA3005

MA3002

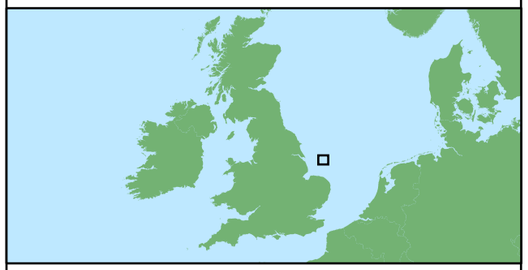
MA3003

400000

5950000

Legend

- Array Area
- Offshore Export Cable Corridor
- Marine Archaeology Study Area
- Channels with Geoarchaeological Potential
- NSPP Lakes
- NSPP Fluvial Channels



Coordinate System: WGS 1984 UTM Zone 31N

0 2.5 5 km

Scale:1:130,000

Preliminary Environmental Information Report

Records and Geoarchaeological Features within the Array Area

Figure 13.9

OUTER DOWSING OFFSHORE WIND

Date: 25/05/2023
Produced By: LN
Revision: 2.0

GoBe

13.6 Mitigation

Introduction

13.6.1 The embedded mitigation outlined in Table 13.3 and detailed below have been designed to reduce or eliminate direct impact on known, unknown and potential marine archaeological and cultural heritage receptors. This approach is further detailed in Volume 1, Chapter 13 and is expected to be reflected in the DCO requirements and/or dML conditions.

Mitigation for Known Wrecks and Obstructions

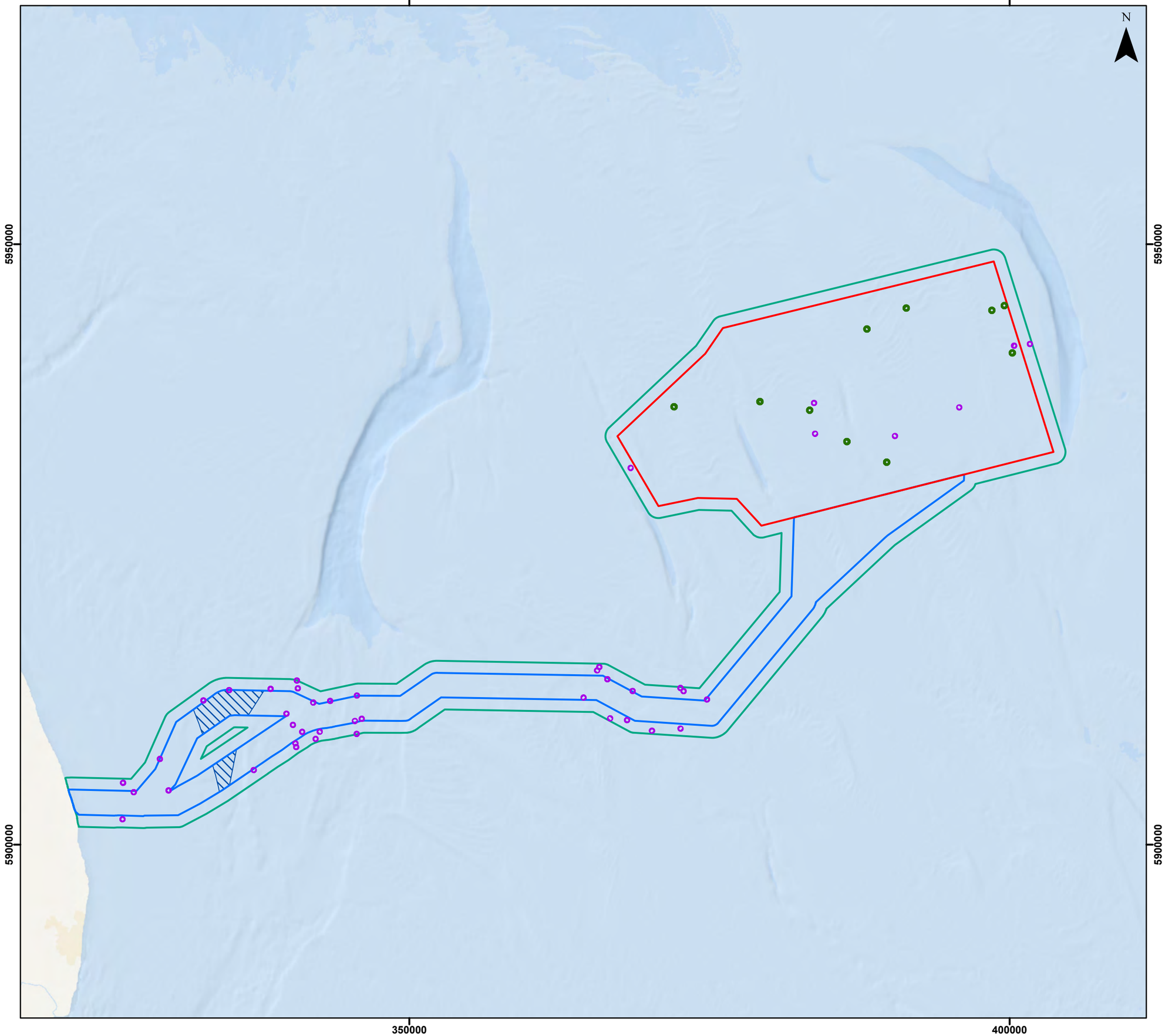
13.6.2 There are 56 wrecks and obstructions recorded in the UKHO, NRHE and Lincolnshire HER dataset within the marine archaeology study area. Within these records there are 21 LIVE wrecks (three of which correspond with geophysical anomalies in the data assessed to date). The archaeological significance of these known wrecks is assessed based on the criteria set out in the Scheduled Monuments & Nationally Important but Non-Scheduled Monuments guidance (DCMS, 2013) and detailed in section 13.3.

13.6.3 Precautionary AEZs of a 50m radius are recommended for all known marine archaeological and cultural heritage receptors, as illustrated in Figure 13.10. Of the 56 recorded wrecks and obstructions, 15 are within the array area. Eight of the 15 records correspond with anomalies identified in the geophysical data and have been assigned AEZs due to being of archaeological potential (Table 13.20), three of which were based around their visible extent (further detailed in Annex A and Annex B). The records for wrecks, fouls and obstructions not identified in the geophysical data, as well as those located in the Offshore ECC where the data assessment is ongoing, are covered by a precautionary 50m AEZ based around their recorded location (further detailed Annex A and Annex B).

13.6.4 There are currently no designated marine archaeological and cultural heritage receptors such as Designated or Protected Wreck Sites or other sites subject to the provisions of the Protection of Military Remains Act 1986 within the marine archaeology study area.

13.6.5 The commitment to avoid all known marine archaeological and cultural heritage receptors and to further investigate the area of impacts ensuring that unknown receptors are located, and impact mitigated will ensure preservation *in situ*, which is in keeping with current best practice.

13.6.6 Where marine archaeological and cultural heritage receptors cannot be preserved *in situ*, justification for continued archaeological work including potential impacts will be clearly outlined in the relevant MSs produced ahead of any archaeological works and following agreement with Historic England.

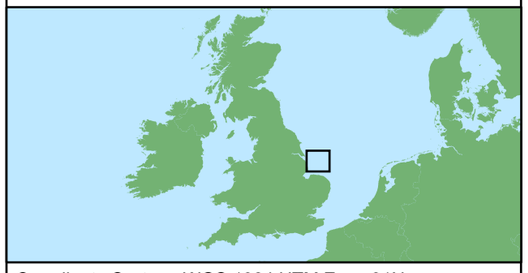


Legend

- Array Area
- Offshore Export Cable Corridor
- Marine Archaeology Study Area
- ORCP Search Area

AEZs for known wrecks and obstructions

- 100 (10)
- 50 (43)



Coordinate System: WGS 1984 UTM Zone 31N

0 5 10 km

Scale: 1:300,000

Preliminary Environmental Information Report

AEZs Recommended for Recorded Wrecks and Obstructions

Figure 13.10

OUTER DOWSING OFFSHORE WIND

Date: 25/05/2023
Produced By: LN
Revision: 2.0

GoBe

Document Path: O:\Active Tenders\1900 - GoBe GIG-Total Outer Dowsing OWP\GIS\ODOW_PEIR\ODOW_PEIR.aprx

Mitigation for Unlocated Marine Archaeological and Cultural Heritage Receptors

13.6.7 There is always a possibility that yet unlocated marine archaeological and cultural heritage receptors will be located within the marine archaeology study area. Unlocated marine archaeological and cultural heritage receptors are of unknown archaeological potential and heritage significance but might still be impacted by indirect or direct impact caused by project activities. In recent years large offshore renewable developments have located several previously unknown and unlocated sites of High archaeological significance within marine archaeology study area, even after construction.

13.6.8 Further geophysical and geotechnical investigations followed by archaeological campaigns are essential to developing effective mitigation within the array area and Offshore ECC. The combination of geophysical and geotechnical surveys completed to a standard where they can be archaeologically assessed and with archaeological objectives work effectively by increasing the likelihood of marine archaeological and cultural heritage receptors becoming identified and ultimately protected. Detailed archaeological assessments aim to ensure that to the extent possible, areas of impact are clear of marine archaeological and cultural heritage receptors ahead of any intrusive works or further mitigation and archaeological campaigns are taken.

13.6.9 Avoidance is considered the most effective form of protection, as per the NPS for Renewable Energy Infrastructure (NPS EN-3; DECC, 2011b) and Draft NPS for Renewable Energy Infrastructure EN-3 (DESNZ, 2023). In the case of previously unlocated marine archaeological and cultural heritage receptors being identified during survey or construction works, TEZs will be established via the use of the PAD reporting until further investigation can be undertaken to determine the character of the discovery.

13.6.10 These TEZs may be lifted following further investigation and in consultation with the Archaeological Curator(s) if the features are determined to be non-archaeological, or they may form the basis of an AEZ, to avoid further disturbance long-term.

13.6.11 The project specific Outline PAD (see Annex A of document 8.5) will be applied during any work where unknown archaeology may be encountered and is designed to operate when it is not practical or safe for an archaeologist to be present. The Outline PAD (see Annex A of document 8.5) does not replace the process of archaeological assessment and evaluation but rather acts as a safety net in the event of unexpected discoveries during the course of works.

13.6.12 Implementation of the Outline PAD (see Annex A of document 8.5) helps to ensure that any adverse effects of the Project on sites, features or objects of potential archaeological significance encountered and/or recovered during project works are reduced by establishing rapid communication between key stakeholders, who are then able to implement appropriate mitigation.

Mitigation for Geophysical Anomalies of Archaeological Potential

13.6.13 The combined geophysical data assessments undertaken to identify material of archaeological potential identified anomalies of Low, Medium, and High archaeological potential within the marine archaeology study area as detailed in Table 13.20.

13.6.14 While generally no active conservation strategy is proposed, anomalies assessed as being of Medium or High archaeological potential are probably of anthropogenic origin and/or archaeological significance and have therefore been assigned AEZs based on their archaeological potential, their archaeological significance and their size as understood from the geophysical data assessment. A gazetteer of the geophysical anomalies identified as High and Medium potential can be found in Annex A.

13.6.15 Preservation *in situ* is ensured by the commitment to avoid all known marine archaeological and cultural heritage receptors and to further investigate areas of impacts increasing the potential for unknown receptors to be located.

13.6.16 Where items are being removed from the seabed, conservation strategies will be clearly outlined in the relevant MSs produced and submitted to the Archaeological Curator(s) (Historic England and Lincolnshire County Council) ahead of any archaeological works.

13.6.17 Anomalies of Low archaeological potential and magnetic anomalies >100 nanotesla (nT) without correlating seabed features have not been assigned AEZs due to the uncertainty of their archaeological potential. Further investigation of these sites will occur during future survey works, where possible, and avoidance of these features by micro-siting is recommended if there is potential for them to be impacted by the Project.

13.6.18 It is possible these anomalies could represent material from wreck sites or other marine archaeological and cultural heritage receptors 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 Curator(s). Further assessment may be in the form of investigation undertaken in conjunction with a Remotely Operated Vehicle (ROV) or UXO surveys.

13.6.19 Works during the construction, operation and decommissioning phases of the project should implement the project specific Outline PAD (see Annex A of document 8.5) and any objects of archaeological potential should be reported, should an archaeologist not be present.

13.6.20 Within the array area and associated 1km buffer 13 High potential anomalies have been assigned 100m AEZs, and 33 Medium potential anomalies have been assigned 50m AEZs (20 of these are magnetic anomalies which do not correspond with any other geophysical data records) (Figure 13.11).

400000

5950000

N

5950000

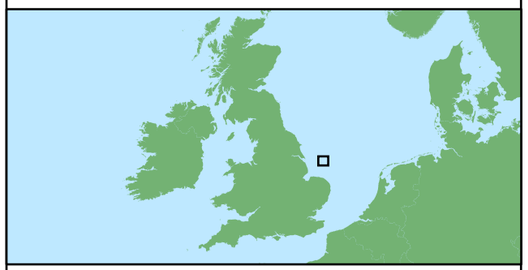
400000

Legend

- Array Area
- Offshore Export Cable Corridor
- Marine Archaeology Study Area

AEZs for geophysical anomalies

- 100 (12)
- 50 (33)



Coordinate System: WGS 1984 UTM Zone 31N

0 2.5 5 km

Scale: 1:130,000

Preliminary Environmental Information Report

AEZs Recommended for High and Medium Geophysical Anomalies

Figure 13.11

OUTER DOWSING OFFSHORE WIND

Date: 25/05/2023
Produced By: LN
Revision: 2.0

GoBe

Mitigation for Deposits of Geoarchaeological Potential

13.6.21 The baseline review, summarised in section 13.3, supported by the geophysical survey data assessment, summarised in section 13.4 has provided information on the location of palaeolandscapes and areas of geoarchaeological potential within the marine archaeology study area.

13.6.22 It is recognised that all phases of the Project may cause direct impact to deposits which have the potential to be of geoarchaeological interest, however, the impact to the mentioned sediments will be restricted to the required burial and penetration depths, as outlined in Volume 1, Chapter 13.

13.6.23 Any potential impact will be offset by the collection and analysis of geotechnical data, including dedicated cores for archaeological analysis. The geoarchaeological assessment will be undertaken using a phased approach to assessment and analysis of the collected geotechnical data resulting in project reports and a deposit model as prescribed in COWRIE guidance (2011) and further outlined in section 13.4. This collection of geotechnical data and its subsequent geoarchaeological analysis will be used to contribute to seabed mapping and modelling of submerged prehistoric landscapes, resulting in a greater understanding of the prehistoric past and the use and habitation of submerged former terrestrial landscapes.

13.6.24 Specific archaeological sample locations will be recommended in addition to the geotechnical samples collected for the overarching geotechnical campaign. These will be outlined in specific MSs.

Mitigation for Impacts Post-Construction

13.6.25 To confirm the effectiveness of the established AEZs and other recommended mitigation, and the stability of marine archaeological and cultural heritage receptors, it is expected that some marine archaeological and cultural heritage receptors identified during the pre-construction surveys will require further monitoring.

13.6.26 Priority will be given to features and locations of High archaeological potential and/or significance located in proximity to installed infrastructure, particularly where archaeological potential and/or significance has been established through direct observation.

13.6.27 In addition to wrecks or wreck assemblages, attention will also be given to a range of feature types including discrete objects (historic anchors, aircraft components), magnetic anomalies with some degree of surface expression, possible debris, and areas of seabed disturbance.

13.6.28 The archaeological post-construction monitoring plan will be developed and submitted to the relevant Archaeological Curator(s) and will outline the monitoring methodology and reporting structure.

Mitigation for Unexpected Archaeological Discoveries

13.6.29 Mitigation for unexpected archaeological discoveries is considered under the recommended archaeological objectives for geophysical and geotechnical surveys, and their subsequent archaeological review.

13.6.30 Additionally, any finds believed to be of archaeological potential that are identified and/or recovered by any operating vessels during construction, O&M or decommissioning phases and where an archaeologist is not present will be reported using the methodology outlined in the Project specific Outline PAD (see Annex A of document 8.5).

13.6.31 The Project specific Outline PAD (see Annex A of document 8.5) has been produced in reference to the TCE guidance (2014). The Outline PAD (see Annex A of document 8.5) aims to mitigate impact on the historic environment by enabling people working offshore to report their finds in an effective and convenient manner.

13.6.32 The Outline PAD (see Annex A of document 8.5) anticipates discoveries being made by Project staff who report to a Site Champion (potentially the Client Representative on the vessel or another manager appointed by the contractor), who then reports to the Project's nominated person to coordinate implementation of the Outline PAD (the Nominated Contact) (see Annex A of document 8.5).

13.6.33 All discoveries of archaeological material must be reported by the Project, in accordance with the communication plan, to the Nominated Contact, who will then inform the Retained Archaeologist. If the find constitutes 'wreck' within the terms of the Merchant Shipping Act 1995 then the Retained Archaeologist will produce a report to the Receiver of Wreck. Full contact details for all relevant parties are included in Annex A of document 8.5.

13.6.34 Any finds discovered will be safeguarded for instance, kept in water in a clean, covered container. It is not recommended to remove concretion, clean the finds, or in any other way interfere with them.

13.6.35 Following the application of the embedded environmental measures outlined above, there may be other discoveries during offshore works or geophysical data assessments that have not been previously characterised through the archaeological assessments. Any discoveries that are of archaeological potential may require TEZs to be established.

13.6.36 TEZs must be respected during all activities associated with the windfarm construction, O&M, and decommissioning phases. Measures will be put in place to communicate the position of TEZs to all contractors and to monitor compliance with the TEZs during construction, O&M, and decommissioning. As with AEZs, TEZs must also consider that the use of anchors and lines, which could impact upstanding features, are adequately considered in the planning of operations.

13.6.37 Following an assessment of the available data for the discovery, ground truthing or new information, the Retained Archaeologist will (in agreement with the curator, Historic England), provide advice on whether the TEZ may be lifted or will form the basis of a permanent AEZ and become applicable for all activities associated with the Project across all phases of the Project.

13.6.38 Further archaeological works required as a result of the discovery will be undertaken subject to a MSs and followed by archaeological reporting.

13.7 References

Ancient Monuments and Archaeological Areas Act (1979) (c.46) https://www.legislation.gov.uk/ukpga/1979/46 [Accessed: March 2022].

Bryant, S. (1997), 'Research and Archaeology: a Framework for the Eastern Counties, 1. Resource assessment'. pp. 23–34 (Glazebrook, J. ed.). East Anglian Archaeology, Occasional Paper, 3.

Bynoe, R. (2018), 'The submerged archaeology of the North Sea: Enhancing the Lower Palaeolithic record of northwest Europe', Quaternary Science Reviews, 191/1: 14.

Camidge, K., Holt, P., Johns, C., Randall, L. and Schmidt, A. (2010), 'Developing Magnetometer Techniques to Identify Submerged Archaeological Sites: Theoretical Study Report'. https://archaeologydataservice.ac.uk/archiveDS/archiveDownload?t=arch-983-1/dissemination/pdf/Report/Developing_Magnetometer_Techniques_Theoretical_Study_Final_Report_Rev_02.pdf [Accessed: March 2023].

CIfA (2014a), 'Code of conduct: professional ethics in archaeology. Reading, Charted Institute for Archaeologists'. [revised October 2019, October 2020, October 2021] https://www.archaeologists.net/sites/default/files/Code%20of%20conduct.pdf%20%5b[Accessed: March 2023].

CIfA (2014b), 'Standard and guidance for the collection, documentation, conservation and research of archaeological materials'. [updated October 2020] https://www.archaeologists.net/sites/default/files/CIfAS%26GFinds_2.pdf[Accessed: February 2023].

CIfA (2014c), 'Standard and guidance for commissioning work on, or providing consultancy advice on, archaeology and the historic environment'. [updated October 2020] https://www.archaeologists.net/sites/default/files/CIfAS&GCommissioning_1.pdf[Accessed: February 2023].

CIfA (2019a), 'Standard and Guidance for Historic Environment Desk-Based Assessment'. https://www.archaeologists.net/sites/default/files/CIfAS%26GDBA_4.pdf[Accessed: March 2023].

CIfA (2019b), 'Regulations for professional conduct'. Reading, [revised July 2021] https://www.archaeologists.net/sites/default/files/Regulations%20for%20professional%20conduct.pdf[Accessed: March 2023].

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'. https://doi.org/10.5284/1000033[Accessed: March 2023].

COWRIE (2007), 'Historic Environment Guidance for the Offshore Renewable Energy Sector'. https://www.wessexarch.co.uk/sites/default/files/field_file/COWRIE_2007_Wessex_%20-%20archaeo_%20guidance_Final_1-2-07.pdf [Accessed: March 2023].

COWRIE (2011), 'Offshore Geotechnical Investigation and Historic Environment Analysis'. https://www.historicenvironment.scot/media/2376/2011-01-offshore-geotechnical-investigations-and-historic-environment-analysis-guidance-for-the-renewable-energy-sector.pdf[Accessed: March 2023].

Darling, M.J. and Gurney, D. (1993), 'Caister-on-Sea excavations by Charles Green'. East Anglian Archaeology Report, 1951/55.

Dellino-Musgrave, V. and Heamagi, C. (2010), '1808 Our Marine Historic Environment: Enhancing the National Monuments Record Phase One - Identifying the Scale of the Problem'. https://archaeologydataservice.ac.uk/archiveDS/archiveDownload?t=arch-1033-1/dissemination/pdf/NMR_Report_final_v2a.pdf [Accessed: March 2023].

Department for Culture Media & Sport (DCMS) (2013), 'Scheduled Monuments & nationally important but non-scheduled monuments'. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/249695/SM_policy_statement_10-2013__2_.pdf[Accessed: March 2023].

Department of Energy and Climate Change (DECC)(2011), 'National Policy Statement for Renewable Energy Infrastructure (EN-3)'. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/47856/1940-nps-renewable-energy-en3.pdf[Accessed: March 2023].

Department for Energy Security and Net Zero (DESNZ)(2023), 'Draft National Policy Statement for Renewable Energy Infrastructure (EN-3)'. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1015236/en-3-draft-for-consultation.pdf[Accessed: March 2023].

Department for Environment Food and Rural Affairs (2009), 'Marine and Coastal Access Act 2009'. https://www.legislation.gov.uk/ukpga/2009/23/contents [Accessed: March 2023].

Natural England's coastal access reports: Guidance on the Secretary of State's decision making processhttps://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/428251/pb13855-marine-coastal-access.pdf [Accessed: March 2023].

Dix J.K, Cazenave P.W. and Lambkin D.O. (2008), 'Quantitative bedform analysis using decimetre resolution swath bathymetry. Caris Conference Proc'.

Ellmers D. (1994), 'The Cog as a Cargo Carrier', in R. Gardiner (ed.), Cogs Caravels and Galleons: The Sailing Ship, 29/46: 1000-1650.

English Heritage (2013), 'Marine Geophysical Data Acquisition, Processing and Interpretation'. https://historicengland.org.uk/images-books/publications/marine-geophysics-data-acquisition-processing-interpretation/mgdapai-guidance-notes/[Accessed: February 2023].

Fitzpatrick, A P. (2003), 'Roman Amphorae in Iron Age Britain', J Roman Pottery Studies10: 10–25.

Flemming, N.C. (on behalf of Department of Trade and Industry) (2002), 'The scope of Strategic Environmental Assessment of North Sea areas SEA3 and SEA2 in regard to prehistoric archaeological

remains'. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/197339/TR_SEA3_Archaeology.pdf[Accessed: March 2023].

Gaffney, V. and Fitch, S. (eds.) (2022), 'Europe's Lost Frontiers: Volume 1'. Europe's Lost Frontiers. Volume 1. Context and Methodology (archaeopress.com) [Accessed: March 2023].

Gould, S. (1997), 'The archaeology of industrialisation and manufacture 1750–1960'. In: Research and archaeology: a framework for the Eastern Counties, 1. Resource assessment, pp. 73–79 (Glazebrook, J., ed.). East Anglian Archaeology, Occasional Paper no. 3.

Greenhill, B. (1993), 'The iron and steel sailing ship', In: Sail's last century: the merchant sailing ships 1830–1930'. pp. 74–97 (Gardiner, R., ed.), (London: Conway Maritime Press).

Gurney, D. (2005), 'Roman Norfolk (c. AD 43–110). In: An historical atlas of Norfolk', pp. 19–20 (Ashwin, T. & Davison, A., eds.). Phillimore and Co. Ltd, Andover, UK.

Hegarty, C. and Newsome, S. (2004), 'The archaeology of the Suffolk Coast and Intertidal zone: a report for the National Mapping Programme'. https://historicengland.org.uk/research/results/reports/81-2005[Accessed: March 2023].

Historic England (2011), 'A Guide to the Theory and Practice of Methods, from Sampling and Recovery to Post-excavation'. (second edition). https://historicengland.org.uk/images-books/publications/environmental-archaeology-2nd/[Accessed: March 2023].

Historic England (2017), 'Historic Seascape Characterisation Thesaurus'. https://archaeologydataservice.ac.uk/archiveDS/archiveDownload?t=arch-2958-1/dissemination/pdf/HSC_Thesaurus_July17.pdf[Accessed: March 2023].

Historic England (2020), 'Deposit Modelling and Archaeology. Guidance for Mapping Buried Deposits'. https://historicengland.org.uk/images-books/publications/deposit-modelling-and-archaeology/heag272-deposit-modelling-and-archaeology/[Accessed: February 2023].

Historic England (2021), 'Commercial Renewable Energy Development and the Historic Environment Advice Note 15. https://historicengland.org.uk/images-books/publications/commercial-renewable-energy-development-historic-environment-advice-note-15/heag302-commercial-renewable-energy-development-historic-environment/[Accessed: March 2023].

Historic England (2023), 'Intertidal and coastal Peat Database,' https://historicengland.org.uk/research/current/heritage-science/intertidal-peat-database/[Accessed: 2023].

Historic England (2018), 'The Role of the Human Osteologist in an Archaeological Fieldwork Project' https://historicengland.org.uk/images-books/publications/role-of-human-osteologist-in-archaeological-fieldwork-project/heag263-human-osteologist-archaeological-fieldwork-project/[Accessed: March 2023].

Humber Field Archaeology (2009), 'Rapid Coastal Zone Assessment: Yorkshire and Lincolnshire'. https://archaeologydataservice.ac.uk/archives/view/yorksrcza_eh_2009/#:~:text=The%20Yorkshire

%20and%20Lincolnshire%20Rapid%20Coastal%20Zone%20Assessment,by%20rising%20sea%20level%20and%20consequential%20coastal%20erosion[Accessed: March 2023].

HM Government (2014), 'East Inshore and East Offshore Marine Plans'. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/312496/east-plan.pdf[Accessed: March 2023].

Jacobi, R. (2004), 'The Late Upper Palaeolithic Lithic Collection from Gough's Cave, Cheddar, Somerset and Human Use of the cave'. Proceedings of the Prehistoric Society, 70: 1-92.

Joint Nautical Archaeology Policy Committee (JNAPC) (2006), 'Joint Nautical Archaeology Policy Committee Code for Practice for Seabed Development'. http://www.jnapc.org.uk/jnapc_brochure_may_2006.pdf[Accessed: February 2023].

Kristensen, P., Knudsen, K.L., Sejrup, H.P. (1998), 'A Middle Pleistocene glacial–interglacial succession in the Inner Silver Pit, southern North Sea foraminiferal stratigraphy and amino acid geochronology'. Quaternary Science Reviews, 17/19-10: 901-911.

Knudsen, K & Lykke-Andersen, A.L. (1982), 'Foraminifera in Late Saalian, Eemian, Early and Middle Weichselian of the Skærumhede I boring'. Bulletin Geological Society Denmark. 30. 10.37570/bgsd-1981-30-10.

Larn, R. and Larn, B. (1997), 'Shipwreck index of the British Isles Volume 3 – The East Coast', (London: Lloyds Register of Shipping).

Limpenny, S.E., Barrio Froján, C., Cotterill, C., Foster-Smith, R.L., Pearce, B., Tizzard, L., Limpenny, D.L., Long, D., Walmsley, S., Kirby, S., Baker, K., Meadows, W.J., Rees, J., Hill, J., Wilson, C., Leivers, M., Churchley, S., Russell, J., Birchenough, A.C., Green, S.L., and Law, R.J. (2011), 'The East Coast Regional Environmental Characterisation', in Cefas Open report 08/04. 287pp (Marine Aggregate Levy Sustainability Fund (MALSF)).

Land Use Consultants (LUC) (2018), 'National Historic Seascape Characterisation Consolidation'. https://archaeologydataservice.ac.uk/archives/view/seascape_he_2018/[Accessed: March 2023].

McGrail, S. (2004), 'Boats of the world: from the Stone Age to medieval times' Oxford: Oxford University Press.

Museum of London Archaeology Service (2009), 'England's Historic Seascapes: Withernsea to Skegness Pilot Study, https://doi.org/10.5284/1000104 [Accessed: March 2023].

Merchant Shipping Act (1995) (part 9, c.2) https://www.legislation.gov.uk/ukpga/1995/21/part/IX/chapter/II[Accessed: December 2022].

Merrifield, R. (1983), 'London, city of the Romans' London: Batsford.

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.

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

Praeg, D. (2003), 'Seismic imaging of mid-Pleistocene tunnel-valleys in the North Sea Basin - high resolution from low frequencies'. Journal of Applied Geophysics, 53: 273-298.

Protection of Wrecks Act (1973) (c.33), https://www.legislation.gov.uk/ukpga/1973/33[Accessed: December 2022].

Protection of Military Remains Act (1986), https://www.legislation.gov.uk/ukpga/1986/35/contents [Accessed: March 2023].

Scottish Natural Heritage (2017), 'Visual Representation of Wind farms: Guidance'. Version 2.2 https://www.nature.scot/visual-representation-wind-farms-guidance[Accessed: March 2023].

SeaZone Solutions Limited (2011), 'England's Historic Seascapes: Demonstrating the Method'. https://doi.org/10.5284/1000144[Accessed: February 2023].

SeaZone Solutions Limited (2011), 'Historic Seascape Characterisation (HSC): Demonstrating the Method'. https://doi.org/10.5284/1000144 [Accessed March 2023].

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

The Crown Estate (2014), 'Protocol for Archaeoloigcal Discoveries: Offshore Renewables Project'. https://www.wessexarch.co.uk/sites/default/files/field_file/2_Protocol%20For%20Archaeological%20Discoveries.pdf[Accessed: February 2023].

The Crown Estate (2016), 'Marine Antiquities Scheme Database' https://marinefinds.org.uk/database [Accessed: March 2023].

The Crown Estate (2021), 'Archaeological Written Schemes of Investigation for Offshore Wind Farm projects'. https://www.thecrownestate.co.uk/media/3917/guide-to-archaeological-requirements-for-offshore-wind.pdf[Accessed: February 2023].

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, 29/7, https://doi.org/10.1002/jqs.2743[Accessed: March 2023].

University of Birmingham (2011) North Sea Palaeolandscape Project [dataset]. https://doi.org/10.5284/1000397. [Accessed: March 2023].

Van de Noort, R. (2006), 'Argonauts of the North Sea – a Social Maritime Archaeology for the 2nd Millennium BC'. Proceedings of the Prehistoric Society 72: 267–87.

Walsh, M. with Brockman, A., Eddy, M., Grainge, G., Ellis Jones, J., Locker, A., Moore, A., Murphy, P., Satchell, J., Tomalin D. and Wilson P. (2022), 'Roman. A Maritime Archaeological Research Agenda for England'. https://researchframeworks.org/maritime/[Acessed: March 2023].

Wessex Archaeology (2008), 'Aircraft Crash Sites At Sea: A Scoping Study: Archaeological Desk-Based Assessment: Final Report'. https://blogs.wessexarch.co.uk/aircraftcrashsitesatsea/files/2008/03/aircraft_crash-sites_at_sea_report.pdf[Accessed: March 2023].

Williams, N. (1988), 'Maritime Trade of the East Anglian Ports 1550–1590'. International Journal of Maritime History, 2/2.

Wingfield, R T R. (1990), 'The origin of major incisions within the Pleistocene deposits of the North Sea'. Marine Geology, 91: 31–52.

Annex A: Gazetteer of High and Medium Geophysical Anomalies within the Array Area

MA ID	Name	Wreck ID	Geophysical ID (SSS, MBES, MAG)	Magnetic amplitude (nT)	Archaeological Potential	Classification	Interpretation	AEZ (m)	X	Y
MA0001			SSS: MA2007, MBES: MA4002; raised linear feature measuring 14x1.5m., MAG: MA5001	1340.36nT (5.9m to NE)	High	Potential Wreck	100	array area	53.51745	1.094819
MA0002	Uncharted		SSS: MA2014, MBES: MA4004; ovate raised feature measuring 13x4m., MAG: MA5006	695.56nT (14.45m to NW)	High	Wreck	100	array area	53.60553	1.113291
MA0003	Unknown	UKHO 9440	SSS: MA2101, MBES: MA4030; outline of ovate raised feature measuring 35.5x5.5m with greater height seen at apparent stern of wreck, small raised features 18m NW and 10m SE., MAG: MA5035	136.8nT (29.78m to the W)	High	Wreck	100	array area	53.62335	1.308138
MA0004			SSS: MA2102, MBES: MA4031; raised feature	68.86nt (19.78m to NE)	High	Wreck Debris	100	array area	53.62354	1.308485

MA ID	Name	Wreck ID	Geophysical ID (SSS, MBES, MAG)	Magnetic amplitude (nT)	Archaeological Potential	Classification	Interpretation	AEZ (m)	X	Y
			measuring 2.5x5m., MAG: MA5228							
MA0005	Basto	UKHO 9417	SSS: MA2220, MBES: MA4072; long ovate raised feature measuring 55x8m with small raised features in surround area., MAG: MA5000	4522.38nT (100m to W, however data gap for mag data in area covering wreck).	High	Wreck	100	array area	53.60765	1.492183
MA0014	Obstruction	UKHO 9441	MA4035; raised feature measuring 3x2.5m with scour to NW.		High	Debris	100	array area	53.63957	1.357318
MA0017	Obstruction	UKHO 9424	MA4077; small feature with scour around.		High	Obstruction	100	array area	53.56143	1.2387
MA0018	Unknown	UKHO 9426	MA4078; ovate raised feature measing 8.5x0.85m to the N.		High	Unknown	100	array area	53.52395	1.337033
MA0020	Obstruction	UKHO 9429	MA4079; debris field, potential rock dump.		High	Obstruction	100	array area	53.53867	1.286483
MA0022	Obstruction	UKHO 9443	MA4080; raised feature measuring 3.6x4.5m surrounded by		High	Obstruction	100	array area	53.63933	1.465033

MA ID	Name	Wreck ID	Geophysical ID (SSS, MBES, MAG)	Magnetic amplitude (nT)	Archaeological Potential	Classification	Interpretation	AEZ (m)	X	Y
			scour located 14m E.							
MA0023	Obstruction	UKHO 9445	MA4081; small feature measing 1.5x1.5m with scour located 14m NW.		High	Obstruction	100	array area	53.64308	1.480583
MA0024	Obstruction	UKHO 9482	MA5680	25.68nT (133.7m to E)	High	Obstruction	100	array area	53.56143	1.068167
MA0025	Obstruction	UKHO 9483	MA5016	209.2nT (116.01m to SE)	High	Obstruction	100	array area	53.56698	1.175917
MA0006			SSS: MA2027, MBES: MA4006; pair of raised features surrounded by scour., MAG: MA5574	32.85nT (163.34m to S)	Medium	Debris	50	array area	53.60118	1.147353
MA0007			SSS: MA2028, MBES: MA4007: raised feature measuring 6x2m., MAG: MA5946	14.4nT (5.17m to S)	Medium	Debris	50	array area	53.52715	1.15119
MA0008			SSS: MA2048, MBES: MA4075; small raised feature with scour		Medium	Debris	50	array area	53.63503	1.225046

MA ID	Name	Wreck ID	Geophysical ID (SSS, MBES, MAG)	Magnetic amplitude (nT)	Archaeological Potential	Classification	Interpretation	AEZ (m)	X	Y
			approximated 12.5 m to the south							
MA0009			SSS: MA2096, MBES: MA4027; raised feature measuring 3.5x1.5m		Medium	Wreck Debris	50	array area	53.49162	1.298695
MA0010			SSS: MA2099, MBES: MA4028; pair of raised features in area measuring 6x2m		Medium	Debris	50	array area	53.63401	1.305998
MA0011			SSS: MA2103, MBES: MA4032; pair of raised linear features measuring 4.5x1.5m arranged perpendicular to each other with slight scour		Medium	Debris	50	array area	53.55136	1.309382
MA0012			SSS: MA2200, MBES: MA4065; pair of small raised features in scour measuring 6.5x4m		Medium	Complex assemblage	50	array area	53.54914	1.456821
MA0013			SSS: MA2218, MBES: MA4071; raised feature measuring 7.5x8.5m		Medium	Wreck Debris	50	array area	53.60835	1.486866

MA ID	Name	Wreck ID	Geophysical ID (SSS, MBES, MAG)	Magnetic amplitude (nT)	Archaeological Potential	Classification	Interpretation	AEZ (m)	X	Y
MA0027			MA5003	847.01	Medium	Magnetic Anomalies	50	array area	53.63735	1.311372
MA0028			MA5005	724.87	Medium	Magnetic Anomalies	50	array area	53.60583	1.269513
MA0031			MA5011	286.63	Medium	Magnetic Anomalies	50	array area	53.63638	1.446528
MA0032			MBES: MA4082; small feature measuring1.5x0.5m with scour located 14m to SE., MAG: MA5012	268.14	Medium	Magnetic Anomalies	50	array area	53.54116	1.086529
MA0033			MAG: MA5013	249.8	Medium	Magnetic Anomalies	50	array area	53.55895	1.184996
MA0034			MAG: MA5014	229.55	Medium	Magnetic Anomalies	50	array area	53.55087	1.185457
MA0035			MAG: MA5015	222.3	Medium	Magnetic Anomalies	50	array area	53.53585	1.197987
MA0038			MBES: MA4084; located in an area with many raised features, potential rock dump., MAG: MA5020	199.07	Medium	Magnetic Anomalies	50	array area	53.53662	1.193094
MA0046			MAG: MA5028	159.94	Medium	Magnetic Anomalies	50	array area	53.50587	1.079313
MA0047			MBES: MA4083; small feature measuring 1.3x1.3m in scour	148.53	Medium	Magnetic Anomalies	50	array area	53.54529	1.184765

MA ID	Name	Wreck ID	Geophysical ID (SSS, MBES, MAG)	Magnetic amplitude (nT)	Archaeological Potential	Classification	Interpretation	AEZ (m)	X	Y
			located 14m S, MAG: MA5030							
MA0048			MAG: MA5032	144.12	Medium	Magnetic Anomalies	50	array area	53.56222	1.188253
MA0050			MAG: MA5034	139.97	Medium	Magnetic Anomalies	50	array area	53.55711	1.186112
MA0051			MAG: MA5036	135.24	Medium	Magnetic Anomalies	50	array area	53.57859	1.189602
MA0056			MBES: MA4085; small feature measuring 1x1m located 12m NW., MAG: MA5042	126.52	Medium	Magnetic Anomalies	50	array area	53.49973	1.223969
MA0057			MAG: MA5043	125.74	Medium	Magnetic Anomalies	50	array area	53.51011	1.078127
MA0058			MAG: MA5044	125.2	Medium	Magnetic Anomalies	50	array area	53.54001	1.192642
MA0063			MAG: MA5049	120.71	Medium	Magnetic Anomalies	50	array area	53.51838	1.089325
MA0067			MAG: MA5053	117.2	Medium	Magnetic Anomalies	50	array area	53.52017	1.067641
MA0069			MBES: MA4086; two small reflectors in scour one located 10 m to the NE and one located 26m to the SE. , MAG: MA5055	112.64	Medium	Magnetic Anomalies	50	array area	53.5094	1.263571
MA0071			MAG: MA5057	109.98	Medium	Magnetic Anomalies	50	array area	53.53512	1.269918

MA ID	Name	Wreck ID	Geophysical ID (SSS, MBES, MAG)	Magnetic amplitude (nT)	Archaeological Potential	Classification	Interpretation	AEZ (m)	X	Y
MA0074			MAG: MA5060	108.75	Medium	Magnetic Anomalies	50	array area	53.5674	1.157773
MA0082			MAG: MA5068	105.43	Medium	Magnetic Anomalies	50	array area	53.56979	1.186289
MA0083			MAG: MA5069	105.37	Medium	Magnetic Anomalies	50	array area	53.62014	1.145151
MA0084			MAG: MA5070	104.12	Medium	Magnetic Anomalies	50	array area	53.62884	1.24938
MA0085			MAG: MA5071	103.67	Medium	Magnetic Anomalies	50	array area	53.56999	1.169267

Annex B: Gazetteer of Recorded Sites, Wrecks and Obstructions within the Marine Archaeology Study Area

UKHO ID	NRHE ID	LHER ID	MA ID	Name	Period	Category	Status	Description	AEZs	Location within MSA	Lat	Lon
9341	0		MA0016	Dauntless (possibly)	Post-Medieval	Wreck	Live	Foundered in 1892. No magnetic signature, but two smaller pieces of debris.	50	array area	53.54367	1.34675
9417	0		MA0005	Basto	Post-WWII	Wreck	Live	Built in 1965 and took on severe list, was abandoned, and later sank while under tow.	100	array area	53.60782	1.492
9424	0		MA0017	Obstruction	Foul Ground	Obstruction	Live	Unclassified.	100	array area	53.56143	1.2387
9426	0		MA0018	Unknown	Unknown	Wreck	Live	Scattered wreckage in area of boulders.	100	array area	53.52395	1.337033
9427	0		MA0019	Obstruction	Foul Ground	Obstruction	Live	Unclassified.	50	array area	53.56617	1.426733

UKHO ID	NRHE ID	LHER ID	MA ID	Name	Period	Category	Status	Description	AEZs	Location within MSA	Lat	Lon
9429	0		MA0020	Obstruction	Foul Ground	Obstruction	Live	Several objects, probably boulders. Lies in rock strewn area.	100	array area	53.53867	1.286483
9440	0		MA0004	Unknown	Unknown	Wreck	Live	Wreck with slight port list and fairly intact; single boiler.	100	array area	53.62323	1.308283
9441	0		MA0014	Obstruction	Foul Ground	Obstruction	Live	Small square-like object.	100	array area	53.63962	1.357133
9442	0		MA0021	Obstruction	Foul Ground	Obstruction	Live	Small object.	50	array area	53.61323	1.49395
9443	0		MA0022	Obstruction	Foul Ground	Obstruction	Live	Small object.	100	array area	53.63933	1.465033
9445	0		MA0023	Obstruction	Foul Ground	Obstruction	Live	Small object.	100	array area	53.64308	1.480583
9482	0		MA0024	Obstruction	Foul Ground	Obstruction	Live	Unclassified.	100	array area	53.56143	1.068167
9483	0		MA0025	Obstruction	Foul Ground	Obstruction	Live	Unclassified.	100	array area	53.56698	1.175917
9536	0		MA0026	Foul Ground	Obstruction	Foul	Live	Unclassified.	50	array area	53.54393	1.2462
9339	0		MA0015	Excelsior	Post-Medieval	Wreck	Dead	Foundered after collision with Smack 'Scottish Chief'	50	array area	53.56698	1.243983

UKHO ID	NRHE ID	LHER ID	MA ID	Name	Period	Category	Status	Description	AEZs	Location within MSA	Lat	Lon
								position for filing only.				
8630	913043			Konstantinos Hadjipateras	WWII	Wreck	Live	Built in 1913 and mined in 1939.	50	Offshore ECC	53.30983	0.6145
8999	913203			Unknown	Unknown	Wreck	Live	Unclassified.	50	Offshore ECC	53.26257	0.4502
8998	913207			Unknown	Unknown	Wreck	Live	Unclassified.	50	Offshore ECC	53.2859	0.437983
8633	0			Costanza	WWI	Wreck	Dead	Built in 1883 and torpedoed and sunk in 1917.	50	Offshore ECC	53.31923	0.6799
9093	0			Obstruction	Post-WWII	Obstruction	Dead	Two of four road tanker trailers lost overboard from Swedish Ro-Ro MV Nordic Pride en route to Immingham. Other two washed ashore on Norfolk Beach.	50	Offshore ECC	53.34202	0.964867

UKHO ID	NRHE ID	LHER ID	MA ID	Name	Period	Category	Status	Description	AEZs	Location within MSA	Lat	Lon
8635	0			Capitaine Edmond Laborie	Post-WWII	Wreck	Live	Built in 1923 and mined in 1949.	50	Offshore ECC	53.33208	0.62715
9162	0			Obstruction	Obstruction	Obstruction	Live	Possible well-head with scouring all around.	50	Offshore ECC	53.35623	0.993983
92149	0			Unknown	Unknown	Wreck	Unknown	Distributed remains of a possible buried wreck.	50	Offshore ECC	53.34312	1.119267
93354	0			Unknown	Unknown	Wreck	Unknown	Unclassified.	50	Offshore ECC	53.32302	0.5941
93355	0			Unknown	Unknown	Wreck	Unknown	Unclassified.	50	Offshore ECC	53.31483	0.602633
93877	0			Unknown	Unknown	Wreck	Unknown	Unclassified.	50	Offshore ECC	53.3211	0.688383
94444	0			Unknown	Unknown	Wreck	Unknown	Unclassified.	50	Offshore ECC	53.33923	0.521467
0	355931	MLI41602		Find Spot	Roman	Find	Unknown	A Romano-British potsherd was found near the high-water mark at Anderby.		Offshore ECC	53.2501	0.33222
0	0	MLI41607		Find Spot	Roman	Find	Unknown	A 3rd century Roman (43 AD to 409		Offshore ECC	53.25725	0.328561

UKHO ID	NRHE ID	LHER ID	MA ID	Name	Period	Category	Status	Description	AEZs	Location within MSA	Lat	Lon
								AD) potsherd found in clay at mid-tide level at Anderby.				
8617	913040			Arduity	WWII	Wreck	Live	Built in 1935 and mined in 1942.	50	Offshore ECC	53.26033	0.406883
8639	913045			Unknown	Unknown	Wreck	Live	Broken up wreck previously thought to be Fane.	50	1km Buffer	53.34228	0.607267
8626	913042			Argo	WWI	Wreck	Live	Built in 1883 and mined in 1917	50	1km Buffer	53.29835	0.607683
8641	913046			Deodata	WWII	Wreck	Live	Built in 1897 and foundered after stricking a mine laid by U-19 in 1939.	50	1km Buffer	53.34812	0.605767
8632	1459776			Fane	WWI	Wreck	Live	Built in 1901 and struck by a mine lad by UC-63 in 1917.	50	1km Buffer	53.30488	0.6316
9444	0			Obstruction	Foul Ground	Obstruction	Live	Most probably an	50	1km Buffer	53.61477	1.513817

UKHO ID	NRHE ID	LHER ID	MA ID	Name	Period	Category	Status	Description	AEZs	Location within MSA	Lat	Lon
								uncovered cable or pipe.				
93010	0			Unknown	Unknown	Wreck	Unknown	Possible remains of a buried wreck	50	1km Buffer	53.51473	1.015667
8636	0			Lindy Sue	Post-WWII	Wreck	Dead	Sunk in 1965.	50	1km Buffer	53.33367	0.648233
9163	0			Unknown	Unknown	Obstruction	Dead	Unclassified.	50	1km Buffer	53.36262	0.980817
9316	0			Obstruction	Obstruction	Obstruction	Dead	Unclassified.	50	1km Buffer	53.31868	1.051517
8614	0			Unknown	Unknown	Wreck	Live	Has caused fishing gear losses of several years.	50	1km Buffer	53.23978	0.3941
8629	0			Unknown	Unknown	Wreck	Live	Partially buried wreck in area of sandwaves.	50	1km Buffer	53.30965	0.68265
9171	0			Unknown	Unknown	Wreck	Live	Well broken up in two parts and lies in own scour.	50	1km Buffer	53.30107	0.6066
9314	0			Unknown	Unknown	Wreck	Live	Wreck is broken in three parts.	50	1km Buffer	53.32605	1.020017
9320	0			Chatwood (possibly)	WWII	Wreck	Live	Built in 1929 and mined in 1942.	50	1km Buffer	53.327	0.998783

UKHO ID	NRHE ID	LHER ID	MA ID	Name	Period	Category	Status	Description	AEZs	Location within MSA	Lat	Lon
9324	0			Unknown	Unknown	Wreck	Live	Well broken iron wreck originally thought to be La Combattante.	50	1km Buffer	53.34795	1.025917
9325	0			Foul Ground	Obstruction	Foul	Live	Rusted debris most probably abandoned during pipeline works and positively identified when brought up in a trawl.	50	1km Buffer	53.35118	1.085683
9502	0			Unknown	Unknown	Wreck	Live	Well defined intact wreck lying in area of sand and gravelly ripples.	50	1km Buffer	53.32077	1.087083
81902	0			Unknown	Unknown	Wreck	Unknown	Strong magnetic anomaly, partially buried,	50	1km Buffer	53.28005	0.555583

UKHO ID	NRHE ID	LHER ID	MA ID	Name	Period	Category	Status	Description	AEZs	Location within MSA	Lat	Lon
								believed to be a small craft.				
85316	0			Unknown	Unknown	Wreck	Unknown	Unclassified.	50	1km Buffer	53.26703	0.39315
92757	0			Unknown	Unknown	Wreck	Unknown	Remains of wreck, possibly upside down; two cylindrical structures.	50	1km Buffer	53.34892	1.089667
93359	0			Unknown	Unknown	Wreck	Unknown	Unclassified.	50	1km Buffer	53.31043	0.63635
93634	0			Unknown	Unknown	Wreck	Unknown	Unclassified.	50	1km Buffer	53.33078	0.489733
8646	0			Carrier	WWII	Wreck	Dead	Built in 1921 and mined in 1945.	50	1km Buffer	53.36522	0.9834
8638	0			Unknown	Unknown	Wreck	Live	Unclassified.	50	1km Buffer	53.34117	0.573233
93878	0			Unknown	Unknown	Wreck	Unknown	Unclassified.	50	1km Buffer	53.33835	0.6814
0	0	MLI41601		Find Spot	Medieval	Find	Unknown	The base of a green glazed Medieval (1066 AD to 1539 AD) pot was found at the high		1km Buffer	53.2619	0.325365

UKHO ID	NRHE ID	LHER ID	MA ID	Name	Period	Category	Status	Description	AEZs	Location within MSA	Lat	Lon
								water mark at Anderby.				

Annex C: Peat Records

Location	ID	Description	Depth of Deposit	Age	Database
Anderby Creek	365	Lower peat bed exposure. Tree stumps and trunks (dominated oak, but also alder, ash, willow/poplar present).	Unlisted	4,480-4,625 ± 55	Historic England Peat Database
Chapel Point	107	Two coastal peat beds: lower forest bed (with oak stools) on boulder clay and upper fen-wood peat. Separated by 1.83m thick clay layer.	From -2.44 to -2.13m OD	Unlisted	Historic England Peat Database
Chapel Point	108	Saltmarsh sequence of Swinnerton (1931) was dated – lower wood/peat to saltmarsh clay to Phragmites upper peat.	Unlisted	2,630 ±-1,390 BC	Historic England Peat Database
Chapel Point	109	Saltmarsh peat containing Salix and Taxus wood, on Phragmites clay, on basal peat. Upper peat contains remains of salt-making industry (start of Iron Age).	Unlisted	1,390 BC	Historic England Peat Database
Chapel Point	110	Neolithic implements, probably contemporaneous with Lower Peat.	Unlisted	2,000-1,400 BC	Historic England Peat Database
Chapel Six Marshes	116	Stratigraphy as at Wolla Bank i.e., Mid-Holocene and Iron Age peat layers.	Unlisted	Unlisted	Historic England Peat Database
Chapel St Leonard's	427	Unlisted	Unlisted	Unlisted	Historic England Peat Database
Lincolnshire coast	268	Peat and submerged forest. On till, and below soft grey clay. Indicates low sea level prior to around 4,000 years ago. Neolithic artefacts; Higher peat layer suggests later regression. Salt workings and associated Late Bronze Age and early Iron Age.	Near low tide mark; between tide marks	Unlisted	Historic England Peat Database
Wolla Bank	111	Lower pear bed exposure. Tree stumps and trunks (dominated by alder and ash, but also oak, willow/poplar, birch present).	Unlisted	4,865 ± 65-4,500 ±5 5	Historic England Peat Database
Wolla Bank	115	Mid-Holocene peat and forest bed (whole oak stumps) exposed on beach (c. 80cm thick). Also, an upper Iron Age peat layer (c. 30cm thick).	Visible at low tide. (Mid-Holocene peat/	5,290 ± 240 cal. years BP; 4,850 ± 110 cal. years BP; 5,350-5,450 ± 1610 cal. years BP; 2,470 ± 270; 2730 ± 240; 2,500-2,710 ± 330	Historic England Peat Database
Between Leman and Ower Bank	342	Peat lumps (moorlog) trawled up. Barbed bone weapon tip embedded in a lump of peat (early Boreal), 40km from coast in 19-20 fathoms.	Unlisted	Unlisted	Historic England Peat Database
Between Leman and Ower Bank	449	Peat bed. Mesolithic barbed point embedded in the peat.	Unlisted	8,422 ± 170	Historic England Peat Database
Between Leman and Ower Bank	464	Antler/bone	Unlisted	-21.0	Historic England Peat Database
Between Leman and Ower Bank	560	Moorlog. Maglemose-type harpoon dredged up by The Colinda, skipper PE Lockwood. Now at Norwich Castle Museum.	Unlisted	Unlisted	Historic England Peat Database

Location	ID	Description	Depth of Deposit	Age	Database
Brown Bank	100	35km-long, narrow ridge, 19m under water. Unsure if former beach barrier, spit or barrier island. Along the ridge, deep gullies cut into clay and peat layers. Unworked animal bones, oldest of which are Weichselian. Mesolithic worked bones and stone also found (dated typologically), mainly by fishermen. Also, evidence of dog gnawing.	Unlisted	Unlisted	Historic England Peat Database
Dogger Bank	78	Peat remains – birch, willow and hazel. Mineralised animal bones; antler/bone artefact	Unlisted	c. 6050 cal. BC	Historic England Peat Database
Dogger Bank	79	Tree stumps	40-50m	Unlisted	Historic England Peat Database
Dogger Bank	80	Thin silt peat layer (4cm thick), formed under saltmarsh conditions during relatively slow marine transgression.	-31.06m OD (top of peat layer)	-26.63	Historic England Peat Database
Dogger Bank	81	Moorlog peat deposit retrieved by fishermen.	Unlisted	Unlisted	Historic England Peat Database
Dogger Bank	82	Peat and moorlog deposits. Descriptions of numerous implements.	Unlisted	Unlisted	Historic England Peat Database
Dogger Bank	84	Peat deposits 9,500-9,00 year – Late Preboreal,	-46m	Unlisted	Historic England Peat Database
Dogger Bank	651	Peat.	39m	9,300 14C years BP	Historic England Peat Database
Flemish Bight	103	Basal peat in Elbow Formation. Contains coastal bivalve *Spisula subtruncata*. Holocene.	Unlisted	Unlisted	Historic England Peat Database
Frigg Island	102	Frigg Island, thought to be inundated about 12,000 years ago. Context indicates late glacial age. Small, retouched flake considered to be anthropogenic.	Unlisted	Unlisted	Historic England Peat Database
Indefatigable	104	Elbow Formation (early Holocene clay and peat) 5-20m thick mapped in SE half of BGS sheet. Holocene.	Unlisted	Unlisted	Historic England Peat Database
Leman Bank	90	Core 53/+01?1567	Unlisted	-28.88	Historic England Peat Database
Leman Bank	650	Peat.	Unlisted	8,400 years BP	Historic England Peat Database
Noah's woods	101	Reference to peat and wood findings indicating that the North Sea was once dry land.	Unlisted	Unlisted	Historic England Peat Database
North Sea	508	Moorlog deposits – pollen analysis done on samples.	32.92-53.04m	Unlisted	Historic England Peat Database
North Sea	519	Peat.	Unlisted	Unlisted	Historic England Peat Database

Location	ID	Description	Depth of Deposit	Age	Database
North Sea	575	Two peat layers within core.		9,210-8,720 ± 90 BP	Historic England Peat Database
North Sea	576	Dredged peat.	-21.5-35m NAP	10,900-8,500 cal. year BP	Historic England Peat Database
North Sea	577	Peat.	-51m below mean sea level.	11,667-10. =,214 cal. years BP	Historic England Peat Database
North Sea	578	Peat.	-39m below MSL.	9,300 ± 100.	Historic England Peat Database
North Sea	579	Peat.	-24.5 NAP	Unlisted	Historic England Peat Database
North Sea	580	Peat Early Preboreal,	-47m OD	Unlisted	Historic England Peat Database
North Sea	582	Unlisted	-38.19m below MSL	9,822-8,618	Historic England Peat Database
Off North Norfolk	343	11 cm of silt peat overlain by 5m clay, in Core 52/+01/2699.	-22.87m OD	7,975 ± 55 14C years BP – 7,580 ± 70 14C years BP	Historic England Peat Database
Off North Norfolk	419	LOIS cores – show basal peat overlain by up to 14m thick silts and clayey silts. Peat is often thin (a few cms) and contains *Pediastrum alga* (freshwater).	Unlisted	Unlisted	Historic England Peat Database
Sandettie-Fairy Bank	98	One core retrieved early Holocene deposit (with basal transgressive Pre-Boreal peat layer), on top of Weichselian fluvatile layer, on cold-water marine Eemian sediments.	Unlisted	Unlisted	Historic England Peat Database
Sandettie-Fairy Bank	99	Two peat blocks, thought to be from same horizon as layer (Record 98)	Unlisted	9,374 ± 90-9,949 ± 125 BP	Historic England Peat Database
Sheringham Shoal	478	Offshore windfarm site – vibrocores contain peat.	24.33-21.42m below sea level	Unlisted	Historic England Peat Database
Well Bank	91	Suite of cores containing organic deposits at similar depths.	-39-37m	11,325-8,995 ± 85 14C years BP	Historic England Peat Database

Location	ID	Description	Depth of Deposit	Age	Database
North Sea (1.03067, 53.29457)	65079542	Grey, brown mottled peaty silt with organic detritus including wood fragments and monocots. Troels Smith component, Ag2 Sh1 Dg1 DI+.	1.28–1.34m	Unlisted	British Geological Survey
North Sea (1.03753, 53.29578)	65085687	well humified silty peat. Very sharp boundary. Troels Smith component, SH3 Ag1.	0.30–0.36m	Unlisted	British Geological Survey
North Sea (1.50392, 53.32866)	65085696	Black, brown well humified silt peat with wood fragments. Troels Smith component, Sh2 Ag1 Dg1.	1.36-1.44m	Unlisted	British Geological Survey
North Sea (1.50371, 53.32875)	65091982	Silty peat. Troels Smith component, Sh2 Ag2.	1.85-2.00m	Unlisted	British Geological Survey
North Sea (1.02913, 53.29397)	65095122	Brown well humified silty peat with fine sands. Troels Smith component, Sh2 Ag1 Gmin1.	0.50-0.60m	Unlisted	British Geological Survey

Location	ID	Description	Depth of Deposit	Age	Database
North Sea (1.03768, 53.29682)	65082648	Dark grey, brown peaty silt with humified organics. Troels Smith component, Ag2 Sh2 Dg+.	2.34-2.44m	Unlisted	British Geological Survey