RWE Renewables UK Dogger Bank South (West) Limited

RWE Renewables UK Dogger Bank South (East) Limited

Dogger Bank South Offshore Wind Farms

Outline Written Scheme of Investigation (Offshore)

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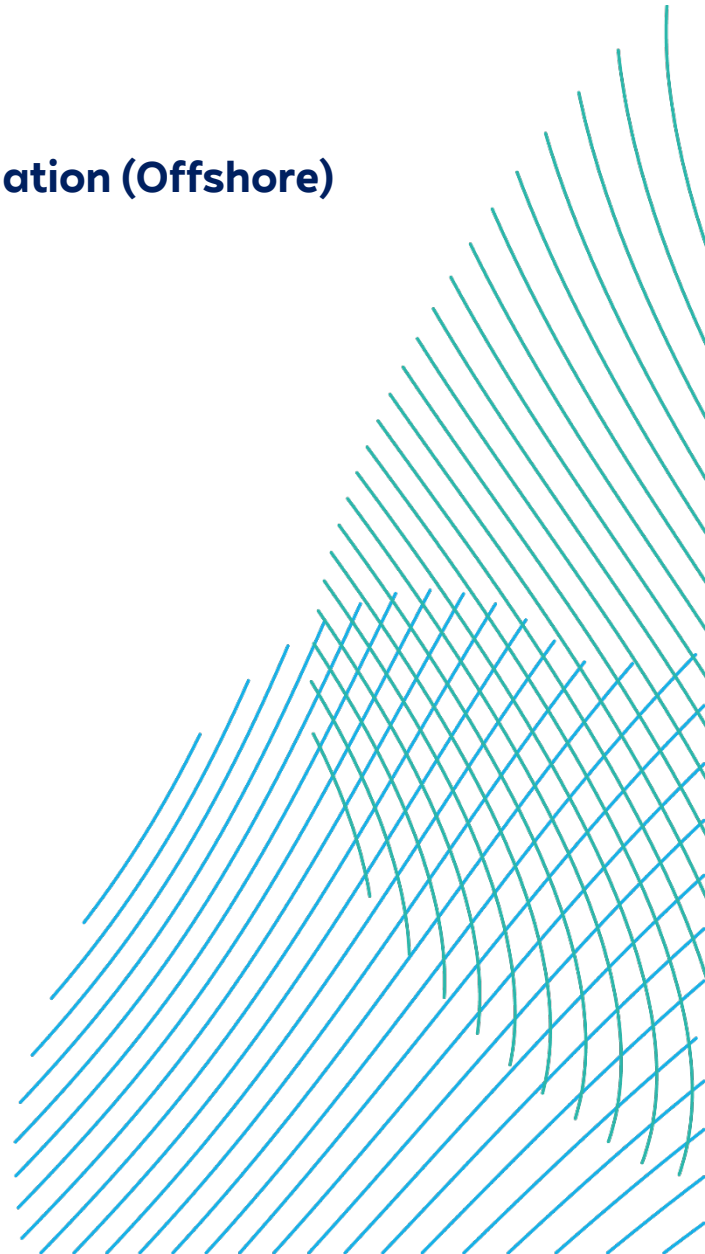

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Glossary

Term	Definition
Accommodation Platform	An offshore platform (situated within either the DBS East or DBS West Array Area) that would provide accommodation and mess facilities for staff when carrying out activities for the Projects.
Array Areas	The DBS East and DBS West offshore Array Areas, where the wind turbines, offshore platforms and array cables would be located. The Array Areas do not include the Offshore Export Cable Corridor or the Inter-Platform Cable Corridor within which no wind turbines are proposed. Each area is referred to separately as an Array Area.
Array Cables	Offshore cables which link the wind turbines to the Offshore Converter Platform(s).
Aviation Archaeology	The remains of crashed aircraft and archaeological material associated with historic aviation activities.
Collector Platforms (CPs)	Receive the AC power generated by the wind turbines through the array cables, collect it and transform the voltage for onward transmission to the Offshore Converter Platforms (OCPs).
Cumulative Effects	The combined effect of the Projects in combination with the effects of a number of different (defined cumulative) schemes, on the same single receptor / resource.
'Dead' Wreck	A wreck which has not been detected by repeated surveys, and is therefore considered not to exist
Dogger Bank South (DBS) offshore wind farms	The collective name for the two Projects, DBS East and DBS West.
Electrical Switching Platform (ESP)	The Electrical Switching Platform (ESP), if required would be located either within one of the Array Areas (alongside an

Term	Definition
	Offshore Converter Platform (OCP)) or the Export Cable Platform Search Area.
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 EIA Directive and EIA Regulations, including the publication of an Environmental Statement (ES).
Fishermen's Fastener	An unidentified feature on the seabed recorded by fishermen as an obstruction to trawling.
Geoarchaeology	The application of earth science principles and techniques to the understanding of the archaeological record. Includes the study of soils and sediments and of natural physical processes that affect archaeological sites such as geomorphology, the formation of sites through geological processes and the effects on buried sites and artefacts.
Glacial/Interglacial	A glacial period is a period of time within an ice age that is marked by colder temperatures and glacier advances. Interglacial correspond to periods of warmer climate between glacial periods. There are three main periods of glaciation within the last 1 million years, the Elsterian, the Saalian and the Weichselian which ended about 12,000 years ago. The Holocene period corresponds to the current interglacial.
Historic Seascape Character	The attributes that contribute to the formation of the historic character of the seascape
Horizontal Directional Drilling (HDD)	HDD is a trenchless technique to bring the offshore cables ashore at the landfall and can be used for crossing other obstacles such as roads, railways and watercourses onshore.
Inter-Platform Cables	Buried offshore cables which link offshore platforms.
Intertidal	Area on a shore that lies between Mean High Water Springs (MHWS) and Mean Low Water Springs (MLWS).

Term	Definition
Landfall	The point on the coastline at which the Offshore Export Cables are brought onshore, connecting to the onshore cables at the Transition Joint Bay (TJB) above mean high water.
Landfall Evaluation Area	The four fields adjacent to the cliff top within the Landfall Zone of the Onshore Development Area where trial trenching was undertaken by AOC Archaeology Group.
Mean High Water Springs (MHWS)	MHWS is the average of the heights of two successive high waters during a 24 hour period.
Mean Low Water Springs (MLWS)	MLWS is the average of the heights of two successive low waters during a 24 hour period.
Mesolithic	10000 to 4000 BC The Middle Stone Age, falling between the Palaeolithic and Neolithic and marking the beginning of a move from a hunter gatherer society towards a food producing society.
Offshore Converter Platforms (OCPs)	The OCPs are fixed structures located within the Array Areas that collect the AC power generated by the wind turbines and convert the power to DC, before transmission through the Offshore Export Cables to the Project's Onshore Grid Connection Points.
Offshore Development Area	The Offshore Development Area for ES encompasses both the DBS East and West Array Areas, the Inter-Platform Cable Corridor, the Offshore Export Cable Corridor, plus the associated Construction Buffer Zones.
Offshore Export Cable Corridor	This is the area which will contain the offshore export cables (and potentially the ESP) between the offshore substation/converter platforms and Transition Joint Bays at the landfall.
Onshore Development Area	The Onshore Development Area for ES is the boundary within which all onshore infrastructure required for the Projects would be located including Landfall Zone, Onshore Export

Term	Definition
	Cable Corridor, accesses, Temporary Construction Compounds and Onshore Converter Stations.
Palaeoenvironmental Analysis	The study of sediments and the organic remains of plants and animals to reconstruct the environment of a past geological age.
Palaeogeographic Features	Features seen within sub-bottom profiler data (buried) and multibeam bathymetry data (sea floor) interpreted as representing prehistoric physical landscape features such as former river channels (palaeochannels).
Palaeolithic	500000 to 10000 BC The Old Stone Age defined by the practice of hunting and gathering and the use of chipped flint tools. This period is usually divided into Lower, Middle and Upper Palaeolithic.
Seabed Features	Features seen on the seafloor in the sidescan sonar or multibeam bathymetry data which are interpreted to represent heritage assets, or potential heritage assets. Also includes magnetic anomalies which may represent shallow buried ferrous material of archaeological interest.
Seabed Prehistory	Archaeological remains on the seabed corresponding to the activities of prehistoric populations that may have inhabited what is now the seabed when sea levels were lower.
The Applicants	The Applicants for the Projects are RWE Renewables UK Dogger Bank South (East) Limited and RWE Renewables UK Dogger Bank South (West) Limited. The Applicants are themselves jointly owned by the RWE Group of companies (51% stake) and Masdar (49% stake).
The Projects	DBS East and DBS West (collectively referred to as the Dogger Bank South Offshore Wind Farms).

Acronyms

Term	Definition
AEZ	Archaeological Exclusion Zone
ALARP	As Low as Reasonably Practicable
BP	Before Present
CAD	Computer Aided Design
CIfA	Chartered Institute for Archaeologists
CP	Collector Platform
DBS	Dogger Bank South
DCO	Development Consent Order
DML	Deemed Marine Licence
EEZ	Exclusive Economic Zone
EIA	Environmental Impact Assessment
ES	Environmental Statement
ESP	Electrical Switching Platform
GIS	Geographic Information System
HAP	Humber Archaeology Partnership
HDD	Horizontal Directional Drilling
HER	Historic Environment Record
JNAPC	Joint Nautical Archaeology Policy Committee
m	Metre
Mag.	magnetometer

Term	Definition
MBES	Multibeam Echosounder
MHWS	Mean High Water Springs
MLWS	Mean Low Water Springs
MMO	Marine Management Organisation
NRHE	National Record of the Historic Environment
NSPRM	North Sea Prehistory Research Management
OASIS	Online Access to the Index of Archaeological Investigations
OCP	Offshore Convertor Platform
O&M	Operation and Maintenance
ORPAD	Offshore Renewables Protocol for Archaeological Discoveries
PAD	Protocol for Archaeological Discoveries
ROV	Remotely Operated Vehicle
SBP	Sub-Bottom Profiler
SSS	Side Scan Sonar
TEZ	Temporary Exclusion Zone
UHRS	Ultra High Resolution Seismic
UK	United Kingdom
UKHO	United Kingdom Hydrographic Office
UXO	Unexploded Ordnance
WSI	Written Scheme of Investigation

1 Introduction

1.1 Purpose of Document

1. This Outline Written Scheme of Investigation (WSI) (Offshore) has been produced to set out the proposed approach to archaeological investigation and mitigation to be undertaken in association with the offshore and intertidal project areas (below Mean High Water Springs (MHWS)) of the Dogger Bank South (DBS) Offshore Wind Farms.

2. DBS comprises two separate projects, DBS East and DBS West and, although the Applicants, RWE Renewables UK Dogger Bank South (East) Limited and RWE Renewables UK Dogger Bank South (West) Limited, are separate legal entities, both are owned by the RWE group of companies. The Projects form the basis of a single application for a Development Consent Order (DCO), allowing for consistency across the Projects on the approach to assessments, consultation and examination. Similarly, both projects are also addressed together by this Outline WSI (Offshore). It is noted, however, that five separate Deemed Marine Licences (DMLs) have been requested as schedules to the DCO for different elements of the Projects. This approach allows for ease of future changes in ownership and the retention of rights for particular assets should ownership change. The DMLs will include a condition requiring a detailed Offshore WSI to be approved prior to carrying out works.

3. The offshore infrastructure for the Projects includes wind turbines, offshore Collector Platforms (CPs), Offshore Convertor Platforms (OCPs), an accommodation platform, and an Electrical Switching Platform (ESP), array cables, Inter-Platform Cables and Offshore Export Cables from the wind farm sites to the landfall.

4. At the landfall, a trenchless solution (likely to be Horizontal Directional Drilling (HDD)) would be used to install the export cables under the cliffs from transition joint bays located landward of landfall, to an exit location which could either be located intertidally or below Mean Low Water Springs (MLWS). A short trenchless landfall option, exiting within the intertidal zone and the excavation of cable trenches through the beach is also under consideration.

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

- sets out the roles and respective responsibilities of the project team, contractors, and retained archaeologist and archaeological contractor(s) and formal lines of communication between the parties and with the archaeological curators and regulators (section 4);
- outlines the known and potential archaeological receptors that could be impacted by the scheme (section 1 and section 3);
- outlines the agreed mitigation and archaeological actions that are to take place in various circumstances (section 5 and section 6);
- sets out the importance of research frameworks in setting objectives that are delivered through realisation of the work (section 1.3 and section 9); and
- provides summarised details of methodologies for these archaeological actions, which will be clarified in more detail in subsequent activity-specific method statements (section 5 and section 6).

6. Onshore archaeology and cultural heritage receptors are not considered in this document. A separate **Volume 8, Outline Onshore WSI (application ref: 8.14)** for onshore archaeology above MHWS has also been prepared and submitted alongside the DCO application.

1.2 Study area

7. The DBS East and DBS West Array Areas are located more than 100km offshore on the Dogger Bank in the southern North Sea and each covers approximately 350km². The Offshore Export Cables make landfall near Skipsea, on the North Sea coast of the East Riding of Yorkshire.

8. The offshore archaeology and cultural heritage study area (referred to as the Offshore Archaeology Study Area) is defined as the Offshore Development Area, including the intertidal zone at the landfall up to MHWS (**Volume 7, Figure 5-1 (application ref: 7.5.1)**). The Offshore Archaeology Study Area corresponds to the footprint within which development activities could occur and, consequently, the area of potential impacts to the offshore archaeology and cultural heritage existing environment.

9. At the landfall, reference has also been made to areas of the Onshore Development Area (and study areas as defined in the Environmental Statement (ES) **Volume 7, Chapter 22 Onshore Archaeology and Cultural Heritage (application ref: 7.22)**) which are located below MHWS and overlap with the Offshore Archaeology Study Area. The onshore archaeology study areas comprise:

- Non-Designated Heritage Assets Study Area - known non-designated heritage assets, potential buried archaeological remains and previously unrecorded above ground heritage assets within 500m of the Onshore Development Area (**Volume 7, Figure 22-1 (application ref: 7.22.1)**); and
- Designated Heritage Assets Study Area - designated heritage assets within 1km of the Onshore Development Area and 5km of the onshore Substation Zones, to inform a setting assessment of heritage assets identified as potentially being affected by the development through a change in their setting (**Volume 7, Figure 22-1 (application ref: 7.22.1)**).

10. As there are no designated heritage assets within the Offshore Archaeology Study Area, reference is made only to the Non-Designated Heritage Assets Study Area as relevant to intertidal archaeology.

1.3 Approach

11. A commitment to investigation and mitigation is set out in **Volume 7, Chapter 17 Offshore Archaeology and Cultural Heritage** (**application ref: 7.17)** comprising:

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

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

- Pre-consent: desk-based, marine geophysical and geoarchaeological assessments undertaken to date (section 2.1) including preliminary identification of AEZs (section 6.1);
- Post-application/pre-commencement: acquisition of further geotechnical data and progression of geoarchaeological assessment (section 5.2);
- Pre-construction:
    - archaeological assessment of high resolution marine geophysical data (including Unexploded Ordnance (UXO) specification magnetometer data) acquired from refined layouts (section 5.1);
    - acquisition of further geotechnical data (if required) and progression/completion of geoarchaeological / palaeolandscape assessment (section 5.2);
    - archaeological investigation of selected anomalies as part of planned UXO investigation and clearance (section 5.3);
    - updates / amendments to AEZs (section 6.1)
    - micrositing of the design to avoid AEZs and any other anomalies of possible archaeological interest (where possible) or further mitigation where avoidance is not possible (section 6.2);
    - operation of PAD during seabed preparation (e.g. boulder clearance, sandwave levelling, pre-lay grapnel run) (section 6.3); and
    - watching briefs (if required) during seabed preparation in high potential areas (section 5.5).
- Construction:
    - watching briefs (if required) during construction activities in high potential areas (section 5.5); and
    - operation of PAD during construction phase (section 6.3).
- Post-construction:
    - archaeological assessment of post-construction geophysical data to monitor construction and post-construction effects on offshore archaeology and cultural heritage (section 7).
- All stages:
    - Consideration of opportunities for data sharing and to the creation of joined-up objectives for post-consent investigation and mitigation, including links with academic and industry wide research initiatives (section 6.4).

13. Archaeological requirements for the operations and maintenance (O&M) and decommissioning phases of the Projects would be determined based on the outcomes of this phased approach (section 8).

14. As an 'Outline' WSI, this document has been developed as part of the Environmental Impact Assessment (EIA) process to set out the framework for the assumed mitigation that is submitted with the DCO application.

15. Prior to further surveys taking place for DBS East or DBS West, which may take place pre-determination, a pre-commencement survey WSI (or WSIs) (in accordance with this Outline WSI) would be required to ensure archaeological objectives are taken into account. Post-consent, a final, agreed WSI (or WSIs) (in accordance with this Outline WSI (Offshore)) would set out the overarching approach to pre-construction survey and archaeological investigations agreed with the MMO. All revisions of the WSI would be prepared in consultation with the 'archaeological curators' and agreed with the 'regulators' prior to works commencing.

16. The regulatory body responsible for enforcing conditions specified in the final DMLs is the Marine Management Organisation (MMO). The regulatory body responsible for enforcing the implementation of requirements within the DCO is the relevant Planning Authority in which the works are situated (East Riding of Yorkshire Council). The MMO and the East Riding of Yorkshire Council are collectively referred to as the 'regulators' for the purposes of this WSI.

17. The archaeological curator for heritage matters offshore (below MHWS) is Historic England. The archaeological curators responsible for heritage matters onshore (above MLWS) and including the intertidal zone) are Humber Archaeology Partnership (HAP) as the advisors to East Riding of Yorkshire Council. Historic England and HAP are collectively referred to as the 'archaeological curators' for the purposes of this WSI.

18. The document 'Archaeological Written Schemes of Investigation for Offshore Wind Farm Projects' (The Crown Estate, 2021) sets out high level guidance on a range of archaeological methodologies that may be required in the production of WSIs and method statements. The approach to further site investigations ((section 5) and the delivery of mitigation (section 6) takes account of these standard, high level methodologies and each section sets out how they are relevant to the delivery of DBS East and DBS West and explains any necessary adaptations and amendments for agreement with the archaeological curators.

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

20. Survey and work package specific archaeological objectives will be established on a case-by-case basis with reference to all relevant project datasets (and associated archaeological and geoarchaeological interpretations) and to other relevant research (see section 10) and investigations with specific reference to established research agendas, including (but not limited to):

- The North Sea Prehistory Research Management (NSPRM) Framework (2023) (https://researchframeworks.org/nsprmf/ [Accessed 26/10/2023]);
- Identifying and Protecting Palaeolithic Remains (English Heritage, 1998);
- People and the Sea: A Maritime Research Agenda for England (Ransley *et al.*, 2013).

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

22. In demonstrating adherence to industry good practice, this Outline WSI (Offshore) also draws upon available archaeological guidance for offshore development including:

- Archaeological Written Schemes of Investigation for Offshore Wind Farm Projects (The Crown Estate, 2021);
- Protocol for Archaeological Discoveries: Offshore Renewables Projects (The Crown Estate, 2014);
- Chartered Institute for Archaeologists (CifA) Code of Practice and Standards and Guidance (CifA 2020a, 2020b, 2020c, 2022);
- Offshore Geotechnical Investigations and Historic Environment Analysis: Guidance for the Renewable Energy Sector (Gribble and Leather, 2011);
- Historic Environment Guidance for the Offshore Renewable Energy Sector Guidance (Wessex Archaeology, 2007); and
- Code of Practice for Seabed Development (Joint Nautical Archaeology Policy Committee (JNAPC), 2006).

2 Existing Environment Summary

2.1 Summary of Assessment to Date

2.1.1 Marine Geophysical Survey and Assessment

23. In order to provide site specific and up to date information on which to base the impact assessment, marine geophysical data were acquired from the Offshore Development Area by Fugro in 2022. Data comprised sidescan sonar (SSS), magnetometer (Mag.), multibeam echosounder (MBES), multibeam backscatter (MBBS), sparker-sourced 2D ultra high resolution seismic (UHRS) and parametric sub-bottom profiler (SBP) datasets.

24. Full details on the survey specifications, including an assessment of the suitability of the data for archaeological assessment, are included in **Volume 7, Appendix 17-2 Archaeological assessment of seabed features (application ref: 7.17.17.2)** and **Volume 7, Appendix 17-3 Palaeolandscapes assessment (application ref: 7.17.17.3)** of **Volume 7, Chapter 17 Offshore Archaeology and Cultural Heritage (application ref: 7.17)**. All data were considered suitable for archaeological interpretation.

25. In summary, data for the array area were acquired by Fugro using the vessels *Fugro Searcher*, *Fugro Frontier* and the *Mainport Geo*. The *Mainport Geo* acquired a broad grid of data with 1km line spacing between 21st April and 15th May 2022. The *Fugro Searcher* and *Fugro Frontier* acquired data at a line spacing of 100m between 7th August and 10th September 2022, and 22nd May and 23rd October 2022, respectively.

26. Data from the offshore export cable corridor (excluding the 500m temporary construction buffer) were acquired onboard the vessel *Fugro Discovery* between 15th June and 21st July 2022 at a line spacing of approximately 100m, with some areas reduced to a line spacing of 65m due to a change in water depth to ensure complete coverage. Data from the nearshore section of the offshore export cable corridor were acquired by Fugro on board survey vessel Valkyrie between 22nd June and 31st July 2022 at a line spacing of between 15 - 35m depending on water depth.

27. Over some sections of the nearshore section (Block A) and a large section of the adjacent Block B, the vessels were inhibited by the presence of fishing gear from obtaining data from towed sensors (SSS and Mag.). Where there was no data from towed sensors, MBBS was additionally assessed in order to obtain the maximum amount of information over the areas possible.

28. Due to the large size of the Offshore Development Area and the high volume of geophysical data acquired, a proportionate approach to the archaeological assessment of seabed features has been applied. This proportionate approach allowed for the assessment of all data acquired from the Offshore Archaeology Study Area, but not all data was assessed in its 'raw' format. The approach was discussed, and agreed, in consultation with Historic England during Expert Topic Group (ETG) meetings carried out as part of the Evidence Plan Process (EPP) as set out in **Volume 7, Appendix 17-1 Consultation Responses (application ref: 7.17.17.1)**.

29. In summary the approach applied comprised the analysis of:

- MBES data, provided gridded at 1.0m and analysed using QPS Fledermaus software, which enables a 3-D visualisation of the acquired data and geo-picking of seabed anomalies;
- High frequency SSS mosaics, provided as .tifw files and assessed using ArcMap with low frequency SSS mosaics used to infill gaps in the high frequency and reviewed alongside the geophysical contractor's target listings; and
- Mag. data processed using in-house proprietary software and gridded to produce a map of magnetic anomalies.

30. The following thresholds were also applied:

- Anomalies picked from the SSS mosaic and MBES over 5m in any one direction were included in the gazetteer; and
- Magnetic anomalies below 20nT have been excluded based on ground-truthing information from similar large scale sites which shows that smaller anomalies are less likely to represent features of archaeological interest.

31. A sub-set of anomalies tagged by Wessex Archaeology in the SSS mosaics and Mag. data were then further investigated in the individual line SSS data files (.xtfs). These included anything thought to be:

- Wreck;
- Debris fields;
- Anything deemed unusual and warranting further investigation due to its archaeological potential during interpretation;
- Mag. anomalies over 1000nT (that are not known to be modern).

32. Anomalies assessed in the raw SSS data were not subject to a size threshold, as this process was designed to ensure the full extents of significant anthropogenic seabed features, including adjacent related small anomalies (e.g. a wreck ad associated small items of debris), were recorded to ensure AEZs are as comprehensive as possible.

33. In the sections of the offshore export cable corridor where SSS and Mag. could not be acquired due to the presence of fishing gear, MBES data was assessed alongside the MBBS, both gridded at 0.5m (rather than 1m). Geotiffs were created from the MBBS and reviewed using ArcMap to identify individual features of possible archaeological potential.

34. The nearshore offshore export cable corridor (Block A) was undertaken as a full assessment of raw SSS data, MBES, MBBS and Mag. datasets. However, where sections were not covered by towed sensors (due to the presence of fishing gear), higher resolution MBES data and MBBS data (gridded at 0.25m) was provided and assessed. The minimum thresholds for anomaly sizes applied to interpretation of the offshore datasets was not applied to the nearshore area.

35. Once all the datasets had been individually interpreted the anomalies were grouped together, allowing one ID number to be assigned to a single object for which there may be, for example, a United Kingdom Hydrographic Office (UKHO) record, a MBES anomaly, and multiple SSS anomalies. Following grouping, Wessex Archaeology apply a discrimination flag to each feature in order to discriminate against those which are not thought to be of an archaeological concern. The criteria for each discrimination flag are set out in **Table 2-1** below. The results are presented in full in **Volume 7, Appendix 17-2 (application ref: 7.17.17.2)** and are summarised in section 2.3.

Table 2-1 Wessex Archaeology criteria discriminating relevance of identified features to proposed scheme

Overview classification	Discrimination	Criteria	Data type
Archaeological (palaeogeographic features)	P1	Feature of probable archaeological interest, either because of its palaeogeography or likelihood for producing palaeoenvironmental material	UHRS, SBP, MBES
	P2	Feature of possible archaeological interest	

Overview classification	Discrimination	Criteria	Data type
Archaeological (seabed features)	A1	Anthropogenic origin of archaeological interest	MBES, SSS, Mag
	A2_h	Anomaly of likely anthropogenic origin but of unknown date; may be of archaeological interest or a modern feature	
	A2_l	Anomaly of possible anthropogenic origin but interpretation is uncertain; may be anthropogenic or a natural feature	
	A3	Historic record of possible archaeological interest with no corresponding geophysical anomaly	
Non-archaeological	U1	Not of anthropogenic origin	MBES, SSS, Mag
	U2	Known non-archaeological feature / Feature of non-archaeological interest	MBES, SSS, Mag, SBP
	U3	Recorded loss	MBES, SSS, Mag
Non-impact	O1	Outside horizontal footprint of study area	MBES, SSS, Mag, SBP
	O2	Outside vertical footprint of proposed impact	SBP
	O3	Area subsequently cleared after data acquired, anomaly/object recovered	MBES, SSS, Mag, SBP

36. In addition, the interpretation of UHRS, SBP and MBES has been undertaken to inform the palaeolandscape assessment. In the array areas, a 3km x 3km grid of UHRS data was assessed using Kingdom software (2022). Features were interpreted to approximately 70m below seabed to account for potential monopile depths.

37. In the Offshore Export Cable Corridor SBP data were processed using CodaOctopus Survey Engine Seismic+ software. An initial centre line of data was assessed, with additional infill lines assessed across the width of the corridor (including both main lines and cross lines) where features of archaeological potential were identified. The data interpretation was particularly focussed on the upper 5m of sediment along the Offshore Export Cable Corridor, selected as a standard maximum depth of sediment disturbance during cable laying. In addition to the SBP data, the MBES data were visually assessed in ArcGIS and QPS Fledermaus for any exposed and / or underfilled palaeolandscape features in the nearshore area where some features of palaeogeographic interest were visible at seabed.

38. After initial observation and geophysical interpretation of the UHRS and SBP data, palaeolandscape features were interpreted in a geological and stratigraphic context in order to be assigned an archaeological discrimination in line with the definitions in **Table 2-1**.

39. The results of the assessment are presented in full in **Volume 7, Appendix 17-3 (application ref: 7.17.17.3)** and summarised in section 2.2.

2.1.2 Marine Geotechnical Survey and Assessment

40. A total of 122 vibrocores were acquired by Fugro within the Offshore Export Cable Corridor, five boreholes within the nearshore part of the Offshore Export Cable Corridor and five boreholes within the Array Areas during geotechnical surveys undertaken between 2022 and 2023. One vibrocore was acquired for dedicated geoarchaeological purposes following an archaeological review of the draft DBS Seafloor and Shallow Geological Results Report (Fugro, 2023).

41. Geoarchaeological review of vibrocores and boreholes was undertaken in two stages. The first stage included a review of preliminary vibrocore logs that were drafted on the vessel and sent to the geoarchaeologist (direct from the vessel). These preliminary logs were used to flag vibrocores with the potential to contain deposits of archaeological interest, prior to scheduling engineering testing.

42. A second stage of geoarchaeological review was undertaken using the detailed geotechnical core logs and photographs after cores / samples were split in the laboratory.

43. The results of this review are presented in **Volume 7, Appendix 17-4 (application ref: 7.17.17.4)** and summarised in section 2.2.

2.2 Seabed Prehistory

44. The potential for prehistoric sites to be present within the Offshore Archaeology Study Area, either exposed on or buried below the seabed, is primarily associated with surviving terrestrial features and deposits corresponding to times when sea levels were lower and prehistoric hominin populations may have inhabited what is now the seabed.

45. Archaeological material may also be present within secondary contexts, as isolated finds within deposits that may have been reworked by marine or glacial processes. While these deposits formed during periods when the North Sea was inhabitable, they have some potential to contain reworked archaeological material.

46. There are no known in situ prehistory sites within the Offshore Archaeology Study Area. However, late Mid- and Late-Pleistocene fauna have been recovered from the wider region by trawlers and a mammoth tusk reported from Marine Aggregate Licence Area 408 (located 50km south-west of DBS) has produced a date of approximately 44,000 years Before Present (BP) (Allen *et al.*, 2008). This indicates there is some potential for prehistoric faunal remains to be present in the Offshore Archaeology Study Area.

47. The shallow geology and interpreted archaeological potential of deposits within the Offshore Development Area is summarised in **Table 2-2**.

Table 2-2 Shallow Geology of the Offshore Archaeology Study Area

Unit Name	Lithology	Epoch	BGS Formation	Archaeological potential
Gravel Lag	Sandy gravel with shell	Early to mid-Holocene	Indefatigable Grounds	Considered of low potential in itself, but possibly contains re-worked artefacts and can cover wreck sites and other cultural heritage.
Shallow Marine Sand	Slightly gravelly sand with shell fragments	Middle to Late-Holocene	Nieuw Zeeland Gronden Terschellinger Bank or Well Hole	
Alluvium	Slightly gravelly sand with rare organic matter, organic	Early Holocene	Elbow	Potential to contain in situ and derived archaeological material, and

Unit Name	Lithology	Epoch	BGS Formation	Archaeological potential
	laminations and shell fragments			palaeoenvironmental material.
Alluvium and Peat	Low to medium strength clay with fibrous wood fragments and rare organic matter	Early Holocene	Elbow	
Proglacial	Not recorded	Late Weichselian	Botney Cut	Glaciomarine deposits considered to have low potential. Glaciolacustrine deposits have potential to contain in situ and derived archaeological material, and palaeoenvironmental material.
Diamict and Glacial Sand	Stiff high strength gravelly clay with occasional beds of clayey sand	Weichselian	Bolders Bank or Dogger Bank	Considered low but has potential to bury deposits of interest or to contain reworked material.
Pre-Glacial Sand	Fine sand with rare lamina of clay or organic matter, fragments of organic matter, wood and shell	Holstenian to Eemian	Egmond Ground, Cleaver Bank, Tea Kettle Hole or Eem	Potential to contain in situ and derived archaeological material, and palaeoenvironmental material.

48. Of the six units anticipated to be present within the Offshore Development Area, five were recorded in the boreholes from the Array Areas.

49. Deposits of archaeological interest include Alluvium and Peat which have potential to contain in situ and derived archaeological material, and palaeoenvironmental material. The geoarchaeological review of DBS boreholes (**Volume 7, Appendix 17-4 (application ref: 7.17.17.4)**) identified a sequence of silt and clay (alluvium) interbedded with a thin (0.28m) peat deposit at a depth of 18m below seafloor in borehole BBSW-005-BH-A. Core sample photographs suggest a large (up to 10cm) piece of wood is preserved within the peat and a sample has been retained for future palaeoenvironmental assessment. These deposits indicate there is high potential for remnants of prehistoric landscapes to be present in DBS, although these may be buried below significant thicknesses (>10m) of recent Shallow Marine Sand.

50. Proglacial deposits were not recorded, but this may reflect low data resolution and there is potential for these deposits to be present in the Offshore Development Area. The archaeological potential of Proglacial deposits depends on their depositional history and relative sea-level history. If laid down in warming periglacial landscape, these deposits have the potential to preserve palaeoenvironmental records and as such, understanding their formation history is of geoarchaeological interest.

51. Within the Offshore Export Cable Corridor, bedrock of chalk and mudstone was recovered at four of the vibrocore locations indicating a relatively thin cover of Quaternary deposits in places. The shallow Quaternary stratigraphy of the export cable corridor overall is dominated by seabed sediments and shallow marine sands overlying glacial clays interbedded with glacial sands.

52. In four vibrocores, low strength clay and sandy silts were recovered which are initially interpreted as alluvium and may have formed in and along the margins of river or tidal channels before the area was submerged. These deposits are of archaeological interest as they preserve inorganic palaeoenvironmental material. No peat or organic deposits were identified in the vibrocores.

53. Similarly, in the nearshore area of the Offshore Export Cable Corridor, a sequence of seabed sediments overlying glacial clay resting on chalk bedrock was encountered and no deposits of archaeological interest were recovered.

54. The archaeological assessment of URHS and SBP data undertaken by Wessex Archaeology (**Volume 7, Appendix 17-3 (application ref: 7.17.17.3)**) identified a total of 171 palaeolandscape features of archaeological interest, with 155 located within the Array Areas and 16 in the offshore export cable corridor. These features include geomorphological features such as channels, basins, mounds and sediment wedges. They also include seismic anomalies such as bright reflectors and acoustic blanking that may indicate the presence of organic material. A gazetteer of palaeolandscape features is included as Appendix I to **Volume 7, Appendix 17-3 (application ref: 7.17.17.3)** and the distribution of the features is shown on Figures 3 to 9 (Array Areas) and Figures 10.1 to 10.6 (Offshore Export Cable Corridor) in **Volume 7, Appendix 17-3 (application ref: 7.17.17.3)**.

55. The assessment revealed a multi-age sequence of channel features within the Array Areas that could represent periodic sub-aerial exposure of the Dogger Bank from the Eemian interglacial to the early Holocene. The palaeolandscape potential of the Offshore Export Cable Corridor is lower in comparison, but localised pockets of alluvium are preserved, potentially associated with palaeochannel features. The nearshore part of the Offshore Export Cable Corridor shows evidence of relict channels and other potentially terrestrial features that could correlate to the extensive wetland environments at Skipsea Withow Mere.

2.3 Maritime and Aviation Archaeology

56. There are no designated wrecks or other types of protected sites within the Offshore Archaeology Study Area. There is, however, one record from the UKHO which describes the recovery of material from a crashed Tornado (UKHO ID 6586). Should any material from a crashed military aircraft be encountered located within the Offshore Archaeology Study Area, these would automatically be protected under the Protection of Military Remains Act 1986.

57. SSS, MBES, MBBS and Mag. data interpreted by Wessex Archaeology have demonstrated the presence of 847 seabed features which have been identified as being of archaeological interest (A1) or potential archaeological interest (A2 and A3) in accordance with the definitions set out in **Table 2-1**. A full list of seabed features interpreted from the data by Wessex Archaeology for the Projects is included in the gazetteer in **Volume 7, Appendix 17-2 (application ref: 7.17.17.2)**. The locations of seabed features within the Array Areas are illustrated on Figures 2.01 to 2.24 and within the Offshore Export Cable Corridor on Figures 2.10, 2.22 and 2.25 to 2.41 in **Volume 7, Appendix 17-2 (application ref: 7.17.17.2)**.

58. A total of 495 features have been identified within the Array Areas and 352 within the Offshore Export Cable Corridor, as shown in **Table 2-3**.

Table 2-3 Anomalies of Archaeological Potential Within the Offshore Archaeology Study Area

Archaeological discrimination	Array Areas	Offshore Export Cable Corridor	Total	Interpretation
A1	18	8	26	Anthropogenic origin of archaeological interest
A2_h	60	63	123	Anomaly of likely anthropogenic origin but of unknown date; may be of archaeological interest or a modern feature
A2_l	392	276	668	Anomaly of possible anthropogenic origin but the interpretation is uncertain; may be anthropogenic or a natural feature
A3	25	5	30	Historic record of possible archaeological interest with no corresponding geophysical anomaly
Total	**495**	**352**	**847**	

59. Furthermore, these anomalies can be classified by probable type, which can further aid in assigning archaeological potential and importance as shown in **Table 2-4**.

Table 2-4 Types of Anomaly Identified

Anomaly classification	Array Areas	Offshore Export Cable Corridor	Total
Wreck Areas of coherent structure including wrecks of ships, submarines and some aircraft (where coherent structure survives).	6	3	9
Debris field A discrete area containing numerous individual debris items that are potentially anthropogenic and can include dispersed wreck sites for which no coherent structure remains.	13	9	22
Debris Distinct objects on the seabed, generally exhibiting height or with evidence of structure, that are potentially anthropogenic in origin.	9	11	20
Linear debris Distinct linear objects on the seabed, either straight or curved, generally exhibiting height or with evidence of structure, that are potentially anthropogenic in origin. May represent linear anthropogenic debris which can include, for example, lengths of rope or chain or abandoned fishing gear.	12	31	43
Seabed disturbance An area of disturbance, occasionally containing objects of uncertain origin. May indicate wreck debris or other anthropogenic features, or items buried just below the seabed, but lacking any definite anthropogenic structures. Precise nature is uncertain.	41	19	60
Bright reflector Individual objects or areas of low reflectivity, characteristic of materials that absorb acoustic energy, such as waterlogged wood or synthetic materials. Precise nature is uncertain.	7	1	8

Anomaly classification	Array Areas	Offshore Export Cable Corridor	Total
Dark reflector Individual objects or areas of high reflectivity, displaying some anthropogenic characteristics. Precise nature is uncertain.	57	53	110
Mound A mounded feature with height not considered to be natural. Mounds may form over wreck sites or other debris.	3	25	28
Magnetic No associated seabed surface expression and have the potential to represent possible buried ferrous debris or buried wreck sites.	322	195	517
Recorded Wreck Position of a recorded wreck at which previous surveys have identified definite seabed anomalies, but for which no associated feature has been identified within the current data set.	24	4	28
Recorded obstruction Position of a recorded obstruction (e.g. foul ground, fisherman's fastener recorded by the UKHO), but for which no associated feature has been identified within the current data set.	1	1	2
Total	**495**	**352**	**847**

60. The A1 anomalies, including identified wrecks, are summarised by area in **Table 2-5**. Further details on each wreck are provided in Sheet 1 to Sheet 9 in **Volume 7, Appendix 17-2 (application ref: 7.17.17.2)**.

Table 2-5 Known Wrecks and Unidentified A1 Anomalies Within the Offshore Archaeology Study Area

WA ID	UKHO ID	Description
Array Areas		
70006	N/A	Unidentified and previously unrecorded wreck, isolated and mostly coherent, seen as an ovoid shape with what appears to be an upright and fairly intact hull measuring 23.3 x 12.6 x 0.9m (Sheet 1 in **Volume 7, Appendix 17-2 (application ref: 7.17.17.2)**). There is some indication of surviving deck structure. The north-eastern end is disjointed with some evidence of collapse with small angular dark reflectors visible outside the interpreted hull. Associated with a 42nT anomaly on the closest Mag. line located 60m to the east.
70019	6900	Unidentified wreck, highly degraded and somewhat dispersed, seen across an area measuring 40.7 x 21.9m (Sheet 2 in **Volume 7, Appendix 17-2 (application ref: 7.17.17.2)**). Despite being broken up, significant height can still be seen at 3.1m and some possible superstructure survives. The wreck site is associated with a 699nT Mag. anomaly seen on one profile line located around 30m away. The UKHO record describes a steam ship recorded on a Danish fishing chart and identified during diving in 1989 as a merchant vessel with lead pipe scattered on the seabed, hence it is known as the 'Lead Wreck'. This wreck was swept clear in 1960 and was recorded as being well dispersed in 1989. In 2020 the most prominent feature of the wreck was recorded as being a round cylinder.
70018		Debris field (5.2 x 4.7 x 0.2m) located to the south of wreck 70019. A further three A2_h anomalies were also considered possibly related to the wreck (debris 70020, debris 70021 and debris field 70022).
70128	97864	Unidentified wreck, coherent and upstanding with a well-defined structure which measures 32.8 x 10.9 x 2.0m (Sheet 3 in **Volume 7, Appendix 17-2 (application ref: 7.17.17.2)**). The vessel is internally indistinct, and some associated debris is seen to the north and east (A2_h anomalies, linear debris 70127, linear debris 70129, and debris 70130). It is associated with a very large anomaly of 649nT in the Mag. data. The UKHO record describes an unknown wreck, being intact and sinking into the sand on one side, having been first identified in 2021.

WA ID	UKHO ID	Description
70252	97582	Unidentified wreck, visible as a distinct angular structure measuring 59.6 x 11.8 x 3.1m (Sheet 4 in **Volume 7, Appendix 17-2 (application ref: 7.17.17.2)**). The hull appears to be broken up, particularly along the western extents. Two large angular objects are present within the northern end. This is associated with a very large Mag. anomaly of 1001nT. The UKHO record describes a wreck first identified in 2021 and reported as being visibly decaying and broken up, with a small debris field at the south-southwest end.
70249		Debris field (6.3 x 3.5 x 0.3m) located west of wreck 70252
70251		Debris field (9.1 x 5.2 x 0.1m) located east of wreck 70252
70349	N/A	Unidentified and previously unrecorded wreck, seen as a coherent vessel measuring 31.0 x 7.0 x 2.8m (Sheet 5 in **Volume 7, Appendix 17-2 (application ref: 7.17.17.2)**). The wreck appears upright and is situated within sand ripples so its full extent may be buried. Some probable internal structure is indicated, the southern end slopes into the seabed and may be settled or partially buried. This is associated with a very large Mag. anomaly of 8797nT.
70348		Angular object measuring 7.2 x 2.1 x 0.3m and located west of the southern end of wreck 70349.
70350		Elongate dark reflector measuring 3.4 x 1.0 x 0.2m and located west of the north-eastern end of wreck 70349.
70448	N/A (70444)	Unidentified wreck, seen as a distinct vessel and measuring 29.6 x 7.8 x 2.5m (Sheet 6 in **Volume 7, Appendix 17-2 (application ref: 7.17.17.2)**). This contains a large internal feature, possibly a boiler. The hull appears fairly coherent, with the suggestion of some disintegration. This wreck is located 330m north-west of UKHO record 6824 (70444) and is likely the wreck to which the record refers. However, due to the large distance between the wreck and the recorded location, 70444 has been recorded separately as an A3.
70449		Debris (2.7 x 2.3 x 0.2m) located on the south-western side of the vessel which may be hollow in the centre.

WA ID	UKHO ID	Description
70030	N/A	Isolated debris field comprising three groups of possible debris that are potentially related and are associated with a very large Mag. anomaly of 2649nT. The area measures 96.2 x 30.1 x 0.2m in total. Interpreted as an area of slightly dispersed ferrous debris.
70264	N/A	Isolated item of debris (5.1 x 3.6 x 1.7m) interpreted as a sub-rounded object which casts a bright shadow in the SSS data and has a very large associated Mag. anomaly of 4747nT. This has been interpreted as ferrous debris.
70051	N/A	Magnetic only anomaly (1815nT) possibly representing significant ferrous debris that is either buried or without surface expression.
70118	N/A	Magnetic only anomaly (8377nT) possibly representing significant ferrous debris that is either buried or without surface expression.
70267	N/A	Magnetic only anomaly (2865nT) possibly representing significant ferrous debris that is either buried or without surface expression.
70299	N/A	Magnetic only anomaly (1501nT) possibly representing significant ferrous debris that is either buried or without surface expression.
Offshore Export Cable Corridor		
70572	6617	Unidentified wreck, seen as a distinct curved dark reflector with complex internal dark reflectors indicating internal structure (Sheet 7 in **Volume 7, Appendix 17-2 (application ref: 7.17.17.2)**). It appears partially covered by sandwaves and the visible remains measure 31.0 x 10.0 x 1.0m. There is an associated Mag. anomaly measuring 164nT indicating ferrous material present.
70571		Debris field (25.4 x 13.8 x 0.2m) located to the north of wreck 70572.
70573		Debris field (10.2 x 3.1 x 0.1m) located to the south of wreck 70572.

WA ID	UKHO ID	Description
70574		Debris (4.6 x 1.1 x 0.1 m) located to the west-northwest of wreck 70572.
70628	6596	Unidentified wreck, seen as a distinct elongate dark reflector with some complex internal reflectivity likely indicating structure. It measured at least 35.4 x 14.0 x 2.1m (Sheet 8 in **Volume 7, Appendix 17-2 (application ref: 7.17.17.2)**). The wreck is situated in an area of sandwaves which may periodically cover the wreck. Possibly in three segments.
70627		Debris (4.1 x 1.5m) identified approximately 8m to the east of wreck 70628.
70774	97497	Unidentified wreck, seen as a series of dark reflectors across an area measuring 12.5 x 2.5 x 0.4m, with one larger and more distinct dark reflector measuring 1.7 x 0.8 x 0.3m (Sheet 9 in **Volume 7, Appendix 17-2 (application ref: 7.17.17.2)**). It was also associated with a very large Mag. anomaly measuring 904nT. The UKHO records describes an unknown wreck that is heavily degraded and reported to have part of the bow and boiler visible.
70599	N/A	Magnetic only anomaly (1575nT) possibly representing significant ferrous debris that is either buried or without surface expression.

61. In addition to the A1 anomalies, including wrecks, listed in **Table 2-5** there are 30 A3 historic records of possible archaeological interest with no corresponding geophysical anomaly. Of these 30, ten have descriptions within the UKHO record which suggest material has previously been recorded on the seabed (**Table 2-6**). Two of the A3 records (70534 and 70659) are located within the construction buffer which has not been covered by the 2022 geophysical dataset. For the remining eight A3 records in **Table 2-6** it is possible that, although they weren't seen in the current geophysical dataset, wrecks may still be present, either well dispersed and / or buried at the recorded location, or that the record may be inaccurately positioned, and the wreck is located elsewhere.

Table 2-6 A3 Historic Records within the Offshore Archaeology Study Area

WA ID	UKHO ID	Description
Array Areas		
70035	6896	An unknown wreck recorded on a Danish fishing chart in 1965. This was reported as having been visually located in 1989, but has since been amended to dead in 2002.
70076	6898	An unknown dangerous wreck. This was first reported in 1915 and last updated in 1972 from a Danish fishing chart.
70146	6870	A small unknown wreck, recorded as dangerous. This was first located and dived in 1989, a survey in 1990 failed to identify it in bathymetric data and the record was amended to dead
70220	6838	An unknown wreck. This was identified in 1982, but has since been amended to dead.
70271	6815	An unknown dangerous wreck. This was first reported in 1960, and was recorded as being present on a 1965 edition Danish fishing chart in 1972.
70286	6808	An unknown dangerous wreck. This was first noted in 1959, was shown on a Danish fishing chart and last recorded in 1978. No information is provided in the record of its dimensions or condition.
70444	6824	An unknown wreck. This was present on a Danish fishing chart and was visually observed as present in 1982. This position is 330m south-east of observed wreck 70448 and may represent this wreck although this is uncertain.
Offshore Export Cable Corridor		
70534	6849	An unknown wreck last surveyed in 1986, observed to be lying between sandwaves and measuring 25m in length and 1.9m in height. Located within the construction buffer and not covered by the 2022 geophysical data.

WA ID	UKHO ID	Description
70653	6586	The recorded position of the wreck *Resercho*, a British vessel lost in 1939 after hitting a mine. The position was originally recorded as an obstruction by fishermen but, in 1986, large pieces of wreck were located by the fishing vessel *Alatna* during a search for aircraft wreckage, believed to be from a crashed Tornado. Nothing was found at this location in 2016 and the record was amended to 'dead'. No anomalous features were identified in the 2022 data at this location during this assessment. This may be due to the fact the some of the wreckage has been recovered, although there is still the possibility of material being present on, or below, the seabed.
70659	6470	*Feltre*, originally the *Rhenania*, a steamship built in Germany in 1904 as a passenger ship for the Hamburg-Amerika Line. At the outbreak of WWI the ship was requisitioned and renamed Feltre by the Italian government and put to use as a cargo ship. Feltre was on route to the Tyne with a cargo of iron ore when the vessel was torpedoed and sunk by the German submarine UB-32 on 26th August 1917. The wreck was positively identified in 1986, from the original name on the ships bell found by divers. The site is known locally as Cap Morel, or Cattermole. The wreck was last recorded in2016 with dimensions of 135.4 x 34.2 x 11.3m, broken up with a strong magnetic anomaly. Located within the construction buffer and not covered by the 2022 geophysical data.

62. The remaining 20 A3 records correspond to fishermen's fasteners, wrecks or obstructions that are recorded by the UKHO, but which have descriptions which suggest that no material has actually ever been observed at the recorded location. All have been retained within the gazetteer as a precaution for recording purposes and are described further in **Volume 7, Appendix 17-2 (application ref: 7.17.17.2)**.

63. Of the total 847 seabed features, 791 are discriminated as A2 anomalies of possible archaeological interest, comprising 123 discriminated at A2_h (anomaly of likely anthropogenic origin but of unknown date, may be of archaeological interest or a modern feature) and 668 as A2-l (anomaly of possible anthropogenic origin but interpretation is uncertain, may be anthropogenic or a natural feature). These anomalies may be of no archaeological interest (i.e. modern debris or potentially a natural feature), may represent isolated finds lost from a vessel or aircraft boat (e.g. ordnance, anchors, items of deck machinery, or broken super structure) or may represent buried or dispersed wreckage, which could be previously unrecorded, or could be associated with recorded losses that have not yet been located, as described below. Full details are provided in **Volume 7, Appendix 17-2 (application ref: 7.17.17.2)**.

64. In addition to the seabed features summarised above there is potential for the presence of previously unrecorded maritime archaeological material to be present, dating from the Mesolithic period up to the present day. Similarly, there is potential for the discovery of previously unknown aircraft material.

2.4 Intertidal Archaeology

65. There are no designated heritage assets below MHWS at the landfall.

66. Records of non-designated heritage assets within the intertidal zone have been compiled from searches of the Humber HER and records held by Historic England which were formally part of the NRHE dataset. Records of heritage assets which were once located on land, but which have been lost due to coastal erosion, have also been included as relevant to the potential for fragmentary remains to survive within the Offshore Archaeology Study Area. Intertidal heritage assets located within the Offshore Development Area, and the onshore Non-Designated Heritage Assets Study Area, are illustrated on **Volume 7, Figure 22-2-3a (application ref: 7.22.1)** and listed in the gazetteer provided in **Volume 7, Appendix 22-2 Annex 22.2.2 (application ref: 7.22.22.2)**.

67. The assessment of the intertidal baseline was further supported by a heritage walkover survey which took place over four days from 5th - 8th December 2022. The full results of the walkover survey are presented in **Volume 7, Appendix 22-4 (application ref: 7.22.22.4)**.

68. Reference is also made to the interim results of archaeological trial trenching undertaken by AOC Archaeology Group between August and December 2023 at the landfall, above MHWS, as relevant to adjacent archaeology within the intertidal zone **Volume 7, Appendix 22-8 (application ref: 7.22.22.8)**. The Landfall Evaluation Area consists of four fields adjacent to the cliff top where evidence of Iron Age and Roman activity, a medieval settlement (possibly the lost village of Cleeton), and further undated and post-medieval features have been excavated.

69. The records of non-designated heritage assets, walkover survey, and trial trench evaluation suggest a high potential for archaeological remains within the intertidal zone, including buried archaeology, corresponding to four main areas of potential:

- Prehistoric archaeology including the potential for buried features and paleoenvironmental remains;
- Iron Age and Roman archaeology comprising isolated finds and relating to former sites and features which have been lost/impacted through coastal erosion;
- Medieval and post-medieval archaeology comprising isolated finds and relating to former settlements which have been lost/impacted through coastal erosion; and
- 20th century military installations and coastal defences, many of which have also been lost or have fallen onto the beach due to coastal erosion.

2.4.1 Prehistoric

70. Earlier Prehistoric activity is demonstrated through the presence of findspots of faunal remains (Humber HER 16379, 18037, 15531) and flint and bone implements (Humber HER 21182, 20667, 8835). A number of undated pits, ditches and buried deposits observed in the eroding cliff face may also represent early Prehistoric features (Humber HER 21228, 21231, 21232, 18037), although these may also be related to the Iron Age and Roman activity described in section 2.4.2 below.

71. During the heritage walkover survey an organic/peat deposit was observed in the cliff face at the northern point of the Seaside Caravan Park at the recorded location of Humber HER 18037 (a Prehistoric animal bone recovered from organic deposit at Ulrome cliffs) (see **Volume 7, Appendix 22-4 (application ref: 7.22.22.4)**). Peat sequences at the Holderness Coast have been dated to the Mesolithic, c. 11.6 ka (Evans and Thompson, 2010). This deposit, therefore, likely represents a prehistoric buried deposit, although the precise date is unknown. Other features visited during the walkover survey were not observed (Humber HER 21228, 21231, 21232) and have likely been lost due to coastal erosion.

72. An 'alleged lake dwelling' of possible Neolithic to Iron Age date is reported to have been discovered in 1894, recorded near the northern end of the Skipsea lacustrine deposit, exposed in the cliffs and comprising a dense mass of twigs and brushwood on top of a pointed stake (Humber HER 8849). Similarly, a further possible 'lake dwelling' comprising carved wooden rods and stakes of early Neolithic age are reported from the carr peats exposed at Withow Mere (Humber HER 9001). Other finds of later Prehistoric material include a bronze spearhead from Ulrome beach (Humber HER 4409).

73. The potential for Prehistoric finds should, therefore, be considered high. Due to coastal erosion, in situ sites within the intertidal zone are unlikely to survive, although isolated finds may be encountered. Features, such as the organic deposit at Ulrome Cliffs (Humber HER 18037), however, may survive in situ exposed in the cliff face and there is potential for further buried deposits and pits or ditches to be exposed with ongoing coastal erosion.

2.4.2 Iron Age and Roman

74. Iron Age and Roman findspots include coins (Humber HER 13459, 4523) and a sherd of Romano-British pottery (Humber HER 21182) found on the beach, or within the eroding cliffs. Further recorded features include an Iron Age ditch, drain, pottery and animal bone (Humber HER 15807), a double ditch (Humber HER 15809) and a probable Roman-British pit and contemporary pottery (Humber HER 15808) found during a watching brief at Ulrome caravan park, now destroyed by erosion. A former Roman settlement site is also recorded at a location now in the intertidal zone (Humber HER 3759). The site, found in 1950 and 1952, comprised Romano-British calcite gritted ware, Samian ware, an Iron Age/Romano-British storage jar and hard grey fabrics. The site had been exposed by coastal erosion and most likely represented a small village site, now presumed destroyed by further erosion. Further Iron Age and Roman features and pottery are also recorded in the vicinity (Humber HER 21199, 18396 and 6668).

75. Although, these features are all recorded to the north of the Onshore Development Area, evaluation trenches excavated for the Projects have also revealed significant evidence for Iron Age and Roman activity within the Onshore Development Area, above MHWS (**Volume 7, Appendix 22-8 (application ref: 7.22.22.8)**). A double-ditched trackway and settlement evidence have been revealed in evaluation trenches in the southeast corner of the Landfall Evaluation Area. The area immediately around the trackway ditches contain a significant concentration of archaeological features with a high incidence of finds, indicating a rubbish dump and proximity to settlement activity. A small number of features were encountered in the northwest corner of the Landfall Evaluation Area, which have blackened fills containing fired stones, indicative of burning. A concentration of ditches in the northwest corner, also indicate a zone of possible Iron Age activity.

76. The potential for Iron Age and Roman finds within the intertidal and nearshore area should, therefore, be considered high. Due to coastal erosion, in situ sites within the intertidal zone are unlikely to survive, although isolated finds may be encountered. Further features may also be revealed within the eroding cliff face, as indicated by the adjacent undated ditch (Humber HER 21231) and pit (Humber HER 21232) which are likely associated with the settlement activity recorded during the evaluation.

2.4.3 Medieval and Post-medieval

77. There are a number of towns and villages know to have been lost due to coastal erosion along the Holderness Coast. Within, and adjacent to, the Offshore Archaeology Study Area the former locations of Cleeton (Humber HER 3412), Withow (Humber HER 8838) and Hyde (Humber HER 8845) are recorded, although no known archaeological remains are associated with these locations. Similarly, a 19th century farmhouse was recorded on the cliff edge in a derelict condition in 2009, presumably now lost, (Humber HER 15032). No evidence of these former structures was observed during the heritage walkover (**Volume 7, Appendix 22-4 (application ref: 7.22.22.4)**). A further former asset includes the site of a fish weir (Humber HER 15051) shown on the O.S. 6" first edition map from 1855.

78. There is a single Medieval findspot recorded within the intertidal area, a heart-shaped gold brooch from Skipsea Beach found in 2001 (Humber HER 19770) and two features previously observed in the cliff face are recorded as being of likely Medieval or Post-medieval date (Humber HER 21226, 21227).

79. The highest concentration of archaeological features encountered during the evaluation at the landfall are located in the northwest corner of the Landfall Evaluation Area, representing medieval settlements over more than one phase (**Volume 7, Appendix 22-8 (application ref: 7.22.22.8)**). Finds include pottery of mixed medieval fabrics, with smaller quantities of animal bone, some shell, several iron or copper allow objects and quantities of daub or fired clay. It is suggested that this could be the lost village of Cleeton, located in a different location to that recorded by the HER (Humber HER 3412).

80. A series of updated and post-medieval features have also been located in the southwest corner of the Landfall Evaluation Area including a board natural hollow or pond and a spread of cobble stones which may have been dumped in order to consolidate the ground, rather than representing an ordered surface or trackway.

81. The potential for Medieval and Post-Medieval finds within the intertidal and nearshore area should, therefore, be considered high, although in situ sites within the intertidal zone are unlikely to survive.

2.4.4 20th Century Military Activity

82. The majority of the records recorded from within, and adjacent to, the Offshore Archaeology Study Area correspond with WWII activity although many of these features are no longer extant.

83. In summary, the records primarily correspond to former coastal defence structures, many recorded from aerial photographs, including a large number of pillboxes, anti-tank obstacles, beach lights, gun emplacements, observation posts, beach scaffolding and anti-aircraft obstacles and other features including weapons pits, trackways, barbed wire obstructions and military buildings. Two records correspond to the former locations of military training camps observed on aerial photographs, both since lost due to coastal erosion (Humber HER 21192 and 21221).

84. During the heritage walkover survey a number of these previously recorded locations were visited (**Volume 7**, **Appendix 22-4 (application ref: 7.22.22.4)**). Most were not observed to survive extant, although remains which were observed on the beach comprised:

- Pillbox 21224: observed on the beach, heavily eroded with only a small corner of the pillbox surviving;
- Pillbox 21233: largely broken up with only fragments remaining;
- Pillbox 21237: now on the beach with the remains only partially visible in the sand;
- Pillbox 21242: the Humber HER records a pillbox roof at his location however only widely distributed remains were observed, partially within the sea at low tide; and
- Beach Obstacles 21244: the Humber HER records WWII beach obstacles consisting of a concrete block with steel pipes, the beach was seen to be littered with concrete and metal debris, particularly along this stretch of the beach although this is also in proximity to the location where previous makeshift seaside huts (MHU21797) once stood on the cliff.

85. Notably, none of the previously recorded anti-tank cubes were seen to survive on the beach.

86. The potential for WWII remains should be considered high. However, due to the action of coastal erosion these would be fragmentary and most likely to comprise the remains of structures which once would have stood on the cliff top. In situ remains such as beach scaffold poles and anti-tank cubes may survive, potentially buried, although these may now be located further offshore.

3 Impact Assessment Summary

87. **Volume 7, Chapter 17 Offshore Archaeology and Cultural Heritage (application ref: 7.17)** of the ES identifies the potential for impacts upon offshore and intertidal archaeology and cultural heritage including both direct and indirect physical changes and non-physical changes to the setting of heritage assets or historic seascape character.

88. Direct (physical) impacts to heritage assets below MHWS, either proud of the seabed or buried within it, or within intertidal deposits, may result in damage to, or destruction of, archaeological material. Impacts may also damage the relationship between the material and the wider environment. Direct impacts may occur where heritage assets are located within the footprint of the Projects where construction activities will take place. These include seabed clearance, installation of foundations and cables, vessel anchoring or the placement of jack-up vessel legs.

89. Indirect (physical) impacts may occur where changes to the hydrodynamic and sedimentary process regimes, as a result of the Projects, affect heritage assets by altering erosion and accretion patterns or altering tidal currents which in turn may affect the stability of nearby morphological and archaeological features. Such impacts may occur if buried heritage assets become exposed to marine processes, due to increased wave or tidal action, for example. This will result in a faster rate of deterioration than heritage assets afforded protection by sediment cover. Conversely, increased sedimentation could result in an exposed site becoming buried thus affording it protection and may be considered a beneficial impact.

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

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

92. With respect to cumulative effects, schemes which spatially overlap with the Projects are listed in **Table 3-1**.

Table 3-1 List of Schemes Screened in for CEA

Tier	Scheme	Closest distance to (km):	
		Export Cable Corridor	**Array Areas**
Offshore Wind Farms and associated export cables			
2	Dogger Bank A	20	8
2	Dogger Bank A export cable	0.25 (export cable corridor overs the Projects 1km Construction Buffer Zone	4
2	Dogger Bank B	20	17
2	Dogger Bank B export cable	0.25 (export cable corridor overs the Projects 1km Construction Buffer Zone	8
3	Hornsea Project Four export cable	0km (export cable corridor crosses the Projects)	40
Carbon Capture and Storage (CCS)			
3	Northern Endurance	12	37
3	Northern Endurance Pipeline	0 (pipeline crosses the Projects Offshore Export Cable Corridor)	45
7	CCS North Sea Leasing Round SNS Area 1 - Licence CS020 & CS025	0 (Overlaps Projects' Offshore Export Cable Corridor and Array Areas)	
7	CCS North Sea Leasing Round SNS Area 3 – Licence CS028	0 (overlaps Offshore Export Cable Corridor)	92
Sub-sea Cables			

Tier	Scheme	Closest distance to (km):	
		Export Cable Corridor	**Array Areas**
7	Eastern Green Link 3 (EGL 3)*	0km (potentially crosses the Projects' Offshore Export Cable Corridor)	Not available
7	Eastern Green Link 4 (EGL 4)*	0km (potentially crosses the Projects' Offshore Export Cable Corridor)	Not Available
7	National Grid HND Bootstrap**	Not available	Potentially within the Array Areas
7	Aminth Energy Interconnector*	Not available	
7	Continental Link*	Not available	

**Current routes detailed publicly are for illustrative purposes only, but if accurate are projected to cross the Projects Offshore Export Cable Corridor*

***Cable route not yet finalised*

93. Studies undertaken for Dogger Bank A and B, Northern Endurance CCS and Hornsea Project Four, have all indicated the presence of seabed and palaeolandscape features. These features are relevant to understanding the potential for previously undiscovered maritime, aviation and submerged prehistoric archaeology, within the different scheme boundaries. Publicly available studies are not yet available for the Tier 6 and Tier 7 projects.

94. However, with the application of mitigation, as set out in the respective ES chapters for Dogger Bank A and B and Northern Endurance CCS (Wessex Archaeology, 2013a, 2023) and Outline WSI for Hornsea Project Four (Maritime Archaeology, 2022), the residual cumulative effect on heritage assets, located within the area of the spatial overlaps, is assessed as being no greater than the effects of DBS on its own (i.e. anticipated to be no worse than a minor adverse significance). Publicly available studies are not yet available for the North Sea Leasing Round SNS Areas 1 and 3 CSS schemes and Eastern Green Link 3 and 4 sub-sea cables although these will be subject to the same assessment and mitigation requirements.

95. The ES also recognises that cumulative (and potentially transboundary) effects, resulting from multiple unavoidable project impacts, upon seascapes / palaeolandscapes, which may extend beyond the confines of any scheme, can also occur even when schemes do not spatially overlap with each other.

96. With due consideration of the mitigation and investigation set out in **Volume 7, Chapter 17 Offshore Archaeology and Cultural Heritage (application ref: 7.17)** and summarised in section 1.3 of this WSI, potential impacts to archaeology and cultural heritage below MHWS have been assessed as part of the EIA for the Projects. A summary of the impacts and suggested mitigation is provided in **Table 3-2**.

Table 3-2 Summary of Potential Likely Significant Effects on Offshore Archaeology and Cultural Heritage

Potential Impact	Receptor	Importance (Sensitivity)	Magnitude of Impact	Pre-mitigation Effect	Mitigation Measures Proposed	Residual Effect	Residual Cumulative Effect
Construction							
Impact 1 Direct impact to known heritage assets	Known wrecks and debris of archaeological interest	High	High	Major adverse	AEZs	No change	N/A
Impact 2 Direct impact to potential heritage assets	In situ prehistoric, maritime or aviation sites	High	High	Major adverse	Further assessment and investigation and additional mitigation to avoid, reduce or offset impacts.	Minor adverse	Minor adverse
	Sub-surface archaeology and geoarchaeological / palaeoenvironmental deposits	High	High	Major Adverse	Watching brief and preservation by record of any exposed remains	Minor adverse	Minor adverse
	Isolated finds	Medium	Low	Minor adverse	Protocol for archaeological discoveries	Minor adverse	Minor adverse
Impact 3 Indirect impact to heritage assets from changes to physical processes	Known and potential heritage assets below MHWS	Medium to high	No impact	No change	N/A	No change	No change
	Sub-surface archaeology and geoarchaeological / palaeoenvironmental deposits within the cliffs	Low to high	High	Major Adverse	Location of exit pits a suitable distance from the cliffs / monitoring and preservation by record of any exposed remains	Minor adverse	Minor adverse
Impact 4 Impacts to the setting of heritage assets	Known and potential heritage assets	Medium to high	No impact	No change	N/A	No change	N/A
Operation							
Impact 1 Direct impact to known heritage assets	Known heritage assets	Medium to high	High	Major adverse	AEZs	No impact	N/A

Potential Impact	Receptor	Importance (Sensitivity)	Magnitude of Impact	Pre-mitigation Effect	Mitigation Measures Proposed	Residual Effect	Residual Cumulative Effect
Impact 2 Direct impact to potential heritage assets	In situ prehistoric, maritime or aviation sites	High	High	Major adverse	Further assessment of geophysical and geotechnical data.	Minor adverse	Minor adverse
	Isolated finds	Medium	Low	Minor adverse	Protocol for archaeological discoveries.	Minor adverse	Minor adverse
Impact 3 Indirect impact to heritage assets from changes to physical processes	Known and potential heritage assets	Medium to high	No impact	No change	N/A	No change	No change
Impact 4 Impacts to the setting of heritage assets	Known and potential heritage assets	Medium to high	No impact	No change	N/A	No change	N/A
Decommissioning							
Impact 1 Direct impact to known heritage assets	Known wrecks and debris of archaeological interest	High	High	Major adverse	AEZs	No impact	N/A
Impact 2 Direct impact to potential heritage assets	In situ prehistoric, maritime or aviation sites	High	High	Major adverse	Further assessment and investigation and additional mitigation to avoid, reduce or offset impacts.	Minor adverse	Minor adverse
	Isolated finds	Medium	Low	Minor adverse	Protocol for archaeological discoveries	Minor adverse	Minor adverse
Impact 3 Indirect impact to heritage assets from changes to physical processes	Known and potential heritage assets	Medium to high	No impact	No change	N/A	No change	No change
Impact 4 Impacts to the setting of heritage assets	Known and potential heritage assets	Medium to high	No impact	No change	N/A	No change	N/A

4 Roles, Responsibilities and Communications

97. The overall responsibility for the implementation of the final Offshore WSI will be with the undertaker(s) named in the DCO (herein referred to as the 'project team'). The project team will ensure that its agents and contractors are contractually bound to adhere to the terms of the final Offshore WSI, including the implementation of the Protocol for Archaeological Discoveries (section 6.3).

98. For each phase of archaeological works the project team or their agents, will as required, obtain the services of specialised archaeological contractors with the required expertise and experience to undertake the necessary archaeological works as and when required.

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

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

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

101. All agents and contractors engaged by the project team will:

- Familiarise themselves with the requirements of the final Offshore WSI and make it available to their staff;
- Explain the requirements of the final Offshore WSI and the need for strict adherence to it;
- Familiarise themselves with the protocol for archaeological discoveries (section 6.3) and ensure its implementation;
- Ensure adherence to the protocol by staff, ensuring staff awareness of the protocol and making staff available for training through toolbox talks, as necessary;
- Assist and afford access to archaeological contractors as advised by the project team and the retained archaeologist; and
- Inform the retained archaeologist and the archaeological contractors of any environmental or health and safety constraints which they may be aware of that relate to the archaeologist's activities on site.

102. The specific responsibilities of the specialist archaeological contractors during subsequent phases of work will be set out in separate specific method statements relevant to each package of works.

103. The regulators (the MMO, and the East Riding of Yorkshire Council in the event of works required above MLWS) will be responsible for the approval of WSIs as relevant to the discharge of requirements and conditions specified in the DCO and DMLs.

104. The archaeological curator for heritage matters offshore (below MHWS) is Historic England. Historic England provides guidance and advice to the MMO pre-and post-consent and provide advice regarding the approval of WSIs. Similarly, HAP provides advice to the local authority (East Riding of Yorkshire Council) as relevant to intertidal aspects of the project. For each work package undertaken under the umbrella of the WSI, the Project team and retained archaeologist will consult with the archaeological curators to agree the approach, as set out in the activity-specific method statements.

5 Methodology for Further Site Investigation

5.1 Marine Geophysical Investigations

105. The geophysical data assessed by Wessex Archaeology to inform the ES chapter has been summarised in section 2.1. As discussed above, limited parts of the study area were not covered by SSS and Mag. data (due to fishing gear preventing the towing of sensors) and data was not acquired from the construction buffer of the export cable corridor.

106. Prior to the acquisition of pre-construction geophysical data, it is recommended that reviews of all the data are undertaken by a suitably qualified and experienced archaeological contractor. This will clarify the suitability of existing data and will include clarification on data gaps. As part of the data review, the archaeological contractor should also identify specific objectives to inform the scope of further survey work.

107. The acquisition and assessment of geophysical data will be carried out in accordance with good practice as set out in The Crown Estate (2021) guidance and industry guidelines including:

- Plets R., Dix J. and Bates R. (2013) Marine Geophysical Data Acquisition, Processing and Interpretation – guidance notes (guidance prepared for Historic England, currently under review).

108. As stated in The Crown Estate (2021) guidance, archaeological input will take the form of advice on the following points:

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

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

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

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

111. Before any geophysical survey takes place, the archaeological curators will be consulted to ensure the suitability of any data to meet the archaeological objectives discussed above and to answer any questions which may have arisen through consultation.

112. This will usually be in the form of a method statement (or post-application / pre-commencement survey WSI), and will reference existing guidance (i.e. Plets *et al*., 2013), where appropriate. The method statement will be issued by the project team in advance of any further geophysical survey campaigns that incorporate archaeological objectives. The project team will be responsible for ensuring that all surveys proceed in line with any planned method statement as agreed with the archaeological curators.

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

114. On completion of the geophysical surveys the data will be processed, assessed and interpreted by an experienced and qualified archaeological contractor. Geophysical survey data, supplied to an agreed technical standard and specification, at the same level of fidelity as recorded, will be interpreted by an archaeological geophysicist with an appropriate level of expertise. Survey data, together with operational reports and trackplots, should be made available in digital formats to the archaeological geophysicist. Where possible full-fidelity data unreduced in range, frequency, sampling and dimensionality from that recorded must be used as the input for archaeological interpretation. Full detail on the provision of data for assessment is provided in The Crown Estate guidance (2021: 20).

115. The results of further geophysical interpretation will be compiled as an archaeological technical report consistent with the methodologies for reporting set out in The Crown Estate (2021) guidance and will form part of the project archive as set out in section 10.5. The resulting spatial interpretation data, such as the locations and extents of identified features and / or deposits of archaeological potential, will be provided alongside the compiled report in a suitable digital format, such as Geographic Information System (GIS) shapefiles or Computer Aided Design (CAD) drawing files as agreed with the project team and, where appropriate, the archaeological curator(s). All reports and digital deliverables relating to the assessment should be available for subsequent data interpretations within the life cycle of the Projects.

5.2 Marine Geoarchaeological Investigations

116. Geoarchaeological assessment of geotechnical data acquired for the project forms part of the commitment by the project team to additional mitigation and investigations.

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

- Geoarchaeological input into EIA (to provide a baseline understanding of key deposits and their archaeological significance);
- Geoarchaeological input into geotechnical survey planning (to ensure archaeological objectives are considered in the planning stage of the geotechnical survey);
- Review of geotechnical logs (to establish the likely presence and depth of deposits of archaeological interest and provide a broad characterisation of the site);
- Recording of geotechnical cores (to preserve by record individual core or borehole samples of potential archaeological interest);
- Archaeological sampling (to retain adequate samples (quantity and quality) for palaeoenvironmental assessment and analysis and dating); and
- Assessment and analysis (to provide a chronostratigraphic and palaeoenvironmental understanding of the area, to inform interpretation of geophysical datasets and ground model).

118. Geotechnical data has been acquired for DBS East and DBS West which informed the assessment of Seabed Prehistory undertaken for the ES, as summarised in section 2.2.

119. Recommendations for further geoarchaeological assessment and analysis, following the review of 122 vibrocore logs and 10 borehole logs are included in in **Volume 7, Appendix 17-4 (application ref: 7.17.17.4)**. In summary, of the deposits identified in the Offshore Development Area (Table 2-2), Pre-Glacial Sand has been assigned a medium geoarchaeological potential and Alluvium has been assigned a medium to high geoarchaeological potential, depending on if organic clay or peat is preserved. It has been recommended that:

- Provision is made during future geotechnical borehole surveys within the DBS Array Areas to retain samples from the Pre-Glacial Sand unit in metal shelby tubes to secure samples suitable for luminescence dating; and
- Samples from the Alluvium recovered in four vibrocores (DBS_066_BH, DBS_132_VC, DBS_164_VC and DBS_164_VC) and one borehole (DBSW_005_BH) are retained for geoarchaeological recording and sub-sampling to secure material for further palaeoenvironmental assessment.

120. These samples have been retained by Fugro although further stages of assessment will take place following the completion of a borehole survey within the array area planned for 2024 so that geoarchaeological assessment of samples from all campaigns can be taken forward as a combined work package. The planned borehole locations will be reviewed against the interpreted palaeogeographic features from the SBP data by Wessex Archaeology and samples from specific depths and locations will be requested in order to ground truth features where relevant.

121. The following units have low geoarchaeological potential: Laminated Clay (Cleaver Bank Formation), Diamict and Glacial Sand (Dogger Bank Formation), Shallow Marine Sand (Nieuw Zeeland Gronden Terschellinger Bank Formation or Well Hole Formation), Gravel Lag (Indefatigable Grounds Formation) and Seabed Sediments (Bligh Bank Formation). No further palaeoenvironmental assessment of these deposits is recommended.

122. For all other future surveys, where geotechnical surveys are undertaken for primarily non-archaeological purposes, advice will be obtained from the retained archaeologist, to ensure that archaeological considerations are taken into account. These surveys, and subsequent geoarchaeological assessment, will be undertaken in accordance with The Crown Estate (2021) guidance and with industry best practice as set out in:

- Offshore Geotechnical Investigations and Historic Environment Analysis:
- Guidance for the Renewable Energy Sector (Gribble and Leather, 2011);

- Environmental Archaeology: A Guide to the theory and practice of methods, from sampling and recovery to post-excavation (Historic England, 2011); and
- Geoarchaeology: using earth sciences to understand the archaeological record (Historic England, 2007).

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

124. Borehole / vibrocore locations will be micro-sited to avoid recommended AEZs and anomalies of possible archaeological interest, as set out in section 6.1.

125. Comparison of the proposed locations will also be made to the positions of previously identified palaeogeographic features and deposits of archaeological interest. This will allow for samples to be obtained to inform archaeological interpretation. Provisions will be made for archaeology specific boreholes to be acquired where deposits of archaeological or palaeoenvironmental potential have been identified.

126. During all geotechnical surveys, all operatives should observe the protocol for archaeological discoveries, as set out in section 6.3. Archaeological briefings for survey staff will be carried out prior to the commencement of surveys and the project team will be responsible for ensuring that surveys proceed in accordance with any planned method statement agreed with the archaeological curators.

127. The project team will procure the services of a specialist geoarchaeological contractor to undertake assessment, and, if required, palaeoenvironmental analysis and dating. The primary aim of any geoarchaeological investigations will be the development of a Quaternary (sedimentary) deposit model for the study area.

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

129. Geoarchaeological assessment will be carried out in accordance with existing interpretations of SBP data assessed for the Projects.

130. Prior to the commencement of any site investigation campaign a method statement will be prepared by the retained archaeologist and issued by the project team setting out the specific details of the campaign to inform consultation with the archaeological curators regarding the scope and proposed locations of geotechnical work. The archaeological curators will also be consulted on subsequent geoarchaeological assessments commissioned by the project team. As stated in The Crown Estate (2021) guidance, it is also recommended that the method statement includes a timetable and policy for the storage, retention and disposal of offshore samples including access to the geotechnical material, agreed at the outset of the geotechnical investigation, between the project team, the archaeological curators and any receiving institutions (e.g., the geotechnical testing laboratory).

131. The results of further marine geoarchaeological assessment will be compiled as an archaeological technical report consistent with the methodologies for reporting set out in The Crown Estate (2021) guidance and will form part of the project archive as set out in section 10.5. The final report will integrate the results of review, recording, assessment, analysis and dating. The report will address the palaeoenvironment, prehistory and any other historical periods as relevant (for example, remains of Roman or medieval settlements now on the seabed) of the area affected by the development, including relevant data generated by desk-based assessment and other field investigations, including geophysical surveys. Where necessary, the geophysical data interpretation may need to be re-assessed depending on the findings of the geotechnical assessment. If warranted, publication of the findings will need to be considered depending on the results of the assessment.

5.3 Non-archaeological Diver / ROV Surveys

132. Prior to construction, Remotely Operated Vehicle (ROV) or diver surveys may be undertaken for various non-archaeological purposes such as the refinement of the design parameters/layout, for ecological assessment, UXO investigation and obstruction inspection and/or removal. These diver and / or ROV investigations can also provide the necessary ground-truthing information which may be required to establish the archaeological interest of seabed features seen in the geophysical data.

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

134. To maximise the potential benefits of any proposed non-archaeological diver and / or ROV surveys, the project team will seek archaeological input from the retained archaeologist at the planning stage of any such works. Any such survey specification will be informed by previous stages of the Projects, so that archaeological considerations can be considered.

135. The selection of geophysical anomalies requiring ground truthing/assessment will require consideration of a multitude of factors. There may be a limited number of geophysical anomalies to assess which can easily be incorporated into the scope of planned ROV surveys. A number of geophysical anomalies identified as being of possible archaeological interest may also correspond to anomalies interpreted as potential UXO or obstructions, for example. There is also potential for a large number of anomalies to be present within the footprint of potential impact, necessitating additional consideration to select an appropriate proportion of anomalies, for example, based on the size of the features or on their location within an area of archaeological potential. The specific approach to the selection of anomalies for ground-truthing will be discussed as part of planning for diver and / or ROV surveys by the project teams and retained archaeologist in consultation with the archaeological curator, which will then be captured in an associated method statement.

136. Where the primary objectives of ROV or diver survey are non-archaeological, but may also contribute to archaeological objectives, consideration will be given to having the retained archaeologist (or the archaeological contractor, if appointed), present during the surveys. For example, when surveying sites of archaeological interest or in areas of high archaeological potential the presence of an archaeological specialist may help to optimise archaeological results and thereby reduce the need for repeat survey.

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

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

139. If remains of archaeological interest are identified during diver / ROV surveys, where possible, they will be avoided through the implementation of AEZs (section 6.1). Where archaeological remains cannot be avoided, if remains are small enough (e.g. anchors and other isolated finds) it may be possible to move these outside of the area of impact.

140. If large remains such as a wreck, which cannot be moved, are identified, consultation with the archaeological curator will need to be undertaken as to whether an archaeological diver/ROV-based assessment is required. This would provide additional certainty on the nature and extent of the wreck, to determine whether micrositing to avoid an AEZ would problematic within the Projects parameters, and inform the specification for further mitigation. Any further work will require detailed methodologies to be set out in a method statement, to be agreed with the archaeological curator. Discussions may also need to include the Receiver of Wreck (RoW) and if aircraft, the Ministry of Defence. A clear timeline for consultation and reporting will be set out in each method statement. This will be essential so that sufficient time is allowed for review of information by stakeholders, in order to guide decision making about appropriate mitigation options and for a plan to be agreed prior to the commencement of additional works.

141. The results of diver/ROV assessment will be compiled as an archaeological technical report consistent with the methodologies for reporting set out in The Crown Estate (2021) guidance and will form part of the project archive as set out in section 10. The report will identify those sites and/or geophysical anomalies that are potentially of archaeological interest significance and may warrant further investigation. It will also identify and characterise those sites that are no longer of archaeological interest, and hence may be removed from the list of AEZs or geophysical anomalies of possible archaeological interest, following consultation with the archaeological curators. The applicable digital data, including gazetteers and GIS shapefiles, will be updated by the retained archaeologist and reissued to the project teams and relevant contractors.

5.4 Archaeological Diver / ROV-based Site Assessment

142. Where objectives cannot be met through planned non-archaeological investigations, archaeological diver or ROV-based investigations may be required, where the primary objectives are archaeological, and the diving is led by archaeologists.

143. As above, any planned survey will be carried out in accordance with good practice as set out in The Crown Estate (2021) guidance and the survey methodology will be set out in a method statement, prepared by the retained archaeologist (or the archaeological contractor, if appointed) and agreed between the project team and the archaeological curator.

144. Diver / ROV assessment for archaeological purposes will be directed by an archaeological contractor, with the appropriate expertise and experience of the environment/conditions likely to be encountered.

145. Archaeological diving surveys will comply with the Diving at Work Regulations 1997 and with applicable HSE Approved Codes of Practice (ACOPs). The dive team may include only marine archaeological divers or could comprise an archaeological diver embedded in a dive contractor's team. All divers will have approved commercial diving certification for the work being undertaken, an appropriate level of experience and an in-date medical from an Approved Medical Examiner of Divers (AMED).

146. ROV surveys for archaeological purposes may either be undertaken by a suitably qualified and experienced archaeological contractor with an ROV, or by an archaeologist directing an ROV contractor.

147. Recording will take place in accordance with The Crown Estate (2021) guidance and should be conducted to a level whereby a statement can be made as to the date, character, and extent of archaeological importance of the site, to inform an assessment of archaeological potential.

148. Similar to the approach outlined for non-archaeological surveys above, if a site is determined to be of high archaeological interest but cannot be avoided a plan for additional mitigation will be required, such as the relocation of material and / or full excavation of a site. This work would require a task-specific method statement, to be prepared by the retained archaeologist and / or archaeological contractor through discussions with the project teams and agreed with the archaeological curator. A clear a timeline for the production and review of each method statement will be established so that the plan for mitigation can be agreed and in order to support timely decision-making by all key parties.

149. The results of any archaeological diver / ROV assessment will be compiled as an archaeological technical report consistent with the methodologies for reporting set out in The Crown Estate (2021) guidance and will form part of the project archive as set out in Section 11.5. The report should include any findings that may lead to the alteration of AEZs, as well as a statement of the likely requirements (if any) for further archaeological work.

5.5 Archaeological Watching Briefs

150. As defined in The Crown Estate (2021) guidance, a watching brief is a formal programme of archaeological monitoring that involves attendance by a suitably qualified and experienced archaeologist during groundworks or other site activities / interventions associated with the scheme in the terrestrial or inter-tidal zone, and / or marine activities such as during offshore obstruction clearance (where considered appropriate).

151. Within the intertidal zone, should the short trenchless landfall option be taken forward, a progamme of archaeological monitoring / watching brief may be required during ground works. This requirement would be informed by the results of ground investigations, considered against the depth and area of planned excavations and the risk of encountering deposits with archaeological or geoarchaeological / paleoenvironmental potential.

152. Archaeological monitoring (watching brief) normally takes place where there is considered to be a lower potential of encountering archaeological remains, as part of construction-led ground intrusive works. Where there is demonstrably little to no archaeological remains present it is considered that archaeological monitoring is not required and any unexpected remains would be covered by the Protocol for Archaeological Discoveries (see Section 6.3).

153. Machine excavation would proceed under archaeological observation, but would not be controlled directly by the on-site archaeologist(s). A contingency period would be included in the works programme to allow investigation and recording of archaeological remains that might be identified, disturbed or destroyed.

154. An agreed mechanism would be established to allow for archaeological investigation during the archaeological monitoring works, where appropriate. However, it is not usually anticipated that substantial archaeological remains will be found in areas that have been identified for archaeological monitoring, although the possibility still remains. Should material of archaeological interest be encountered during ground works, a programme of excavation, post-excavation assessment, and analysis, publication and archiving would be required to ensure that any remains are recorded appropriately (preservation by record).

155. Should the results of ground investigations suggest high potential for the presence of sub-surface remains then a full programme of archaeological evaluation / excavation would be required.

156. All programmes of work relating to the requirement for an archaeological watching brief (or evaluation / excavation) would be set out in a method statement prepared by the retained archaeologist in consultation with the archaeological curators (HAP and Historic England. This method statement (or work package specific WSI) would be prepared in accordance with standards and guidance as outlined in the **Volume 8, Outline Onshore WSI (application ref: 8.14)** and well as measures specified in The Crown Estate (2021) guidance and summarised in the Outline WSI (Offshore) (this document).

157. Offshore, should activities be undertaken which may result in disturbance to archaeological remains or remains being brought to the surface (e.g. clearance operations and pre-lay grapnel runs), an archaeological watching brief may be required, comprising on board supervision by a suitably qualified and experienced archaeologist. If areas subject to clearance are considered to be of medium or high archaeological potential, on board monitoring may be required to ensure consideration is given to any archaeological material brought to the surface. In areas of low archaeological potential any material brought to the surface will be dealt with through the PAD as set out in section 6.3.

158. It is anticipated that the archaeological assessment of high-resolution pre-construction geophysical data (section 6.1) will allow for the spatial identification of locations where the risk of encountering unexpected archaeological material is higher. Areas where large sand wave features are present for example, have greater potential for concealing archaeological remains, or areas where greater concentrations of geophysical anomalies of archaeological potential have been recorded. Watching briefs may also be required if micro-siting to avoid seabed and sub-seabed features of potential archaeological interest is not possible.

159. Whilst not common practice offshore, should an on-board watching brief be required, the approach will accord with that set out in The Crown Estate (2021) guidance and will be set out in a method statement prepared by the retained archaeologist in consultation with the archaeological curator. If significant archaeological material or palaeoenvironmental deposits are encountered then the project team will make provision for the retained archaeologist (or the archaeological contractor, if appointed), to undertake a programme of investigation commensurate with the evidence discovered. A timeline for consultation and reporting will be established when planning any such works to ensure sufficient time for review and the provision of advice prior to any additional works commencing.

160. Recording and reporting for any watching briefs, should these be required, will be undertaken in line with the approaches set out in The Crown Estate (2021) guidance and other relevant guidance such as CIfA (2020a) Standards and guidance for an archaeological watching brief.

6 Delivery of Mitigation

6.1 Archaeological Exclusion Zones

161. A total of 43 AEZs have been recommended by Wessex Archaeology within the array areas and 13 within the offshore cable corridor (55 in total) (**Table 6-1**). AEZs have not been recommended for anomalies that have been interpreted as A2s (uncertain origin of possible archaeological interest) although an avoidance strategy with respect to these anomalies has been advised, where possible (section 6.2). The locations of seabed features and A2 anomalies within the Array Areas are illustrated on Figures 2.01 to 2.24 and within the Offshore Export Cable Corridor on Figures 2.10, 2.22 and 2.25 to 2.41 in **Volume 7, Appendix 17-2 (application ref: 7.17.17.2)**.

162. AEZs agreed between the project team and the archaeological curator will be the primary means employed to preserve features or remains of archaeological interest or potential *in-situ*.

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

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

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

166. The position, extent and design of any AEZs, including the size of the buffer, will take into account all available information including geology, hydrology and sediment transport. As most AEZs will not be a standard shape (i.e., they comprise a buffer around the known extents of the site rather than a circle consisting of a centre-point with a radius distance), the AEZs agreed during the consenting process must be supplied as a GIS shapefile. The list of AEZs is 'live' and will be held in the project GIS maintained by the retained archaeologist. At all stages of the Projects, the project team should supply the retained archaeologist (if different from the previous process) and all contractors with the agreed AEZs as shapefile data. In addition, all documentation required for project delivery provided to contractors will include the lists and illustrated locations of AEZs.

167. AEZs recommended on the basis of the pre-consent assessments undertaken to date are listed in **Table 6-1**. The locations of the AEZs within the Array Areas are illustrated on Figures 2.01 to 2.24 and within the Offshore Export Cable Corridor on Figures 2.10, 2.22 and 2.25 to 2.41 in **Volume 7, Appendix 17-2 (application ref: 7.17.17.2)**.

168. Buffers of 25m, 50m and 100m have been recommended as deemed appropriate, based on the relationships between how well constrained the anomaly is, confidence in positioning, and the likelihood of further buried or low lying material that is not currently visible. Anomalies that consist only of point data with uncertain, possibly buried, extents have been attributed a 100m buffer, this includes all A3s and Mag. anomalies. Nine of the anomalies are associated with wrecks and, therefore, have AEZs which are merged with the wider wreck AEZ. For this reason, there are 46 separate AEZs within the Offshore Archaeology Study Area.

Table 6-1 Recommended AEZs within the Offshore Archaeology Study Area

ID	Classification	Easting	Northing	Exclusion Zone
Array Areas				
70006	Wreck (A1)	440339	6028771	50m around visible wreck extent
70019	Wreck (A1)	440388	6037926	100m around visible wreck extent
70018	Debris field	440379	6037905	25m buffer merged with Wreck 70019
70030	Debris field (A1)	438293	6041881	50m around visible feature extents

ID	Classification	Easting	Northing	Exclusion Zone
70051	Magnetic (A1)	435289	6047757	100m centred on reported position
70118	Magnetic (A1)	429045	6050204	100m centred on reported position
70128	Wreck (A1)	430247	6032452	50m around visible wreck extents
70249	Debris field (A1)	412362	6045700	25m buffer merged with Wreck 70252
70251	Debris field (A1)	412413	6045729	25m buffer merged with Wreck 70252
70252	Wreck (A1)	412408	6045711	50m around visible wreck extents
70264	Debris (A1)	411305	6053692	25m centred on reported position
70267	Magnetic (A1)	410130	6056308	100m centred on reported position
70299	Magnetic (A1)	403769	6060507	100m centred on reported position
70348	Debris (A1)	399634	6059714	25m buffer merged with Wreck 70349
70349	Wreck (A1)	399649	6059722	50m around visible wreck extent
70350	Debris (A1)	399662	6059731	25m buffer merged with Wreck 70349
70448	Wreck (A1)	391947	6062989	50m around visible wreck extent
70449	Debris (A1)	391939	6062981	25m buffer merged with Wreck 70448
70004	Recorded wreck (A3)	440393	6028342	100m centred on recorded position
70035	Recorded wreck (A3)	439636	6028351	100m centred on recorded position

ID	Classification	Easting	Northing	Exclusion Zone
70076	Recorded wreck (A3)	435009	6030270	100m centred on recorded position
70107	Recorded wreck (A3)	429831	6038229	100m centred on recorded position
70146	Recorded wreck (A3)	429382	6032307	100m centred on recorded position
70181	Recorded wreck (A3)	422317	6049113	100m centred on recorded position
70211	Recorded wreck (A3)	416966	6051063	10m centred on recorded position
70220	Recorded wreck (A3)	415230	6057336	100m centred on recorded position
70271	Recorded wreck (A3)	412413	6045729	100m centred on recorded position
70286	Recorded wreck (A3)	408249	6057782	100m centred on recorded position
70340	Recorded wreck (A3)	402241	6053486	100m centred on recorded position
70378	Recorded wreck (A3)	398793	6055787	100m centred on recorded position
70419	Recorded wreck (A3)	395549	6055119	100m centred on recorded position
70444	Recorded wreck (A3)	392261	6062897	100m centred on recorded position
70458	Recorded obstruction (A3)	391397	6049161	100m centred on recorded position
70462	Recorded wreck (A3)	393159	6049609	100m centred on recorded position
70463	Recorded wreck (A3)	392061	6049918	100m centred on recorded position

ID	Classification	Easting	Northing	Exclusion Zone
70467	Recorded wreck (A3)	393068	6052579	100m centred on recorded position
70473	Recorded wreck (A3)	392322	6055195	100m centred on recorded position
70474	Recorded wreck (A3)	392635	6057042	100m centred on recorded position
70476	Recorded wreck (A3)	391671	6061703	100m centred on recorded position
70486	Recorded wreck (A3)	388892	6051381	100m centred on recorded position
70491	Recorded wreck (A3)	390126	6053392	100m centred on recorded position
70493	Recorded wreck (A3)	389054	6053603	100m centred on recorded position
70495	Recorded wreck (A3)	390141	6054010	100m centred on recorded position
Offshore Export Cable Corridor				
70571	Debris field (A1)	358909	6033583	50m buffer merged with Wreck 70572
70572	Wreck (A1)	358904	6033574	50m buffer around current feature extent
70573	Debris field (A1)	358906	6033568	50m buffer merged with Wreck 70572
70574	Debris (A1)	358875	6033584	25m buffer merged with Wreck 70572
70627	Debris (A1)	333923	6009726	25m buffer merged with Wreck 70628
70628	Wreck (A1)	333909	6009714	50m buffer around current feature extent

ID	Classification	Easting	Northing	Exclusion Zone
70774	Wreck (A1)	292143	5987147	100m buffer around current feature extent
70534	Recorded wreck (A3)	380150	6036054	100m around recorded position
70555	Recorded wreck (A3)	372484	6042818	100m around recorded position
70599	Magnetic (A1)	346370	6022437	100m around recorded position
70644	Recorded wreck (A3)	405957	6034121	100m around recorded position
70653	Recorded wreck (A3)	308058	5993801	100m around recorded position
70659	Recorded wreck (A3)	305470	5991998	100m around recorded position

169. As set out in The Crown Estate (2021) guidance, AEZs may be altered (enlarged, reduced, moved or removed) as a result of further data assessment or archaeological field evaluation covering those areas that are subject to AEZs. If new finds of potential archaeological significance come to light during the assessment of marine geophysical data, during the course of construction, or during operation or decommissioning phases, for example, as reported through the PAD (section 6.3), they may be subject to the Implementation of a Temporary Exclusion Zone (TEZ). A TEZ which will prevent impact to the seabed within their extents but allow activities in other areas to continue. The need for and the design (position, extent) and implementation of any new exclusion zones (TEZs, which may be formalised and converted to AEZs), or any alterations to existing AEZs, will be subject to discussions between the retained archaeologist and the project team, and in consultation with the archaeological curator, confirmed with a formal response. Following alteration, a new plan giving details of the AEZs will be drawn up and issued to each relevant party.

6.2 Avoidance or Further Mitigation

170. Following completion of the archaeological assessment of geophysical data and identification of any further AEZs, it may be possible for the Projects to microsite the components of the transmission and generation assets to avoid AEZs and any other geophysical anomalies of archaeological potential. This would apply to foundations, cables, legs of jack-up crane vessels and/or anchors of other vessels. These footprints will likely correspond to areas which will require As Low as Reasonably Practicable (ALARP) certification for risks associated with UXO.

171. Recommendations for micrositing will be discussed by the retained archaeologist with the Projects design teams and following completion of the pre-construction archaeological assessments (section 5.1).

172. If it is not possible for the Projects to avoid geophysical anomalies of archaeological potential through micrositing of the design, further assessment will need to be undertaken to confirm the character and archaeological interest of anomalies. This will comprise a strategy for further investigation (ground-truthing) as set out in section 5.3 and section 5.4. Ground truthing may also be required in order to clarify the extent of a site in order to alter (enlarge, reduce, move or remove) AEZs as set out in section 6.1.

173. Palaeogeographic features such as palaeochannels do not require AEZs or avoidance, but rather potential impacts are mitigated and offset through further assessment of existing material or further investigation, for example through geoarchaeological assessment as set out in section 5.2.

6.3 Protocol for Archaeological Discoveries

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

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

- Pre-construction surveys, for example:
    - Obstructions on the seabed encountered during geotechnical surveys or grab sampling;

  - Archaeological material within cores or grab samples; or
  - Seabed features identified during diver or ROV surveys.
- Seabed clearance, pre-lay grapnel runs (e.g. finds brought to the surface);
- Vessel anchoring (e.g. anchor caught on obstruction);
- Installation of cables (e.g. obstruction interactions with plough/trencher for example); and
- Installation of foundations (e.g. obstruction interactions with jack-up legs).

176. This protocol will apply to pre-construction, construction and installation and O&M activities where an archaeologist is not present on site. It allows for the effective reporting of discoveries of archaeological material to ensure that advice, concerning measures to address discoveries, is received, and implemented, in a timely and efficient manner.

177. Under ORPAD, each vessel or worksite team has a Site Champion, a single person who is responsible for reporting discoveries to a Nominated Contact within the project team. The Nominated Contact will report any new discoveries to the retained archaeologist or an archaeological contractor engaged to implement the protocol.

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

179. The project team will be responsible for ensuring that teams are provided with appropriate training in the application of the protocol and that all staff and contractors are aware of their responsibilities under the protocol. The protocol documentation, including a full description of the methodology and requirements for implementing the protocol will mirror that of the ORPAD (The Crown Estate, 2014).

180. To ensure the effectiveness of the protocol, relevant project staff and contractors should receive protocol awareness training, in the form of a survey start-up briefing or a toolbox talk, in order to:

- Understand their role in the process;
- Recognise finds of archaeological potential;
- Understand how to record them; and
- Be aware of the reporting process.

181. Provision will be made by the project team, in accordance with the protocol, for the prompt reporting/recording to the archaeological curators of archaeological remains encountered or suspected during works.

182. If the find is a wreck within the meaning of the Merchant Shipping Act 1995, then a report will also be made to the Receiver of Wreck. If the find is treasure within the meaning of the Treasure Act 1996 then a report will also be made to the Coroner.

183. Following completion of the construction phase, a report will be prepared presenting the results of the protocol implementation during activities. In the event that no discoveries are made, a nil discoveries report should be compiled in order to demonstrate adherence to the scheme.

6.4 Data Sharing and Research Objectives

184. Recent studies have acknowledged that strategic analysis would facilitate greater understanding of the cumulative effects of multiple constructed and planned projects but that often a lack of data makes such assessments impossible (Office for Environmental Protection, 2023). For example, despite the significant data for offshore archaeology and cultural heritage that is being produced through the consenting process, the extents of seascapes / palaeolandscapes remain largely unmapped.

185. Whilst analysis at a strategic level is beyond the scope of an individual project, the contribution of publicly available data from the Projects does have the potential to contribute to the ongoing industry wide build-up of data which would form the basis for such a study. Similarly, although DBS East and DBS West are within the United Kingdom's (UK's) Exclusive Economic Zone (EEZ), any data acquired and archaeologically assessed as part of the Projects also has the potential to feed into wider research objectives initiated by neighbouring EEZs in the North Sea (transboundary effects).

186. Research agendas and academic research, focussing on the marine historic environment of the North Sea, have gained considerable momentum in recent decades, with data acquired from development-led investigations increasingly considered to represent a significant opportunity to enhance our understanding of the archaeology and cultural heritage resource in offshore contexts. Examples include (but are not limited to):

- People and the Sea: A Maritime Research Agenda for England (Ransley *et al.*, 2013);
- Europe's Lost Frontiers (https://lostfrontiers.teamapp.com) and Taken at the Flood (Research led by Professor Vince Gaffney, University of Bradford);
- Submerged Palaeolithic Archaeology of the North Sea (Research led by Dr Rachel Bynoe, University of Southampton);

- Unpath'd Waters (https://unpathd.ads.ac.uk) and the forthcoming National Marine Heritage Record (Historic England);
- Research using development data to map palaeolandscapes such as 'Ice sheet and palaeoclimate controls on drainage network evolution: an example from Dogger Bank, North Sea' (Emery *et al.* 2020); and
- North Sea Prehistory Research and Management Framework (available online at: https://researchframeworks.org/nsprmf).

187. The Research Agenda set out in the North Sea Prehistory Research and Management Framework includes questions directly relating to opportunities for improved archaeological works and management including, including dissemination of data and realising public benefit. The Research Agenda also includes a specific strategy for collaborative approaches to investigating the prehistoric resource and specifies a requirement for the:

- "C4. Development of stronger connections between the university, museum and development-led sectors that promote sharing of both interpretative and methodological findings and developments".

188. To this end, should DBS be granted consent, the approach to realising the public benefit of data sharing, and to the creation of joined-up objectives for post-consent investigation and mitigation, including links with academic and industry wide research initiatives, will be established post-consent in consultation with key stakeholders, including Historic England.

189. For example, a series of ongoing geoarchaeological and marine geophysical assessments being undertaken for the consented Dogger Bank A, Dogger Bank B, Dogger Bank C and Sofia offshore wind farms, are providing high resolution maps of the extensive prehistoric landscape (Wessex Archaeology, 2020) and palaeoenvironmental assessment and dating of deposits from wetland, riverine, lake and coastal environments (Wessex Archaeology, 2022). Should the results of assessment for DBS have relevance to such studies then opportunities to explore data/information sharing will be explored.

190. Similarly, opportunities will also be explored to contribute to initiatives such as the Unpath'd Waters project led by Historic England, a research project that aims to unite the UK's maritime collections, and the Taken at the Flood project, led by the University of Bradford, which is investigating the methodological approaches to finding prehistoric archaeology offshore.

7 Post-construction Monitoring

191. Post-construction monitoring will be required in order in order to monitor the effectiveness of AEZs and to assess the effects of any direct or indirect impacts that may have occurred to heritage assets as a result of the wind farm construction. As stated in The Crown Estate guidance, monitoring for post-construction "*could comprise an archaeological assessment of post-construction geophysical survey data and review of the final layout of turbine foundations or anchors, foundations for associated infrastructure (such as the offshore substation platform and any met masts), cables and positioning records of vessel jack up legs or anchors*" (The Crown Estate, 2021: 16).

192. **Volume 8, In Principle Monitoring Plan (application ref: 8.23)** has been prepared for the Projects in order to provide a framework to agree the exact detail for monitoring requirements (e.g. timings and methodologies) with the MMO, in consultation with relevant parties (e.g. Historic England) post consent. The agreed plans will make reference to the WSI as the primary mechanism for the delivery of monitoring for offshore archaeology.

193. Following completion of the construction phase, advice from the retained archaeologist will be sought in planning the post-construction survey to ensure that archaeological objectives are taken into account. The archaeological assessment of the post-construction geophysical survey data, relative to the baseline data, will be undertaken by suitably qualified, experienced archaeological geophysicists in line with the general approaches set out in The Crown Estate guidance and outline in section 5.1 above.

194. The timescales and approach to delivery will be discussed in consultation with the project team and the archaeological curators and set out in a method statement for agreement with the archaeological curators. The work will likely include monitoring of AEZs, as well as areas of high archaeological potential, areas of scour, or other areas of interest identified through the pre-construction, baseline surveys.

195. In the event that no effects are identified, post-construction monitoring may be limited to a single phase of survey and assessment immediately following construction. However, should the potential for effects be considered longer term, the duration of monitoring will be consistent with the timeframe for monitoring processes (e.g., sediment transport) that have been identified as having possible indirect archaeological impacts.

8 Operations and Maintenance and Decommissioning Activities

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

197. The approach to mitigation during these phases will be set out in method statements as relevant to that phase, prepared by the retained archaeologist and taking account of best practice and industry standard guidance at that time. It is anticipated that the primary form of mitigation will be through the retention of agreed AEZs (section 6.1) throughout the project lifetime. The PAD (section 6.3) will also continue to apply during O&M and decommissioning to deal with any unexcepted discoveries. In addition, as stated in The Crown Estate (2021) guidance, during the O&M phase, monitoring of AEZs should be undertaken if it becomes apparent that O&M activities that could impact the seabed have taken place within any AEZ.

198. The construction project team will ensure that the O&M project team and any contractors have received the latest data regarding AEZs and features of archaeological potential. Where AEZs have not been recommended for features assigned an A2 archaeological discrimination rating, and which were not investigated as part of planned ROV investigations, continued avoidance of these features by micro-siting is recommended if they are proposed to be directly impacted by O&M activities (i.e. anchoring or placement of jack-up feet). Following review of the post-construction monitoring data, an updated gazetteer of anomalies will be provided to contractors to inform this continued avoidance throughout the O&M phase.

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

9 Archaeological Recording, Samples and Artefacts

200. As required by The Crown Estate (2021) guidance, archaeological recording and assessment of samples and artefacts should be undertaken with the goal of addressing objectives set out in published research frameworks, for example, local research frameworks and research frameworks for specific periods or specialisms (such as those listed in section 1.3)

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

- Indexing and recording systems;
- Position-fixing and levelling;
- Environmental sampling strategies;
- Environmental samples: handling, labelling, packaging and storage;
- Artefacts: handling, labelling, packaging and storage;
- Ordnance;
- Human remains;
- Aircraft;
- Wreck; and
- Materials conservation and storage.

202. Any archaeological remains or environmental samples that are found during activities associated with the Projects will be treated in accordance with this guidance and best practice as set out, for example, in:

- Standards and guidance for the collection, documentation, conservation and research of archaeological materials (CIfA, 2020c);
- Environmental Archaeology (English Heritage, 2011); and
- First Aid for Underwater Finds (Robinson, 1998).

203. Isolated discoveries of artefacts that may come to light during the course of the development will be dealt with through the Protocol for Archaeological Discoveries as set out in section 6.3.

204. Each method statement for activities where archaeological materials might be encountered will set out the approach to recording and dealing with samples and artefacts as relevant for each work package based on all relevant and specific guidance and best practice. A general summary of key requirements is included below.

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

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

207. Recovered objects will be selected, retained, or disposed of in accordance with the policy agreed with the institution receiving the archive, and in consultation with the archaeological contractors.

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

209. If human remains are identified, they should be treated with due care and respect. For each situation, the following actions are to be undertaken and, in any event, the retained archaeologist will inform the project team and the archaeological curators.

210. For human remains on land and in intertidal areas the processes specified in the DCO will be followed.

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

212. Where practical, the human remains will be left *in-situ*, covered, and protected. Where human remains have been found and development will unavoidably disturb them, the remains will be fully recorded, excavated, and removed from the site only once the appropriate licence has been obtained. An appropriate Human Skeletal Biologist will, if required, be available to advise on and assist with the recovery and storage of human remains. The excavation, recording, analysis and storage of any human remains will be undertaken in line with the Guidelines to the Standards for Recording Human Remains (Mitchell and Brickley, 2017) and follow best practice as appropriate (BABAO, 2019; English Heritage, 2004; 2013; McKinley and Roberts, 1993).

213. With regard to the remains of crashed aircraft, the majority of aircraft wrecks are military and so fall under the legal protection of the Protection of Military Remains Act 1986 and would have to be avoided without a licence. Any finds that are suspected of being military aircraft will be reported immediately to the retained archaeologist.

214. In the case of a military aircraft being investigated under licence, any human remains will be reported immediately. For isolated items of aircraft reported through the protocol for archaeological discoveries, advice can be provided by the retained archaeologist, as set out in section 7.2.

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

216. All recovered materials will be subject to a conservation assessment to determine whether special measures are required while the material is being held. This conservation assessment will be carried out by the retained archaeologist or an archaeological contractor with an appropriate level of expertise, with advice from appropriate specialists.

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

10 Data management, Reporting, Publication and Archiving

10.1 Data Management

218. All data management will take place in accordance with the approaches set out in:

- The Crown Estate (2021) guidance;
- CIFA Dig Digital (2019) guidance on digital archives; and
- Project specific data management requirements specified by the project team and as advised by their retained archaeologist.

219. The retained archaeologist has overall responsibility for all matters related to archaeological data management. Issues regarding data storage and management, such as how long and in what format data should be stored, will be confirmed through discussions between the retained archaeologist and the project team. Should a different retained archaeologist be appointed for different stages of a project, the project team should ensure that all relevant data is provided to the new retained archaeologist (for example, shapefiles of AEZs, geophysical anomalies of archaeological potential, areas of high archaeological potential, etc.).

220. On completion of scheme construction, the retained archaeologist will produce an Online Access to the Index of Archaeological Investigations (OASIS) form for the whole scheme, and copies of all archaeological reports will be attached. When the OASIS form is submitted, it is automatically sent to the relevant HERs, and notification is also sent to the archaeological curators, so that they may advise the respective competent authority on compliance with relevant consent conditions.

10.2 Reports

221. Each package of work outlined in the WSI will give rise to one or more archaeological reports, as set out in the method statement relating to the work. This could include:

- Archaeological assessment of marine geophysical data;
- Marine geoarchaeological assessment;
- Investigations using divers / ROVs;
- Archaeological watching briefs;
- Further investigation / mitigation in the event that micrositing is not possible; or
- The application of, and any discoveries reported through, the PAD.

222. Each archaeological report will be consistent with the final Offshore WSI, and The Crown Estate (2021) guidance on reporting, and will demonstrate sufficient planning, recording and data management, with a commitment to archiving and the public dissemination of results. The report will satisfy the method statement for the investigation and will present the project information in sufficient detail to allow interpretation without recourse to the project archive.

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

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

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

225. On completion of archaeological works relating to construction of the scheme and to a timetable agreed with the project team and the archaeological curators, an overarching report on the archaeology of the scheme will be prepared in draft and final copies in accordance with the methods set out above. The overarching report should serve as an index to, and summary of, the archaeological investigations as a whole.

10.3 Post-fieldwork Assessment

226. Where required, provisions will be made for post-fieldwork assessment. This will address where possible, the character, extent, date, integrity, state of preservation and relative quality of any archaeological features or remains that are recorded. Costs will be provided for any further research, analysis, publication, and archiving.

227. Decisions regarding the scope of post-fieldwork assessment will be made by agreement between the project team and the archaeological curator following submission of investigation reports, based on the possible importance of the results in terms of their contribution to archaeological knowledge, understanding or methodological development.

228. As a minimum, a single assessment may be carried out after the works associated with the scheme have been completed. Such an assessment may be carried out by expanding the overarching archaeological report to include proposals in respect of analysis, publication, and archiving.

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

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

10.4 Analysis and Publication

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

231. It is also recognised that the results of archaeological works have the potential to generate significant public interest. Depending upon the significance of the results consideration will also be given to implementing a programme of public outreach. For example, this could include popular publications, engagement events, web pages and a dynamic social media presence. A programme of public outreach and community engagement is similarly proposed in the **Volume 8, Outline Onshore WSI (application ref: 8.14)**. Opportunities to integrate both onshore and offshore archaeology in this programme would be explored.

232. The retained archaeologist should confirm the timeframe for the distribution and/or publishing of results, including public outreach, in consultation with the project team and the archaeological curators, and this should be included in the WSI or method statement, as appropriate.

10.5 Archive

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

- Standard and guidance for the creation, compilation, transfer and deposition of archaeological archives (CIfA 2014b);
- Environmental Guidelines for the Permanent Storage of Excavated Material from Archaeological Sites (Institute of Conservation, 1984); and
- Guidelines for the preparation of excavation archives for long-term storage (Walker, 1990).

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

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

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