NORTH FALLS

Offshore Wind Farm

ENVIRONMENTAL STATEMENT

Chapter 16 Offshore and Intertidal Archaeology and Cultural Heritage

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Glossary of Acronyms

AEZ	Archaeological Exclusion Zones
BP	Before Present
CIfA	Chartered Institute of Archaeologists
CEA	Cumulative Effects Assessment
CHIA	Cultural Heritage Impact Assessment
CITiZAN	Coastal and Intertidal Zone Archaeology Network
DCO	Development Consent Order
Defra	Department for the Environment, Food and Rural Affairs
DESNZ	Department for Energy Security and Net Zero
DLUHC	Department for Levelling Up, Housing and Communities
EEA	European Economic Area
EEZ	Exclusive Economic Zone
EIA	Environmental Impact Assessment
EPP	Evidence Plan Process
ES	Environmental Statement
ETG	Expert Topic Group
GBS	Gravity Base Structure
GIS	Geographical Information System
HDD	Horizontal Directional Drilling
HER	Historic Environment Record
HSC	Historic Seascape Characterisation
HVAC	High-Voltage Alternating Current
HVDC	High-Voltage Direct Current
IEMA	Institute of Environmental Management and Assessment
IHBC	Institute of Historic Building Conservation
IPMP	In-Principle Monitoring Plan
JNAPC	Joint Nautical Archaeology Policy Committee
km	Kilometre
MBES	Multibeam Echosounder
MHWS	Mean High Water Springs
MLWS	Mean Low Water Springs
MIS	Marine Isotope Stage
MMO	Marine Management Organisation
MPS	Marine Policy Statement
NFOW	North Falls Offshore Wind Farm Limited
NHLE	National Heritage List for England
NMHR	National Marine Heritage Record
NPPF	National Planning Policy Framework
NPS	National Policy Statement

NSIP	Nationally Significant Infrastructure Project
OCP	Offshore Converter Platform
ORPAD	Offshore Renewables Protocol for Archaeological Discoveries
OSP	Offshore Substation Platform
OWF	Offshore Wind Farm
PAD	Protocol for Archaeological Discoveries
PEIR	Preliminary Environmental Information Report
PPG	Planning Practice Guidance
ROV	Remote Operated Vehicle
SBP	Sub-bottom Profiler
SSS	Sidescan Sonar
UKHO	United Kingdom Hydrographic Office
UXO	Unexploded Ordnance
WSI	Written Scheme of Investigation
WTG	Wind Turbine Generator

Glossary of Terminology

Array area	The Offshore Wind Farm area, within which the wind turbine generators, array cables, platform interconnector cable, offshore substation platform(s) and/or offshore converter platform will be located.
Array cables	Cables which link the wind turbine generators with each other, the offshore substation platform(s) and / or the offshore converter platform.
Aviation archaeology	The remains of crashed aircraft and archaeological material associated with historic aviation activities.
Evidence Plan Process (EPP)	A voluntary consultation process with specialist stakeholders to agree the approach, and information to support, the EIA and HRA for certain topics.
Expert Topic Group (ETG)	A forum for targeted engagement with regulators and interested stakeholders through the Evidence Plan Process (EPP).
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 corresponds 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 drill (HDD)	Trenchless technique to bring the offshore cables ashore at the landfall. The technique will also be used for installation of the onshore export cables at sensitive areas of the onshore cable route.
Landfall	The location where the offshore export cables come ashore at Kirby Brook.
Marine isotope stage	Marine isotope stages are alternating warm and cool periods in the Earth's paleoclimate, deduced from oxygen isotope data reflecting changes in temperature derived from data from deep sea core samples.
Maritime archaeology	The remains of boats and ships and archaeological material associated with prehistoric and historic maritime activities.
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.
Neolithic	4000 to 2000 BC Constituting the final stage of the Stone Age, it was preceded by the Mesolithic and followed by the Bronze Age.
North Falls	North Falls Offshore Wind Farm, including all onshore and offshore infrastructure.
Offshore cable corridor	The corridor of seabed from array area to the landfall within which the offshore export cables will be located.
Offshore converter platform	Should an offshore connection to a third party High-Voltage Direct Current (HVDC) cable be selected, an offshore converter platform would be required. This is a fixed structure located within the array area, containing High Voltage Alternative Current (HVAC) and HVDC electrical equipment to aggregate the power from the wind turbine generators, increase the voltage to a more suitable level for export and convert the HVAC power generated by the wind turbine generators into HVDC power for export to shore via a third party HVDC cable.
Offshore export cables	The cables which bring electricity from the offshore substation platform(s) to the landfall, as well as auxiliary cables.
Offshore project area	The overall area of the array area and the offshore cable corridor.

Offshore substation platform(s)	Fixed structure(s) located within the array area, containing HVAC electrical equipment to aggregate the power from the wind turbine generators and increase the voltage to a more suitable level for export to shore via offshore export cables.
Onshore export cables	The cables which take the electricity from landfall to the onshore substation. These comprise HVAC cables and auxiliary cables, buried underground.
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.
Platform interconnector cable	Cable connecting the offshore substation platforms (OSP); or the OSP and offshore converter platform (OCP)
Offshore Preliminary Environmental Information Report (PEIR) boundary	The boundary encompassing the offshore cable corridor and array area, as considered within the PEIR.
Safety zones	A marine zone outlined for the purposes of safety around a possibly hazardous installation or works / construction area
Scour protection	Protective materials to avoid sediment being eroded away from the base of the wind turbine generator foundations and offshore substation platform (OSP) or / and offshore converter platform (OCP) foundations as a result of the flow of water.
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.
Study area	Area where potential impacts from the Project could occur, as defined for each individual EIA topic.
The Applicant	North Falls Offshore Wind Farm Limited (NFOW).
The Project or 'North Falls'	North Falls Offshore Wind Farm, including all onshore and offshore infrastructure.
Wind turbine generator (WTG)	Power generating device that is driven by the kinetic energy of the wind

16 Offshore and Intertidal Archaeology and Cultural Heritage

16.1 Introduction

1. This chapter of the Environmental Statement (ES) considers the likely significant effects of the North Falls Offshore Wind Farm (OWF) (hereafter 'North Falls' or 'the Project') on offshore archaeology and cultural heritage. The chapter provides an overview of the existing environment for the proposed offshore project area, followed by an assessment of the likely significant effects and associated mitigation for the construction, operation, maintenance and decommissioning phases of the Project.

2. This chapter has been written by Royal HaskoningDHV, with the assessment undertaken with specific reference to the relevant legislation and guidance, of which the primary sources are the National Policy Statements (NPS). Details of these and the methodology used for the Environmental Impact Assessment (EIA) and Cumulative Effects Assessment (CEA) are presented in Section 16.4. Impacts to offshore archaeology and cultural heritage are assessed with reference to Principles of Cultural Heritage Impact Assessment (CHIA) in the UK, jointly authored by the Institute of Environmental Management and Assessment (IEMA), the Institute of Historic Building Conservation (IHBC) and the Chartered Institute of Archaeologists (CIfA) and published in July 2021. The relationship between these principles and the overarching approach to EIA is described in Section 16.4.3.

3. The assessment should be read in conjunction with the following linked chapters (Volume 3.1):

   - ES Chapter 8 Marine Geology, Oceanography and Physical Processes (Document Reference: 3.1.10); and
   - ES Chapter 25 Onshore Archaeology and Cultural Heritage (Document Reference: 3.1.27).

4. Additional information to support the offshore archaeology and cultural heritage assessment includes:

   - ES Appendix 16.1 Archaeological assessment of geophysical data (Document Reference: 3.3.17).

16.2 Consultation

5. Consultation with regard to offshore archaeology and cultural heritage has been undertaken in line with the general process described in ES Chapter 6 EIA Methodology (Document Reference: 3.1.8). The key elements to date have included Scoping Opinion, consultation on the Preliminary Environmental Information Report (PEIR) and the ongoing technical consultation via the Archaeology and Cultural Heritage Expert Topic Group (ETG). The approach to assessment was set out in a method statement for archaeological and cultural heritage and issued to Historic England and Essex County Council. The feedback received has been considered in preparing the ES. Additionally, the draft Outline Written Scheme of Investigation (WSI) (Offshore) (Document

Refence: 7.11) was shared with Historic England and the submitted version has been updated to take account of their comments. Table 16.1 provides a summary of how the consultation responses received to date have influenced the approach that has been taken.

6. This chapter has been updated following the consultation on the PEIR in order to produce the final assessment that will be submitted with the Development Consent Order (DCO) application.

Table 16.1 Consultation responses

Consultee	Date / Document	Comment	Response / where addressed in the ES
Archaeology and Cultural Heritage ETG	06/07/2021 Meeting Minutes	Historic England suggested that Rachael Bynoe (Southampton University) and colleagues have undertaken a study around Clacton which would be of relevance.	The Historic England research project Investigating the Submerged Pleistocene Landscapes of the Wallet, off Clacton (Bynoe, 2017) is discussed in Section 16.4.1.
Archaeology and Cultural Heritage ETG	06/07/2021 Meeting Minutes	Historic England suggested accessing the 'CITiZAN' survey database, which has some recent points around Clacton.	The Coastal and Intertidal Zone Archaeology Network (CITiZAN) coastal map shows no newly recorded finds within the study area although reports of faunal remains from the adjacent beaches are referenced in Section 16.4.1.
Archaeology and Cultural Heritage ETG	06/07/2021 Meeting Minutes	With respect to planned geophysical surveys Historic England suggested that the 70m line spacing is broad for archaeological features and queried if there would be further opportunities to acquire additional data.	The geophysical data is considered to provide an accurate characterisation of the archaeological potential of the study area, appropriate to the purposes of EIA. A commitment to the acquisition, and assessment, of further high resolution geophysical data post-consent is set out in the Outline WSI (Offshore) (Document Refence: 7.11).
Archaeology and Cultural Heritage ETG	06/07/2021 Meeting Minutes	Historic England requested that if a geoarchaeology survey is planned, can North Falls Offshore Wind farm Limited (NFOW) provide an opportunity for specialists to view borehole cores rather than just bagged samples.	Access to cores (rather than bagged samples) forms part of the approach to geoarchaeological assessment set out in the Outline WSI (Offshore) (Document Refence: 7.11).
Archaeology and Cultural Heritage ETG	06/07/2021 Meeting Minutes	Places Services suggested that a walkover survey at the landfall would be essential.	A site visit at the landfall was undertaken on 5th October 2022 (see Section 16.4.3).
Archaeology and Cultural Heritage ETG	06/07/2021 Meeting Minutes	Historic England queried whether the visual impact upon onshore built heritage assets from the offshore infrastructure will be assessed.	The visual impact of offshore infrastructure on onshore built heritage assets is assessed in ES Chapter 25: Onshore Archaeology and Cultural Heritage (Document Reference: 3.1.27).
Historic England	12/08/2021 Scoping Opinion	To assist any further planning of the proposed NFOW project we offer the following link to the Historic England Advice Note 15 Commercial Renewable Energy Development and the Historic Environment (2021): https://historicengland.org.uk/images-books/publications/commercial-renewable-energy-development-historic-environment-advice-note-15/	The approach to assessment and mitigation presented in this chapter is in line with Historic England Advice Note 15 which is referenced in Section 16.3.1.2.3.

Consultee	Date / Document	Comment	Response / where addressed in the ES
Historic England	12/08/2021 Scoping Opinion	Para. 342 acknowledges this discovery of different elements of the historic environment of "potential archaeological interest" associated with Greater Gabbard and Galloper OWF. It is apparent that as well as potential, these developments have encountered archaeological materials of identifiable interest and significance.	North Falls is considered against other projects in terms of a regional understanding of archaeological potential as part of the CEA in Section 16.7
Historic England	12/08/2021 Scoping Opinion	The attention to detail in para. 343 is noted in reference to palaeoenvironmental interest known to exist in the coastal margin. We note the use of Figure 2.14 derived from United Kingdom Hydrographic Office (UKHO) wreck records, which we acknowledge provides a degree of historic characterisation. However, in consideration of the location of this development, in the outer Thames estuary, it is to be anticipated that a considerable number of older wrecks, presently unknown, may also exist and not qualified as 'wreck' within UKHO data. We add also the legacy of presently unknown aircraft wrecks and highly fragmentary remains will also require attention.	The potential for previously undiscovered wrecks and aircraft is assessed in Section 16.4.2.
Historic England	12/08/2021 Scoping Opinion	We concur with the approach to data collection (as set out in Section 2.11.2). Para. 346 mentions that "…if any geotechnical investigations are completed the samples will be made available for geoarchaeological assessment." However, it is essential that maximum value is obtained from any such analysis and we must therefore recommend that geo-archaeological considerations and requirements are built into the planning of any geotechnical survey campaign. For example, providing isolated physical "samples" are likely to be of limited use compared with having direct access to geotechnical core material on extraction and at time of cutting and prior to any destructive testing.	A commitment to seeking the advice of an archaeologist / geoarchaeologist in planning future surveys is set out in the Outline WSI (Offshore) (Document Refence: 7.11). This will ensure that geoarchaeological objectives are incorporated into planned geotechnical campaigns.
Historic England	12/08/2021 Scoping Opinion	Table 2.1 and 2.2 include important details about presently available geophysical and geotechnical data and what survey campaigns are planned in 2021 to inform the planning of NFOW. We would add that knowledge and understanding about the presence of palaeoenvironmental sedimentary sequences and prehistoric landscape features as may occur within or beneath the contemporary seabed can also support interpretation used for cultural heritage assessment exercises. We would also recommend that the line spacings used in the different geophysical campaigns are considered, and so we are pleased to see that it is stated in	An assessment of the interpreted palaeolandscape features and palaeoenvironmental potential is discussed in Section 16.4.1. The geophysical data is considered to provide an accurate characterisation of the archaeological potential of the study area, appropriate to the purposes of EIA. A commitment to the acquisition, and assessment, of further high resolution geophysical data post-consent is set out in the Outline WSI (Offshore) (Document Refence: 7.11).

Consultee	Date / Document	Comment	Response / where addressed in the ES
		Section 2.11.2 (paragraph 346) that the survey work will be carried out in accordance with the Historic England document 'Marine Geophysics' (2013).	
Historic England	12/08/2021 Scoping Opinion	We note the detail provided in Section 2.11.3 (potential impacts) at all project stages construction, operation and decommissioning and in consideration of other plans or projects. We, therefore, agree with Table 2.28 (summary of impacts) and the statement made in para. 363 about the effects to be scoped into the EIA for all phases of the proposed NFOW project. We also agree with the detail provided in Section 2.11.4 (approach to assessment).	Noted (see Section 16.5).
Historic England	12/08/2021 Scoping Opinion	The identification of inter-relationships is recognised with reference to offshore archaeology and cultural heritage and marine geology (Section 2.14, Table 2.32), which should enable the preparation of any PEIR to fully evaluate the physical environment within which archaeological materials may be encountered.	Noted (see Section 16.10).
Historic England	12/08/2021 Scoping Opinion	By following planning policy and guidance we would expect the Project to be creative in how it might offer opportunities for the enhancement of heritage assets, and how the Project might deliver public (heritage) benefit. The Environmental Statement (ES) should aim to make clear public heritage benefits and outreach as part of planned mitigation.	Opportunities to enhance understanding of offshore heritage assets are discussed in Sections 16.5.1.2.3 and 16.7.3.1.
Historic England	12/08/2021 Scoping Opinion	We would advise the ES should put forward proposals for the use, display and interpretation of archaeological evidence that will be revealed by the development and to provide enhancement to heritage assets and secure wide heritage benefits as part of the Project and we would be pleased to provide advice about potential heritage schemes.	
Planning Inspectorate	26/08/2021 Scoping Opinion	Section 2.11.3.5 Para 361 Indirect physical transboundary effects during operation and decommissioning. The Applicant proposes to scope out indirect effects on marine physical processes (marine geology and oceanography) in the offshore archaeology and cultural heritage chapter on the basis that this was considered to be not significant as a result of the GOWF in	Noted (see Section 16.8).

Consultee	Date / Document	Comment	Response / where addressed in the ES
		2011, which would be closer to the Exclusive Economic Zone (EEZ) boundary than the Proposed Development. The Inspectorate agrees that given the distance from the EEZ boundary it is unlikely that there will be a pathway for likely significant effects and this matter can be scoped out of the ES.	
Planning Inspectorate	26/08/2021 Scoping Opinion	Section 2.11.1 Para 340 Receptors to be assessed. The Inspectorate considers there is insufficient information in the Scoping Report to establish the extent of the study area and type of receptors that will be assessed in the ES. The ES should demonstrate the rationale behind the choice of receptors with reference to the choice of study area. The Applicant should make effort to agree the approach with the relevant consultation bodies.	The choice of study area with respect to offshore archaeology and cultural heritage is described in Section 16.2.1 and was described within the agreed method statement for Historic England 'EIA Methodology for Archaeology and Cultural Heritage' (18/06/2021).
Planning Inspectorate	26/08/2021 Scoping Opinion	Table 2.28 Section 2.11.4 Approach to assessment. The ES should describe the study area that has been used to determine direct and indirect effects on cultural heritage and archaeological receptors that are assessed. This should be supported by appropriate figures. The reasons for the selection of the study area should be explained. Please also see the Inspectorate's comments in Section 3.3.2 of this Scoping Opinion.	The study area for offshore archaeology and cultural heritage is defined as the offshore project area, including the intertidal zone at the landfall up to Mean High Water Springs (MHWS) (Section 16.2.1). This study area corresponds to the footprint within which development activities could occur and, consequently, is considered appropriate for the assessment of potential impacts to the offshore archaeology and cultural heritage existing environment.
Planning Inspectorate	26/08/2021 Scoping Opinion	Section 2.11.4 Approach to assessment. The ES should describe how aspect – specific likely significant effects have been assessed and determined, with reference to the over– arching methodology presented in Section 1.8.2 of the Scoping Report. The ES should be clear on how any conclusions of significance have therefore been reached for the offshore cultural heritage and archaeology assessment taking into relevant guidance and an aspect – specific methodology where this is relevant.	The approach to the assessment of significance is set out in Section 16.3.

Consultee	Date / Document	Comment	Response / where addressed in the ES
Planning Inspectorate	26/08/2021 Scoping Opinion	Section 2.11.4 Relevant guidance. The Applicant should have regard to the following additional guidance to consider where further investigation is required to inform the assessment, in discussion with the relevant consultation bodies: Archaeological Written Schemes of Investigation for OWF Projects, The Crown Estate, July 2021.	The approach to mitigation presented in this chapter is in line with Archaeological Written Schemes of Investigation for OWF Projects, which is referenced in Section 16.3.1.2.3.
Essex County Council	14/07/2023 PEIR Consultation Response Letter	Chapter 25 Onshore Archaeology and Cultural Heritage The offshore cable corridor will run through an area of seabed that was a large swathe of dryland during the Pleistocene and early Holocene period. The potential for submerged landscapes with evidence for archaeological and geoarchaeological remains within this area is considered high, especially for Palaeolithic and Mesolithic archaeological remains. The significance of this is illustrated through the discoveries at Happisburgh and Pakefield, off the Norfolk and Suffolk coast, where the earliest evidence of hominin occupation of northern Europe (c. 900ka to 800ka) was found.	Noted (see Section 16.4.1).
Essex County Council	14/07/2023 PEIR Consultation Response Letter	Chapter 25 Onshore Archaeology and Cultural Heritage The Archaeological Assessment of Geophysical data (Chapter 16.1) states “The rarity of in situ prehistoric sites in offshore contexts means that, should such sites be encountered within the offshore sites, these will be of national, or possibly international interest, with significant potential to contribute to acknowledged international and national research objectives”. The geophysical data for the most inshore Section of the cable route did not fully extend across the whole survey area, within the cable route corridor a number of features of palaeogeographic interest have been interpreted from geophysical data, including the location of former shore-lines and possible extension of the Thames-Medway channel. Submerged terrestrial landscapes have high potential for associated archaeological remains and preservation of organic	Assessment to date has shown there are no known in situ seabed prehistory sites within the study area. The potential for such sites to exist, as indicated by the presence of palaeolandscape features is discussed in Section 16.4.1.

Consultee	Date / Document	Comment	Response / where addressed in the ES
		remains, specifically in the nearshore and intertidal zone. The assessment has identified 56 Archaeological Exclusion Zones (AEZs) within the study area however these largely focus on the sites of wrecks and debris fields and no palaeogeographic landscapes have been identified as being archaeologically sensitive at this time.	
Essex County Council	14/07/2023 PEIR Consultation Response Letter	Chapter 16 Offshore Archaeology and Cultural Heritage - Commitment to avoid heritage receptors is preferable, the success of this will depend on the accuracy in the identification of AEZs and the practicality of avoiding these by design. This information should be clearly presented in the ES to ensure there is flexibility in design to achieve the mitigation proposed. - Further assessment of data in areas of high archaeological/geoarchaeological significance should be carried out specifically in the nearshore/intertidal zone where in situ archaeological or palaeoenvironmental remains would be of national or international significance. These should then be assessed for inclusion as AEZ's - Any AEZs within the intertidal zone could be of high significance and there would be potential for more traditional 'land-based' archaeological investigation techniques to be proposed to determine the nature, significance and extent in order to preserve in situ. The potential for archaeological evaluation within the intertidal zone should be explored and considered as a mitigation method in the forthcoming OWSI (Offshore) - Geophysical survey should be completed across the entire survey area. Should this not be possible any areas where geophysical survey has not been completed should be clearly identified on a plan. - Any forthcoming OWSI should include details on how information will be reported, including methods of publication, should this be appropriate. Proposals for outreach and enhanced public understanding should also be included as part of the mitigation.	The (WSI (Offshore) (Document Refence: 7.11) outlines the approach to delivering mitigation measures for the Project. Table 16.3 of the ES outlines the embedded mitigation measures which include the application of AEZs and avoidance by micro-siting. Further assessment for areas of potential geoarchaeological interest is included as additional mitigation in Section 16.5.1.2.3 of the ES. • Given the use of Horizontal Directional Drilling (HDD) at landfall it is anticipated that impacts to intertidal archaeology can be avoided. The Outline WSI (Offshore) (Document Refence: 7.11) details methods of reporting, publication and outreach and engagement as appropriate.
Historic England	14/07/2023 PEIR	General Comment Historic England's response is limited to our statutory remit for the	Noted

Consultee	Date / Document	Comment	Response / where addressed in the ES
	Consultation Response Letter	historic environment. Our advice is given in relation to the information currently available and may be subject to change as our understanding of the impact on heritage assets changes. In relation to Listed Buildings, the remit for detailed comments and advice on Grade II Listed Buildings lies with the relevant Local Authority Conservation Officers. For onshore archaeology, the remit for detailed comments and advice on non designated archaeological remains lies with the relevant Local Authority Archaeological Advisors. Our advice, however, includes comments on the submitted documents relating to the archaeological assessments and mitigation proposals. Our advice includes comments from our regional Science Advisor and includes suggestions of further detail we would expect to see presented in the Archaeological Mitigation Strategy.	
Historic England	14/07/2023 PEIR Consultation Response Letter	Chapter 8 Marine Geology, Oceanography and Physical Processes We note the data to inform the PEIR was based on available grey literature associated with various developments together with geophysical data and survey reports produced by the Galloper and Greater Gabbard OWF projects (Sections 8.1 and 8.4.2.2). Section 8.5.2 and Table 8.12 describes the offshore geology, identifying three main units, which from an archaeological perspective include: Holocene: i.e. surficial sediments comprising reworked modern Holocene (Recent) and early Holocene (Section 8.5.2.1, para. 62) Pleistocene: comprising a 'variety of channel complexes of varying sizes, incising through London Clay Formation and Harwich Formation' (Section 8.5.2.1, para. 61 and Plate 8.3). We note these units are also identified within the offshore ECC, as described in Section 8.5.2.2. It is, therefore, recommended that any Outline (Offshore) WSI included within the DCO application should focus on the use of this information to produce a deposit model as a viable mitigation measure.	A commitment to the development of the preliminary deposit model, through the assessment of geotechnical and geophysical data post-consent, is captured in the Outline WSI (Offshore) (Document Refence: 7.11)

Consultee	Date / Document	Comment	Response / where addressed in the ES
Historic England	14/07/2023 PEIR Consultation Response Letter	Chapter 16 Offshore Archaeology and Cultural Heritage Chapter 16 considers the potential impacts of the Project on offshore archaeology and cultural heritage. It includes baseline data on the historic environment of the study area and an assessment of potential impacts and associated mitigation for the construction, operation and decommissioning phases of the Project. The chapter is supported by an Offshore Archaeology and Cultural Heritage Technical Report (Volume 2, Annex 16.1). In addition, we note Volume 2, Chapter 10: Seascape, Landscape and Visual Assessment. It is acknowledged that significant archaeological remains are present within the marine zone that need to be considered (buried archaeology, wrecks and aircraft). For example, the export cable corridor passes through the former marine aggregate license Area 447 where significant Palaeolithic and Pleistocene material was identified and recorded (Bynoe 2017 and Bynoe et al., 2022). We note within the glossary of terminology on pages 9-10 definitions are provided for the Mesolithic and Palaeolithic. It is unclear, however, why no definition is provided for the Neolithic. We would recommend this is added for the DCO application.	Noted (Neolithic added to glossary).
Historic England	14/07/2023 PEIR Consultation Response Letter	Chapter 16 Offshore Archaeology and Cultural Heritage We would recommend reference is also made to Bynoe et al., 2022: 'Strategic support for marine development management: Palaeolithic archaeology and landscape reconstruction': https://historicengland.org.uk/research/results/reports/90-2022?searchType=research+report&search=bynoe.	Noted (added to Table 16.7 and referenced in Section 16.7.3.1).
Historic England	14/07/2023 PEIR Consultation Response Letter	Chapter 16 Offshore Archaeology and Cultural Heritage, Section 16.3.3.1 Section 16.4.3.1 (Understanding cultural heritage assets) includes	The Outline WSI (Offshore) (Document Refence: 7.11) has been prepared in consultation with Historic England for submission with the DCO application.

Consultee	Date / Document	Comment	Response / where addressed in the ES
		the statement that 'further investigation and data gathering will be progressed post-consent, including high resolution surveys, alongside additional mitigation requirements as set out in the Outline WSI (Offshore) to be submitted alongside the DCO application'. We note no draft Outline WSI (Offshore) is included within the PEIR documents. Measures to record or protect remains recorded offshore will be agreed in consultation with Historic England. Early engagement with Historic England on an Outline WSI (Offshore) would assist in its timely acceptance during any DCO examination period.	
Historic England	14/07/2023 PEIR Consultation Response Letter	Chapter 16 Offshore Archaeology and Cultural Heritage, Section 16.5.1.2.3 We welcome the statement that 'there will be archaeological input into any future sampling programmes' (Section 16.6.1.2.3). To support whether assessment is beneficial, it is essential the Applicant has access to appropriate and experienced archaeological advice.	Noted (this is addressed in the Outline WSI (Offshore) (Document Refence: 7.11).
Historic England	14/07/2023 PEIR Consultation Response Letter	Chapter 16 Offshore Archaeology and Cultural Heritage, Section 16.5.1 We agree with the impacts scoped in for assessment, as listed in Section 16.6.1 (construction, operations and maintenance and decommissioning) regarding direct and indirect impacts such as disturbance of sediment containing potential marine heritage receptors (material and contexts) leading to the exposure of those marine heritage receptors. We are therefore pleased to see the findings of the Marine Geology, Oceanography and Marine Processes chapter (Volume 1, Chapter 8) have been incorporated into the discussions of indirect impacts on sediments (Section 16.6.1.3).	Noted.
Historic England	14/07/2023 PEIR	Chapter 16 Offshore Archaeology and Cultural Heritage, Table 16.2 We note from Table 16.2 (Realistic worst case scenarios) in relation	Table 16.2 has been updated to reflect these comments.

Consultee	Date / Document	Comment	Response / where addressed in the ES
	Consultation Response Letter	to impacts 1 and 4 that there is no worst case scenario as impacts 'will not occur due to the application of embedded mitigation'. Whilst we understand the principle behind the rationale, we consider this cannot be stated categorically until the mitigation process has been realised. This caveat should be reflected in the ES. Additionally, this table only considers the worst case scenario of the greatest area (horizontal) of seabed and shallow buried deposits impacted by the proposed infrastructure. It does not consider the greatest area (vertical) of deposits that could impacted deeply buried deposits of archaeological interest. It also suggested in the second part of Impact 3 that indirect impacts arising from seabed preparation and installation of foundations and cables would have a positive effect – given that there is no consideration of the negative impacts. We acknowledge that there is potential for sediment mobilisation to have positive effects but this is by no means guaranteed. This impact should be amended to consider the negative impacts also.	
Historic England	14/07/2023 PEIR Consultation Response Letter	Chapter 16 Offshore Archaeology and Cultural Heritage, Table 16.3 In relation to Table 16.3 (Embedded mitigation measures) it would have been useful to include reference to a Protocol for Archaeological Discoveries (PAD).	Noted (added to Table 16.3).
Historic England	14/07/2023 PEIR Consultation Response Letter	Chapter 16 Offshore Archaeology and Cultural Heritage, Table 16.7 Regarding the sources cited in Table 16.7 (Data and information sources), we would recommend the North Sea Prehistory Research and Management Framework (NSPRMF) is also included. This document includes a resource assessment (i.e. literature review) as well as research questions and strategies. These are directly relevant and applicable in the production of any Outline (Offshore) WSI. They should be used by this project, post-consent and pre-commencement (should permission be obtained). It should be noted, the NSPRMF has now been updated and	Noted (added to Table 16.7 and referenced in the Outline WSI (Offshore) (Document Refence: 7.11).

Consultee	Date / Document	Comment	Response / where addressed in the ES
		published online as part of the UK programme for digital research frameworks: https://researchframeworks.org/nsprmf/.	
Historic England	14/07/2023 PEIR Consultation Response Letter	Chapter 16 Offshore Archaeology and Cultural Heritage, Section 16.4.2.1 It is acknowledged there is high potential for the presence of a range of archaeological material which has not been seen in the geophysical data due to issues of visibility. It is noted the east area of the northern and southern array area contain large sand waves with megaripples that could conceal archaeological remains of interest (Section 16.5.2.1, Paragraph 130).	Noted (the offshore project area has been refined following PEIR with the removal of the northern array area and interconnector corridor).
Historic England	14/07/2023 PEIR Consultation Response Letter	Chapter 16 Offshore Archaeology and Cultural Heritage, Section 16.4.1.1 We note it is acknowledged that the potential for submerged landscapes in the marine study area is high (Section 16.5.11) and significant sites are located in nearby areas (e.g. Clacton, Jaywick and Frinton). In particular, potentially well-preserved palaeogeographic features were identified within three of the four projects areas (Northern array area, Southern array area and the ECC). The investigation of these features has the potential to contribute to our understanding landscape and environmental change as well as refining the geological chronology for the region (Section 16.5.11, Paragraph 101).	Noted (the offshore project area has been refined following PEIR with the removal of the northern array area and interconnector corridor).
Historic England	14/07/2023 PEIR Consultation Response Letter	Chapter 16 Offshore Archaeology and Cultural Heritage, Section 16.4.3.1 We are pleased the archaeological potential of the intertidal zone is also recognised (Section 16.5.3.1). However, it is stated in paragraph 161 that no offshore geotechnical surveys are planned and will be delivered post consent (subject to permission). We consider the detail of any Outline (Offshore) WSI prepared for this project is crucial to demonstrate that mitigation measures are identified and ready to be implemented.	Geoarchaeological assessment (with objectives incorporated into the geotechnical campaigns) will be guided by the Outline WSI (Offshore) (Document Refence: 7.11) and survey specific method statements.

Consultee	Date / Document	Comment	Response / where addressed in the ES
Historic England	14/07/2023 PEIR Consultation Response Letter	Chapter 16 Offshore Archaeology and Cultural Heritage, Section 16.5.1.2.3 The statement made in Section 16.6.1.2.3 (Unlocated Marine Heritage Receptors) is very important and any ES produced must adequately determine such risk and ensure viable mitigation strategies are presented and delivered within any draft Deemed Marine Licence(s) (dMLs).	The approach to investigation and mitigation is set out in the Outline WSI (Offshore) (Document Refence: 7.11). The requirement for a final agreed, post-consent WSI is included as a condition of the dML in Draft DCO (document reference: 6.1).
Historic England	14/07/2023 PEIR Consultation Response Letter	Chapter 16 Offshore Archaeology and Cultural Heritage, Table 16.14 We note a total of 1827 seabed features have been identified to date following the marine geophysical surveys: 45 A1 anomalies of anthropogenic origin, 11 A3 anomalies of possible archaeological interest, and 1771 A2 anomalies of possible archaeological interest where the current interpretation is uncertain (Table 16.14).	Noted (the baseline in Section 16.4.2 has been updated following removal of the northern array area and the interconnector cable corridor).
Historic England	14/07/2023 PEIR Consultation Response Letter	Chapter 16 Offshore Archaeology and Cultural Heritage, Section 16.4.1.2 In Section 16.5.1.2 we note that 16 palaeogeographic features have been identified within the northern array area and 15 in the southern array area. 44 palaeogeographic features have been identified within the ECC study area relating to complex channelling. The deposits infilling these features have the potential to preserve archaeological and organic palaeoenvironmental remains of high importance, such as channel 7065 recorded in the cable corridor (Sections 16.5.1.2 and 16.5.1.3).	Noted (the baseline in Section 16.4.1 has been updated following removal of the northern array area and the interconnector cable corridor).
Historic England	14/07/2023 PEIR Consultation Response Letter	Chapter 16 Offshore Archaeology and Cultural Heritage, Section 16.4.1 and 16.5.1.2.3 In addition, areas of possible organic material were frequently seen in the geophysical surveys, which further points to the archaeological and geoarchaeological potential of the proposed development area (Section 16.5.1, para 90). A robust strategy to investigate and understand these features and deposits will therefore need to be developed. We are, therefore, pleased to see	Geoarchaeological assessment (with objectives incorporated into the geotechnical campaigns) will be guided by the Outline WSI (Offshore) (Document Refence: 7.11) and survey specific method statements.

Consultee	Date / Document	Comment	Response / where addressed in the ES
		specific objectives for targeted geotechnical samples and geoarchaeological assessment have been considered (Section 16.6.1.2.3). We would expect to see these explored in more detail in any Outline (Offshore) WSI.	
Historic England	14/07/2023 PEIR Consultation Response Letter	Chapter 16 Offshore Archaeology and Cultural Heritage, Section 16.5.1.2.3 In relation to A2 anomalies, we note they have not been given AEZs but will be mitigated through micro-siting, and further investigation and mitigation if impacts cannot be avoided. In principle we have no issue with this approach, but we wish to highlight that a lot of investigation and mitigation works are proposed for post consent. Should significant archaeological remains and deposits come to light, further investigation and mitigation would potentially be time consuming. Therefore, we recommend that the production of a post-consent Offshore WSI by an appropriate and experience archaeological contractor, collection of further data, its assessment by an appropriate and experience archaeological contractor, and submission to the regulatory authority and their advisors is done in a timely manner as set out in an accepted Outline (Offshore) WSI. This will ensure that enough time is built in to undertake these processes.	The approach to investigation and mitigation is set out in the Outline WSI (Offshore) (Document Refence: 7.11). The requirement for a final agreed, post-consent WSI is included as a condition of the dML in Draft DCO (document reference: 6.1).
Historic England	14/07/2023 PEIR Consultation Response Letter	Chapter 16 Offshore Archaeology and Cultural Heritage, Section 16.5.1.2.3 We note from 16.6.1.2.3 (Additional mitigation) that further archaeological assessment of high-resolution geophysical data and geoarchaeological assessment of geotechnical data will be undertaken post-application / post-consent in order to reduce, as far as possible, the potential for unintended impacts during construction. This is appropriate to mitigate impacts to potential heritage assets and should be	The approach to investigation and mitigation is set out in the Outline WSI (Offshore) (Document Refence: 7.11). The requirement for a final agreed, post-consent WSI is included as a condition of the dML in Draft DCO (document reference: 6.1).

Consultee	Date / Document	Comment	Response / where addressed in the ES
		conducted by an appropriate and experienced archaeological consultant, who should be involved in the planning stages for surveys.	
Historic England	14/07/2023 PEIR Consultation Response Letter	Chapter 16 Offshore Archaeology and Cultural Heritage, Section 16.5.1.2.3 We are pleased to see acknowledged the further assessment of data for potential prehistoric deposits set out in this subsection relating to additional mitigation, and the associated objectives would contribute to publicly available information for seabed prehistory in the Thames offshore region. We note that archaeological input will be afforded to sampling programmes.	Noted.
Historic England	14/07/2023 PEIR Consultation Response Letter	Chapter 16 Offshore Archaeology and Cultural Heritage, Section 16.5.1.2.3 It is acknowledged there is the potential for previously unknown remains of archaeological interest to be present within the footprint of the proposed scheme. It is stated that unexpected discoveries will be managed through a PAD, which will be outlined in detail in the Outline (Offshore) WSI (Section 16.6.1.2.3).	Noted.
Historic England	14/07/2023 PEIR Consultation Response Letter	Chapter 16 Offshore Archaeology and Cultural Heritage, Section 16.6 We are pleased to see monitoring requirements will be described in the in-principle monitoring plan (IPMP) and detailed in the Outline (Offshore) WSI (Section 16.7). Any monitoring proposed should be proportional to the significance of heritage assets potentially impacted.	Noted.
Historic England	14/07/2023 PEIR Consultation Response Letter	Chapter 16 Offshore Archaeology and Cultural Heritage, Table 16.2 We are mindful that structure placement and cable routes are yet to be confirmed. The maximum design parameters and the approach to identifying maximum possible effect are understood in the assessment provided vis. A worst-case scenario approach. However, we recommend the ES includes depths of dredging required for the placement of gravity base jacket foundations. From	Table 16.2 assumes an average 5m sediment depth in calculating the maximum volume of disturbed seabed during seabed preparation for Gravity Base Systems (GBS).

Consultee	Date / Document	Comment	Response / where addressed in the ES
		our perspective, it is the depth and area of seabed excavation that indicates the greatest possible direct impact to archaeological materials on, within and beneath the contemporary seabed, either within the array area or offshore ECC.	
Historic England	14/07/2023 PEIR Consultation Response Letter	Chapter 16 Offshore Archaeology and Cultural Heritage, Table 16.3 Table 16.3 presents the embedded mitigation measures; the approaches outlines are what we would expect to see (avoidance/AEZs, further investigation). We are pleased to see avoidance will form the primary mitigation approach, and archaeologists and archaeological specialists will be involved in the design of the geoarchaeological survey campaigns.	Noted
Historic England	14/07/2023 PEIR Consultation Response Letter	Chapter 16 Offshore Archaeology and Cultural Heritage We would recommend that archaeologists are also be involved in the design of any future geophysical campaigns offshore to ensure opportunities are maximised. In addition, we would also recommend that geoarchaeologists are allowed direct access to the geotechnical cores, to record and assess continuous core sequences rather than isolated deposits allowing for greater reliability and confidence in the resulting conclusions.	A commitment to seeking the advice of an archaeologist / geoarchaeologist in planning future surveys is set out in the Outline WSI (Offshore) (Document Refence: 7.11).
Historic England	14/07/2023 PEIR Consultation Response Letter	Chapter 16 Offshore Archaeology and Cultural Heritage We advise that all mitigation measures are clearly included as conditions within any draft Deemed Marine Licence submitted and detailed within the Outline (Offshore) WSI.	The approach to investigation and mitigation is set out in the Outline WSI (Offshore) (Document Refence: 7.11). The requirement for a final agreed, post-consent WSI is included as a condition of the dML in Draft DCO (document reference: 6.1).
Historic England	14/07/2023 PEIR Consultation Response Letter	Chapter 16 Offshore Archaeology and Cultural Heritage We appreciate the evolution of the Project design, the application of good practice and use of standard protocols. We also note that where significant effects are determined additional mitigation measures will be forthcoming. Any additional mitigation will need to be covered in the Outline (Offshore) WSI.	The approach to investigation and mitigation is set out in the Outline WSI (Offshore) (Document Refence: 7.11). The requirement for a final agreed, post-consent WSI is included as a condition of the dML in Draft DCO (document reference: 6.1).
Historic England	14/07/2023 PEIR	Chapter 16 Offshore Archaeology and Cultural Heritage, Section 16.5.1.1.1	Noted

Consultee	Date / Document	Comment	Response / where addressed in the ES
	Consultation Response Letter	We agree with the spatial extent of 56 AEZs proposed, as described in Section 16.6.1.1.1.	
Historic England	14/07/2023 PEIR Consultation Response Letter	Chapter 16, Sections 16.5.1.1.3 and 16.5.1.2.3 We note the design of the proposed scheme has not yet been finalised, so there is potential it may not be possible to avoid some of identified assets. If this occurs, strategies would be developed and agreed that aim to reduce, remedy or offset disturbances. This may include the use of high resolution geophysical surveys carried out as part of the Unexploded Ordnance (UXO) surveys, or the use of a ROV, which is welcomed (Sections 16.6.1.1.3 and 16.6.1.2.3).	The approach to investigation and mitigation is set out in the Outline WSI (Offshore) (Document Refence: 7.11). The requirement for a final agreed, post-consent WSI is included as a condition of the dML in Draft DCO (document reference: 6.1).
Historic England	14/07/2023 PEIR Consultation Response Letter	Chapter 16 Offshore Archaeology and Cultural Heritage It should be also noted the true extent of known sites at the time of the application may not be completely recorded and captured within prescribed AEZs until a high resolution UXO specification survey has been undertaken. This should be corroborated with detailed ground-truthing investigations (utilising onboard archaeological expertise), to assess any outlying geophysical anomalies.	The approach to further investigation / ground truthing is set out in the Outline WSI (Offshore) (Document Refence: 7.11).
Historic England	14/07/2023 PEIR Consultation Response Letter	Appendix 16.1, Section 2.2.1 Comments in relation to the Archaeological Assessment of Geophysical Data We understand this presents an assessment of geophysical survey data comprising sub-bottom profiler (SBP), sidescan sonar (SSS), magnetometry and multibeam echosounder (MBES). The data was acquired by Fugro in 2021; it was noted the line spacings used in different areas varied (Section 2.2.1). The line spacings used were generally greater than recommended in the Historic England document 'Marine Geophysics' (2013) in all areas, with the exception of part of the Offshore cable corridor, and so further, more detailed studies will be required to investigate the archaeological potential of the development area in due course.	The geophysical data is considered to provide an accurate characterisation of the archaeological potential of the study area, appropriate to the purposes of EIA. A commitment to the acquisition, and assessment, of further high resolution geophysical data post-consent is set out in the Outline WSI (Offshore) (Document Refence: 7.11).

Consultee	Date / Document	Comment	Response / where addressed in the ES
Historic England	14/07/2023 PEIR Consultation Response Letter	Appendix 16.1, Section 2.4.2-2.4.5 It was noted that all of the geophysical data collected in 2021 was classed as being of 'Good' quality (Sections 2.4.2-2.4.5), meaning the datasets provide the highest probability that anomalies of archaeological potential will be identified.	Noted
Historic England	14/07/2023 PEIR Consultation Response Letter	Appendix 16.1, Section 3.2.6, 3.2.18, 3.2.26, 3.2.38 and 5.1.2 The geology of the development area has been divided into four units. Unit 3 has the highest archaeological/palaeoenvironmental potential and comprises numerous terrestrial channel features likely to represent terrestrial deposits dating from the preAnglian to the Early Holocene. They have the potential to contain both in situ and derived archaeological artefacts and preserve palaeoenvironmental evidence that could contribute to the reconstruction of past landscapes and environments (Sections 3.2.6, 3.2.18, 3.2.26, 3.2.38 and 5.1.2). For example, the current data suggests a significant palaeolandscape may be preserved in the western section of the southern array area.	Noted
Historic England	14/07/2023 PEIR Consultation Response Letter	Appendix 16.1, Section 3.2.28, 3.2.39 & 5.1.3 It is acknowledged that further work is needed to investigate the palaeolandscape features in more detail (Sections 3.2.28, 3.2.39 and 5.1.3). We are pleased to see recommendations have been made for suitably qualified archaeological contractors to be consulted during the geotechnical site selection process, and in the assessment of the resulting information (Section 5.1.3).	Noted
Historic England	14/07/2023 PEIR Consultation Response Letter	Appendix 16.1, Section 5.2.2-5.2.4 We are pleased to see AEZs will be applied to A1 and A3 anomalies, with buffers of 50-100m depending on how dispersed the sites are (Section 5.2.2). It is noted the size and shape of AEZs could be altered should further information become available.	The approach to investigation and mitigation is set out in the Outline WSI (Offshore) (Document Refence: 7.11). The requirement for a final agreed, post-consent WSI is included as a condition of the dML in Draft DCO (Document Reference: 6.1).

Consultee	Date / Document	Comment	Response / where addressed in the ES
		It is stated that AEZs will not be applied to A2 anomalies. These remains will be avoided where practicable through micro-siting. If they cannot be avoided then further assessment will be needed to ascertain the nature of the features and define the appropriate mitigation (Section 5.2.3). This approach seems sensible, but the investigation approaches that will be used will need to be detailed within subsequent Offshore WSI documents. A PAD will be developed to record objects of possible archaeological interest that are recovered during ground operation works (Section 5.2.4). This approach seems appropriate to deal with unexpected discoveries, but the detail will need to be presented in subsequent documents.	
Historic England	14/07/2023 PEIR Consultation Response Letter	Schedule of Mitigation, Table 2.9 Comments in relation to Schedule of Mitigation We note the detail regarding mitigation and monitoring for offshore and intertidal archaeology and cultural heritage within Table 2.9. These are in general appropriate, but it would be useful for adherence to a PAD to be included with mitigation for the construction phase. Additionally, further detail should be provided in an Outline (Offshore) WSI and it must be demonstrated how these will be secured through the Outline (Offshore) WSI, DCO, and dMLs.	The approach to investigation and mitigation is set out in the Outline WSI (Offshore) (Document Refence: 7.11). The requirement for a final agreed, post-consent WSI is included as a condition of the dML in Draft DCO (Document Reference: 6.1).
Historic England	14/07/2023 PEIR Consultation Response Letter	Thank you for consulting Historic England on this PEIR for the NFOW Project. We welcome the work that has been undertaken to assess the impact of the scheme on the historic environment, and the ongoing discussion with stakeholders. We acknowledge the proposed scheme preliminary design is ongoing and will continue to be influenced by environmental factors to avoid or reduce effects. As set out in our detailed advice above, we have made a number of comments and recommendations about various aspects of the Project, and the chapters and annexes relating to the historic environment. We would like to see these recommendations addressed and we would be pleased to provide further, and continuing, advice in future meetings and in advance of the submission of the ES.	Noted

Consultee	Date / Document	Comment	Response / where addressed in the ES
Marine Management Organisation (MMO)	14/07/2023 PEIR Consultation Response Letter	Chapter 16 Offshore Archaeology and Cultural Heritage The MMO defers to Historic England regarding the potential impacts to offshore archaeology that may occur because of the North Falls OWF. The MMO will maintain a watching brief on anything that may fall within the MMO's remit – such as DML conditions.	Noted

16.3 Scope

16.3.1 Study area

7. The study area for offshore archaeology and cultural heritage is defined as the offshore project area, including the intertidal zone at the landfall up to MHWS. This 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.

8. It should be noted that, subsequent to the PEIR, the offshore project area has been revised, with the previously defined northern array area and interconnector corridor removed from the offshore scope. The southern array area (now the 'array area') has also been reduced in size and the offshore cable corridor has been extended to meet the revised boundary of the array area. The offshore cable corridor was also reduced in width at the landfall, aligned with the onshore cable route. The baseline presented in this ES chapter has been updated to reflect the new offshore project area, and new study area (i.e. the array area and offshore cable corridor). The archaeological assessment of geophysical data (ES Appendix 16.1 (Document Reference: 3.3.17)), however, was a point in time document and has not been updated. ES Appendix 16.1 (Document Reference: 3.3.17), therefore, covers the PEIR study area which was larger than, and which fully encapsulates, the ES study area.

9. The offshore archaeology and cultural heritage existing environment within this study area is defined as the known archaeological and cultural heritage resource (including designated and non-designated heritage assets) and the potential for previously unrecorded heritage assets and finds to be present within the offshore project area with respect to:

   - Seabed prehistory (i.e. 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);
   - Maritime archaeology (i.e. the remains of boats and ships and archaeological material associated with prehistoric and historic maritime activities);
   - Aviation archaeology (i.e. the remains of crashed aircraft and archaeological material associated with historic aviation activities);
   - Historic seascape character (i.e. the attributes that contribute to the formation of the historic character of the seascape); and
   - Buried archaeology (including palaeoenvironmental deposits) within the intertidal zone below MHWS.

16.3.2 Realistic worst case scenario

10. The final design of North Falls will be confirmed through detailed engineering design studies that will be undertaken post-consent. In order to provide a precautionary but robust impact assessment at this stage of the development process, realistic worst case scenarios have been defined in terms of the likely significant effects that may arise. This approach to EIA, referred to as the

Rochdale Envelope, is common practice for developments of this nature, as set out in Planning Inspectorate Advice Note Nine (2018). The Rochdale Envelope for a project outlines the realistic worst case scenario for each individual impact, so that it can be safely assumed that all other scenarios within the design envelope will have less impact. Further details are provided in ES Chapter 6 EIA Methodology (Document Reference: 3.1.8).

11. One area of optionality is in relation to the national grid connection point (discussed further in ES Chapter 5, Project Description (Document Reference: 3.1.7)). The following grid connection options are included in the Project design envelope:

- Option 1: Onshore electrical connection at a national grid connection point within the Tendring peninsula of Essex, with a project alone onshore cable route and onshore substation infrastructure;
- Option 2: Onshore electrical connection at a national grid connection point within the Tendring peninsula of Essex, sharing an onshore cable route and onshore duct installation (but with separate onshore export cables) and co-locating separate project onshore substation infrastructure with Five Estuaries; or
- Option 3: Offshore electrical connection, supplied by a third party.

12. The realistic worst case scenarios for the likely significant effects scoped into the EIA for the offshore archaeology and cultural heritage assessment are summarised in Table 16.2. These are based on North Falls parameters described in ES Chapter 5 Project Description (Document Reference: 3.1.7), which provides further details regarding specific activities and their durations. For the purposes of offshore and intertidal archaeology and cultural heritage, options 1 and 2 would be the same (as these options correspond to onshore considerations only), and these represent the worst case scenario described in Table 16.2. For option 3 there would be no offshore cable corridor and therefore there would be a lesser effect on offshore and intertidal archaeology and cultural heritage. Within the array area, under options 1 and 2 there would be up to two offshore substation platforms (OSPs); whereas for option 3 there would be one Offshore Converter Platform (OCP) and up to one OSP, i.e. under all scenarios there would be a maximum of two platforms, with no change to the worst case foundation infrastructure. The worst-case scenario for archaeology below MHWS is based upon the general assumption that the greatest potential footprint represents the greatest potential for direct impacts (e.g. damage / destruction) to surviving archaeological material which could be present on the sea floor or buried within seabed deposits.

13. The worst-case scenario for indirect impacts equates to those aspects of the development which result in the greatest potential for increased scour and sediment stripping across an area as a result of changes to physical processes. Conversely, those aspects of the development which result in the greatest increase in sediment deposition also represent the greatest potential effect in terms of the beneficial impact of increased protection for archaeology.

14. For the setting of heritage assets the realistic worst case provides a quantification of the maximum change (e.g. number and type of new

infrastructure elements, height of infrastructure etc.) for the maximum potential duration. This is further qualified by the narrative description of that change, and how this would affect the significance of identified heritage assets, provided in Section 16.5.

Table 16.2 Realistic worst case scenarios

Element of the project infrastructure	Parameter	Notes
Construction		
Impact 1: Direct (physical) impact to known heritage assets	N/A	Direct impacts to known heritage assets are not anticipated to occur due to the application of embedded mitigation (see Table 16.3). A commitment to realising the principle of avoiding known heritage assets, through the application of embedded mitigation, is set out in the Outline WSI (Offshore) (Document Refence: 7.11).

Impact 2: Direct (physical) impact to potential heritage assets	Physical disturbance – array area
	• Total worst case Wind Turbine Generator (WTG) foundation footprint without scour protection, based on 57 x 65m GBS diameter= **189,144m²**
	• Total worst case WTG disturbance volume, based on 57 x 38m diameter mono suction bucket x 25m seabed penetration = 1,616,113m³
	• Scour protection **–** assumes all WTGs have scour protection of up to 83,774m² (excluding WTG foundation footprint) = **4,775,118m²**
	• Two offshore electrical platforms with scour protection = **174,184m²** (87,092m² each)
	• Worst case offshore electrical platforms disturbance volume, based on 2 platforms x 28m diameter suction bucket jackets x 6 legs x 17m seabed penetration = 100,138m³
	• Seabed preparation (The footprint of this lies within the area of scour protection)
	  ○ Area of (GBS of 70m diameter x 57 WTG = 219,362m².
	  ○ The volume of disturbed seabed during GBS seabed preparation, assuming 70m x 57 WTG x average 5m sediment depth = 1,096,809m³
	  ○ Two OSP seabed preparation = 7,697m² (2 platforms with 70m preparation diameter)
	  ○ The volume of disturbed seabed during OSP preparation, assuming average 5m sediment depth = 38,485m³
	• Array cable seabed preparation and burial
	  ○ 190 kilometres (km) length with average 24m disturbance width = **4,560,000m²**
		The worst-case scenario represents the maximum area of disturbed seabed sediments with the potential for archaeological material to be present either on the seafloor or buried within seabed deposits.

Element of the project infrastructure	Parameter	Notes
	○ The volume of disturbed seabed during array cable sandwave levelling **=** 27,293,114m³ ○ The volume of disturbed seabed during array cable burial – 190km length with average 1m trench width x average 1.2m burial depth = 228,000m³ • Array cable protection (The footprint of this lies within the area of cable burial) ○ Up to 38km of cable protection may be required in the unlikely event that array cables cannot be buried (based on 20% of the length) x 6m cable protection width = 228,000m² • Vessel jack up assuming 6 jack up locations per WTG / OSP (275m² per jack up leg x 6 legs x 354 jack up operations) = **584,100m²** • Anchoring during WTG and OSP installation = **274,704m²** (based on vessels with 8 anchors, each with 116.4m² footprint, and 5 anchoring events per WTG / OSP) • Anchoring during array / platform interconnector cable installation = 235,878m² (based on 9 anchors per vessel, each with 61m² footprint, and 432 anchoring events) • UXO clearance = 539m². Crater areas reported from other OWFs range from approximately 2 to 25m², whereas the largest predicted in Ordtek (2018) is around 350m². It is assumed 90% of the UXO would be of 25m² or less and 10% of up to 350m². Up to 9 UXO clearance operations predicted in the array area. • Boulder clearance – 25 boulders of up to 5m diameter = **491m²** Worst case scenario total footprint in the array area = **5.88km²**	
	Physical disturbance – cable corridor: • Export cable seabed preparation and burial: ○ 125.4km length with average 24m disturbance width = **3,009,600m²** ○ The volume of disturbed seabed during export cable sandwave levelling = 1,544,891m³	The worst-case scenario represents the maximum area of disturbed seabed sediments with the potential for archaeological material to be present either on the seafloor or buried within seabed deposits.

Element of the project infrastructure	Parameter	Notes
	○ The volume of disturbed seabed during export cable burial – 125.4km length with average 1m trench width x average 1.2m burial depth = 150,480m³ • Export cable protection (The footprint of this lies within the area of cable burial) ○ Up to 12.5km of cable protection may be required in the unlikely event that export cables cannot be buried (based on 10% of the length x 6m cable protection width) = 75,240m² • Anchor placement = **297,850m²** (based on 9 anchors per vessel, each with 61m² footprint, and 546 anchoring events) • Boulder clearance = **295m²** (up to 15 boulders of 5m diameter) • UXO clearance = 323m². Crater areas reported from other OWFs range from approximately 2m² to 25m², whereas the largest predicted crater in Ordtek (2018) is around 350m². It is assumed 90% of the UXO would be of 25m² or less and 10% of up to 350m². Up to 6 UXO clearance operations predicted in the array area. • HDD exit – 3 bores (2 export cables + 1 contingency). Within the worst-case scenario footprint for the seabed preparation area Worst case scenario total disturbance footprint in the cable corridor = **3.31km²**	
Impact 3: Indirect impact to heritage assets from changes to physical processes	Worst case scenario seabed footprint due to installation vessels = **1.39km²** • Vessel jack up assuming 6 jack up locations per WTG / OSP (275m² per jack up leg x 6 legs x 6 locations x 354 jack up operations) = **584,100m²** • Anchoring during WTG / OSP installation = **274,704m²** (based on vessels with 8 anchors, each with 116.4m² footprint and 5 anchoring events per WTG / OSP) • Anchoring during array / platform interconnector cable installation = **235,878m²** (based on 9 anchors per vessel, each with 61m² footprint; and 432 anchoring events • Anchor during export cable installation = **297,850m²** (based on 9 anchors per vessel, each with 61m² footprint; and 546 anchoring events) • Boulder clearance = **295m²** (up to 15 boulders of 5m diameter)	The worst-case scenarios for marine physical processes are set out in ES Chapter 8 Marine Geology, Oceanography and Physical Processes (Table 8.2) (Document Reference: 3.1.10). The following impacts from that Table are relevant to the worst-case for offshore archaeology and cultural heritage (i.e. negative effects associated with increased exposure of buried archaeological material to marine processes due to loss of sediment cover): • Impact 8: Indentations on the seabed

Element of the project infrastructure	Parameter	Notes
	• Array area UXO clearance = **539m²**. Crater areas reported from other OWFs range from approximately 2 to 25m², whereas the largest predicted in Ordtek (2018) is around 350m². It is assumed 90% of the UXO would be of 25m² or less and 10% of up to 350m². Up to nine UXO clearance operations predicted in the array area. • Offshore cable corridor UXO clearance = **323m²**. It is assumed 90% of the UXO would be of 25m² or less and 10% of up to 350m². Up to six UXO clearance operations predicted along the export cable route.	
	Worst case scenario volume for seabed preparation for foundation installation = **1.14Mm³** • Seabed preparation volume for each GBS = 70m preparation diameter x 57 wind turbine x average 5m sediment depth = **1,096,809m³** • Seabed preparation volume for two OSPs = 70m preparation diameter x 2 x average 5m sediment depth = **38,485m³** Worst case scenario volume for drill arisings for foundation installation = **46,179m³** • Drill arisings at 10% of the WTGs = **34,728m³** (based on 10% of 34 of the largest turbines which is the worst case scenario and an average drill arising per turbine foundation of 10,214m³) • Drill arisings at 1 x monopile OSP / OCP = 11,451m³ (based on 50% of the OSPs / OCP needing drilling) Note that drill arisings would not occur if GBS are used and therefore this parameter cannot be added to the maximum seabed levelling for GBS described above. Worst case scenario volume due to export cable installation = **1.70Mm³** • Export cable sandwave levelling = **1,544,891m³** • Export cable burial – 125.4km length with average 1m trench width x average 1.2m burial depth = **150,480m³**	Conversely, marine physical processes impacts which correspond to potential positive effects associated with increased bed-level and consequent increased potential for the protection of heritage assets which are currently exposed through additional sediment cover (sediment deposited from plume) are: • Impact 2a: Changes in seabed level due to seabed preparation for installation of turbine and OSP / OCP foundations • Impact 2b: Changes in seabed level due to drill arisings for installation of piled foundations for WTGs and OSPs / OCPs • Impact 4: Changes in seabed level due to offshore export cable installation • Impact 6: Changes in seabed level due to offshore array and platform interconnector cable installation

Element of the project infrastructure	Parameter	Notes
	A pre-grapnel run would be required during cable installation, however this is run along the surface of the seabed and would have minimal SSC volume. Worst case scenario volume due to array cable installation = **28.96Mm^3** • Array cable sandwave levelling = **27,293,114m^3** • Array cable burial – 190km length with average 1m trench width x average 1.2m burial depth = **228,000m^3** A pre-grapnel run would be required during cable installation, however this is run along the surface of the seabed and would have minimal SSC volume.	
Impact 4: Changes to the setting of heritage assets	Maximum construction duration of approximately 3 years. Up to 3,090 vessel movements.	The worst-case scenario represents the maximum intrusive/visual effect of construction activities for the longest duration.
Operation		
Impact 1: Direct (physical) impact to known heritage assets	N/A	Direct impacts to known heritage assets are not anticipated to occur due to the retention of AEZs throughout the Project lifespan and the restriction of activities to within the red line boundary.
Impact 2: Direct (physical) impact to potential heritage assets	Unplanned repairs and reburial of cables may be required during Operation and Maintenance (O&M), the following estimates are included. • Reburial of c.2.75% of array cable length is estimated over the life of the Project (24m disturbance width) = 112,200m^2 • Reburial of c.2.75% of platform interconnector cable is estimated over the life of the Project (24m disturbance width) = 13,200m^2 • Reburial of c.4% of export cable is estimated over the life of the Project (24m disturbance width) = 120,384m^2 • Five array cable repairs are estimated over the Project life. 600m section removed x 24m disturbance width = 72,000m^2 • Four export cable repairs are estimated over the Project life. 600m section removed x 24m disturbance width = 57,600m^2	The worst-case scenario represents the maximum area of disturbed seabed sediments with the potential for archaeological material to be present either on the seafloor or buried within seabed deposits.

Element of the project infrastructure	Parameter	Notes
	Anchored vessels placed during the no. of cable repairs include above = 4,914m^2 • Maintenance of offshore infrastructure would be required during O&M. An estimated 177 major component replacement activities may be required per year, using jack up vessels and / or anchoring = 292,050m^2 • One UXO clearance per year anywhere in the offshore project area with a crater footprint estimate of up to 350m^2.	
Impact 3: Indirect impact to heritage assets from changes to physical processes	Anchored vessels placed during the cable repairs included below = **4,914m^2** Maintenance of offshore infrastructure would be required during O&M. An estimated 177 major component replacement activities may be required per year, using jack up vessels and / or anchoring = **292,050m^2** One UXO clearance per year anywhere in the offshore project area with a crater footprint estimate of up to **350m^2**.	The worst-case scenarios for marine physical processes are set out in ES Chapter 8 Marine Geology, Oceanography and Physical Processes (Table 8.2) (Document Reference: 3.1.10). The following impacts from that Table are relevant to the worst-case for offshore archaeology and cultural heritage (i.e. negative effects associated with increased exposure of buried archaeological material to marine processes due to loss of sediment cover): • Impact 8: Indentations on the seabed due to O&M vessels and UXO
	Worst case wind turbine cross-sectional area based on GBS with 65m diameter base, 15m diameter top at 15m above the seabed = **600m^2.** Monopile would continue as a 15m diameter column to the water surface. Total worst case scenario cross-sectional area based on 57 x 65m diameter GBS = **34,200m^2** Up to 38km of array cable protection may be required in the unlikely event that the array cables cannot be buried (based on 20% of the length) Up to 12.5km of cable protection may be required in the unlikely event that export cables cannot be buried (based on 10% of the length)	The worst-case scenarios for marine physical processes are set out in ES Chapter 8 Marine Geology, Oceanography and Physical Processes (Table 8.2) (Document Reference: 3.1.10). The following impacts in that Table are relevant to the worst-case for offshore archaeology and cultural heritage: • Impact 1: Changes to the tidal current regime due to the presence of structures on the seabed (WTGs and OSP / OCP foundations) • Impact 2: Changes to the wave regime due to the presence of structures on the seabed (WTGs and OSP / OCP foundations) • Impact 3: Changes to the sediment transport regime due to the presence of structures on the seabed (WTGs and OSP / OCP foundations) • Impact 5: Morphological and sediment transport effects due to cable protection measures within the array area

Element of the project infrastructure	Parameter	Notes
		• Impact 6: Morphological and sediment transport effects due to cable protection measures within the offshore cable corridor
Impact 4: Changes to the setting of heritage assets	Presence of OWF infrastructure: • Up to 57 WTGs • Two OSPs / OCP[1] Maximum temporal footprint: • Indicative operational lifetime of 40 years O&M vessels: • Maximum number of vessels on site at any one time 22 • Indicative O&M vessel movements per year: 1095 round trips of small vessels, and 127 round trips of large vessels (1,222 in total):	The worst-case scenario represents the maximum intrusive effect of installed infrastructure and operation and maintenance activities for the longest duration.
Decommissioning		
Impact 1: Direct (physical) impact to known heritage assets Impact 2: Direct (physical) impact to potential heritage assets Impact 3: Indirect impact to heritage assets from changes to physical processes	No decision has yet been made regarding the final decommissioning policy for the offshore project infrastructure including landfall, onshore cable route, 400kV cable route and onshore substation. It is also recognised that legislation and industry practice change over time. However, the following infrastructure is likely be removed, reused or recycled where practicable: • WTGs including monopile, steel jacket and GBS foundations; • OSPs / OCP including topsides and steel jacket foundations; and • Offshore cables may be removed or left *in situ* depending on available information at the time of decommissioning. The following infrastructure is likely to be decommissioned *in situ* depending on available information at the time of decommissioning: • Scour protection;	For the purposes of the worst-case scenario, it is anticipated that the impacts will be no greater than those identified for the construction phase. Direct impacts to known heritage assets are not anticipated to occur due to the retention of AEZs throughout the Project lifespan and the restriction of activities to within the red line boundary.

[1] Within the array area, under options 1 and 2 there would be up to two OSPs; whereas for option 3 there would be one OCP and up to one OSP, i.e. under all scenarios there would be a maximum of two platforms, with no change to the worst case foundation infrastructure.

Element of the project infrastructure	Parameter	Notes
Impact 4: Changes to the setting of heritage assets	• Offshore cables may be removed or left *in situ*; and • Crossing and cable protection. The detail and scope of the decommissioning works will be determined by the relevant legislation and guidance at the time of decommissioning and will be agreed with the regulator.	

16.3.3 Summary of mitigation embedded in the design

15. This section outlines the embedded mitigation relevant to the offshore archaeology and cultural heritage assessment, which has been incorporated into the design of North Falls (Table 16.3). Where other mitigation measures are proposed, these are detailed in the impact assessment (Section 16.5) where applicable.

Table 16.3 Embedded mitigation measures

Parameter	Mitigation measures embedded into North Falls design
Known heritage assets	AEZs around the extents of known wreck sites, marine geophysical anomalies of archaeological interest (A1s) and previously recorded sites that have not been seen in the geophysical data (A3s) and at which the presence of surviving material is considered possible. No development related activities will take place within an AEZ.
Potential heritage assets (maritime or aviation)	Avoidance where practicable of identified anomalies (A2s) by micro-siting of design
	Avoidance by micro-siting where practicable of previously recorded sites that have not been seen in the geophysical data (A3s) and at which the presence of surviving material is considered unlikely
	Further investigation of any identified anomalies (A2s) and previously recorded sites (A3s) that cannot be avoided by micro-siting of design and the application of either embedded mitigation (avoidance) or additional mitigation (Section 16.5).

16. A proposed approach to the delivery of this embedded mitigation, post-consent, and how the outcomes of additional investigation will influence the final design of North Falls, have been set out in the Outline WSI (Offshore) (Document Reference: 7.11) prepared in accordance with industry good practice guidance on Archaeological WSIs (The Crown Estate, 2021).

16.4 Assessment methodology

16.4.1 Legislation, guidance and policy

16.4.1.1 National Policy Statements

17. The assessment of potential impacts upon offshore archaeology and cultural heritage has been made with specific reference to the relevant legislation and guidance, of which the principal policy documents with respect to the Nationally Significant Infrastructure Projects (NSIPS) are the NPS. Those relevant to the Project are:

- Overarching NPS for Energy (EN-1) ((Department for Energy Security and Net Zero (DESNZ), 2023a);
- NPS for Renewable Energy Infrastructure (EN-3) (DESNZ, 2023b); and
- NPS for Electricity Networks Infrastructure (EN-5) (DESNZ, 2023c).

18. The specific assessment requirements for offshore archaeology and cultural heritage, as detailed in the NPS, are summarised in Table 16.4 together with an indication of the section of the ES chapter where each is addressed.

Table 16.4 NPS assessment requirements

NPS Requirement	NPS Reference	ES Reference
Overarching NPS for Energy (EN-1)		
"As part of the ES the applicant should provide a description of the significance of the heritage assets affected by the proposed development, including any contribution made by their setting. The level of detail should be proportionate to the importance of the heritage assets and no more than is sufficient to understand the potential impact of the proposal on their significance. As a minimum, the applicant should have consulted the relevant Historic Environment Record (HER) (or, where the development is in English or Welsh waters, Historic England or Cadw) and assessed the heritage assets themselves using expertise where necessary according to the proposed development's impact."	Paragraph 5.9.10	The significance of the archaeological receptors considered in this chapter, and the contribution of setting to that significance, have been detailed in Sections 16.4.1.2, 16.4.2.2 and 16.4.3.2. Marine records maintained by Historic England have been consulted, as detailed in Table 16.7. Issues relating to the setting of onshore heritage assets have been considered as part of ES Chapter 25 Onshore Archaeological and Cultural Heritage (Document Reference: 3.1.27).
"Where a site on which development is proposed includes, or the available evidence suggests it has the potential to include, heritage assets with an archaeological interest, the applicant should carry out appropriate desk-based assessment and, where such desk-based research is insufficient to properly assess the interest, a field evaluation. Where proposed development will affect the setting of a heritage asset, representative visualisations may be necessary to explain the impact."	Paragraph 5.9.11	Section 16.4 of this document provides a full assessment of the baseline environment.
"The applicant should ensure that the extent of the impact of the proposed development on the significance of any heritage assets affected can be adequately understood from the application and supporting documents. Studies will be required on those heritage assets affected by noise, vibration, light and indirect impacts, the extent and detail of these studies will be proportionate to the significance of the heritage asset affected."	Paragraph 5.9.12	This chapter provides an account of the potential impacts of North Falls upon heritage assets and their significance including indirect impacts (Section 16.5).
"The applicant is encouraged, where opportunities exist, to prepare proposals which can make a positive contribution to the historic environment, and to consider how their scheme takes account of the significance of heritage assets affected. This can include, where practicable: • Enhancing, through a range of measures such as sensitive design, the significance of heritage assets or set-ting affected • Considering where required the development of archive capacity which could deliver significant public benefits	Paragraph 5.9.13	The potential for enhancement of the archaeological record for the North Sea is discussed in Section 16.8.3.

NPS Requirement	NPS Reference	ES Reference
• Considering how visual or noise impacts can affect heritage assets, and whether there may be opportunities to enhance access to, or interpretation, understanding and appreciation of, the heritage assets affected by the scheme"		
NPS for Renewable Energy Infrastructure (EN-3)		
"Applicants should consult with the relevant statutory consultees, such as Historic England or Cadw, on the potential impacts on the marine historic environment at an early stage of development during pre-application, taking into account any applicable guidance (e.g., offshore renewables protocol for archaeological discoveries (ORPAD)).."	Paragraph 2.8.168	Consultation has been undertaken with relevant statutory consultees, as outlined in Section 16.1. Consultation will be on going throughout the development process. The guidance taken into account for the assessment of Offshore Archaeology and Cultural Heritage is listed in Section 16.3.1.2.3.
"Assessment of potential impacts upon the historic environment should be considered as part of the EIA process undertaken to inform any application for consent. Desk based studies to characterise the features of the historic environment that may be affected by a proposed development and assess any likely significant effects should be undertaken by competent archaeological experts. These studies should take into account any geotechnical or geophysical surveys that have been undertaken to aid the wind farm and / or offshore transmission design ."	Paragraphs 2.8.169 to 2.8.171	The assessment has been undertaken as part of the EIA process, as detailed above. The assessment of geophysical survey data has underpinned the assessment (Section 16.5 and ES Appendix 16.1 (Document Reference: 3.3.17)). To date, marine geotechnical surveys have not been undertaken for North Falls. This chapter has been prepared by competent experts (and members of Chartered Institute of Archaeologists (CIfA)) in marine archaeology from Royal HaskoningDHV (with support from Wessex Archaeology – see ES Appendix 16.1, (Document Reference: 3.3.17)) in consultation with Historic England (Section 16.2) and in accordance with legislation, policy and industry standards and guidance documents relevant to the marine archaeological and cultural heritage (historic) environment.
"Assessment may also include the identification of any beneficial effects on the marine historic environment, for example through improved access or the contribution to new knowledge that arises from investigation."	Paragraph 2.8.176	Any beneficial effects to the offshore archaeology and cultural heritage resource resulting from North Falls have been identified in Section 16.7.
"Where elements of a proposed project (whether offshore or onshore) may interact with historic environment features that are located onshore, applicants should assess the effects in accordance with Section 5.9 in EN-1.."	Paragraph 2.8.177	Potential impacts of North Falls upon onshore heritage assets have been considered in ES Chapter 25 Onshore Archaeology and Cultural Heritage (Document Reference: 3.1.27).
NPS for Electricity Networks Infrastructure (EN-5)		
"…applicants must take into account Schedule 9 to the Electricity Act 1989, which places a duty on all transmission and distribution licence holders, in formulating proposals for new electricity networks infrastructure, to "have regard	Paragraph 2.2.10	Potential impacts upon sites, and objects of archaeological interest offshore are set out in Section 16.5 along with a proposed approach to mitigation.

NPS Requirement	NPS Reference	ES Reference
to the desirability… of protecting sites, buildings and objects of architectural, historic or archaeological interest; and … do what [they] reasonably can to mitigate any effect which the proposals would have on the… sites, buildings or objects."		

16.4.1.2 Other legislation, policy and guidance

19. In addition to the NPS, there are a number of pieces of legislation, policy and guidance applicable to the assessment of offshore archaeology and cultural heritage, discussed below. Further detail is provided in ES Chapter 3 Policy and Legislative Context (Document Reference: 3.1.5).

16.4.1.2.1 Legislation

20. North Falls is located within the UK EEZ, and the offshore cable corridor extends through the English Territorial Sea (up to 12 nautical miles) from the coast into the UK EEZ. The following legislation applies to marine heritage within both the UK EEZ and English Territorial Sea:

- Protection of Wrecks Act 1973: Section One and Two;
- Ancient Monuments and Archaeological Areas Act 1979 (as amended);
- Protection of Military Remains Act 1986; and
- Merchant Shipping Act 1995.

21. The above legislation provides protection for wrecks of high historical, archaeological or artistic value, as well as allowing military wrecks and aircraft remains to be protected. There are currently no known protected wrecks within the study area, although, if encountered, all military aircraft crash sites are automatically protected under the Protection of Military Remains Act 1986. Ownership of any wreck remains is determined in accordance with the Merchant Shipping Act 1995.

22. In 2000, the UK government ratified The European Convention on the Protection of the Archaeological Heritage (Revised) 1992 (The Valletta Convention). The convention binds the UK to implement protective measures for the archaeological heritage within the jurisdiction of each party, including sea areas.

23. The UNESCO Convention on the Protection of Underwater Cultural Heritage, adopted in 2001, is intended to enable States to better protect their submerged cultural heritage. The UK was one of a number of States that abstained from the 2001 vote and has not ratified the Convention. The UK has, however, adopted the 'The Rules', an Annex to the Convention which sets out a standard for archaeological investigations, as government policy for underwater cultural heritage.

16.4.1.2.2 Policy

24. This assessment has been undertaken in a manner consistent with the National Planning Policy Framework (NPPF), a revised version of which was published by the Department for Levelling Up, Housing and Communities (DLUHC) in December 2023, replacing the original policy from March 2012. Provision for

the historic environment is principally given in Section 16: 'Conserving and enhancing the historic environment' of the NPPF, which directs local authorities to set out "a positive strategy for the conservation and enjoyment of the historic environment, including heritage assets most at risk through neglect, decay or other threats". Local authorities should recognise that heritage assets are "an irreplaceable resource and should be conserved in a manner appropriate to their significance, so that they can be enjoyed for their contribution to the quality of life of existing and future generations" (DLUHC, 2023).

25. The aim of NPPF Section 16 is to ensure that local authorities, developers and owners of heritage assets adopt a consistent and holistic approach to their conservation and to reduce complexity in planning policy relating to proposals that affect them.

26. To summarise, UK government guidance provides a framework which:

- Recognises that heritage assets are an irreplaceable resource;
- Requires applicants to provide a level of detail that is proportionate to the assets' importance and no more than is sufficient to understand the potential impact of the proposal on their significance;
- Takes into account the desirability of sustaining and enhancing the significance of heritage assets, including any contribution made by their setting, and putting them to viable uses consistent with their conservation;
- Places weight on the conservation of designated heritage assets (which include world heritage sites, scheduled monuments, listed buildings, protected wreck sites, registered parks and gardens, registered battlefields or conservation areas), with any anticipated substantial harm weighed against the public benefits of the proposal;
- Requires applicants to include a consideration of the effect of an application on the significance of non-designated heritage assets, giving regard to the scale of any harm or loss and the significance of the heritage asset;
- Regards proposals that preserve those elements of the setting that make a positive contribution to the asset (or which better reveal its significance) favourably; and
- Requires developers to record and advance understanding of the significance of any heritage assets to be lost (wholly or in part) in a manner proportionate to their importance and impact, and to make this evidence (and any archive generated) publicly accessible.

27. The NPPF's associated Planning Practice Guidance (PPG) 'Conserving and enhancing the historic environment', published in 2014 and updated 2019, (Ministry of Housing, Communities and Local Government, 2019) includes further information and guidance on how national planning policy is to be interpreted and applied locally. Although the PPG is an important and relevant consideration in respect to North Falls, EN-1 (the Overarching NPS for Energy) is the key decision-making document.

28. This assessment also takes account of the UK Marine Policy Statement (MPS) (Department for the Environment, Food and Rural Affairs (Defra), 2011). The MPS sets out high level objectives for marine planning, which have directed

development of the Plan at a local level. Marine Plans must be in accordance with other relevant national policy and are intended to contribute to the achievement of sustainable development in the UK marine area. Those relevant to North Falls are the East Inshore and East Offshore Marine Plans (Defra, 2014) and the South-East Inshore Marine Plan (Defra, 2021). Policies specific to heritage assets are outlined in Table 16.5.

Table 16.5 Summary of East Inshore and East Offshore Marine Plans.

Plan Policy	Policy Text
SOC2 (East Inshore / Offshore)	Proposals that may affect heritage assets should demonstrate, in order of preference: • That they will not compromise or harm elements which contribute to the significance of the heritage asset • How, if there is compromise or harm to a heritage asset, this will be minimised • How, where compromise or harm to a heritage asset cannot be minimised, it will be mitigated against or • The public benefits for proceeding with the proposal if it is not possible to minimise or mitigate compromise or harm to the heritage asset
SE-HER-1 (South-East Inshore)	Proposals that demonstrate they will conserve and enhance the significance of heritage assets will be supported. Where proposals may cause harm to the significance of heritage assets, proponents must demonstrate that they will, in order of preference: a) avoid b) minimise c) mitigate - any harm to the significance of heritage assets. If it is not possible to mitigate, then public benefits for proceeding with the proposal must outweigh the harm to the significance of heritage assets.

16.4.1.2.3 Guidance

29. In demonstrating adherence to industry good practice, this chapter has been compiled in accordance with the following relevant standards and guidance:

- Principles of CHIA in the UK (IEMA, IHBC and CIfA, 2021);
- Commercial Renewable Energy Development and the Historic Environment Historic England Advice Note 15 (Historic England, 2021);
- Archaeological Written Schemes of Investigation for OWF Projects (The Crown Estate, 2021);
- The Setting of Heritage Assets: Historic Environment Good Practice Advice in Planning Note 3 (Second Edition) (Historic England, 2017);
- CIfA Standard and Guidance for Historic Environment Desk-Based Assessments (2014a) and Code of Conduct (2014b);
- Marine Geophysical Data Acquisition, Processing and Interpretation – guidance notes (Historic England, 2013);
- Offshore Geotechnical Investigations and Historic Environment Analysis: Guidance for the Renewable Energy Sector (Gribble and Leather, 2011);
- Guidance for Assessment of Cumulative Impacts on the Historic Environment from Offshore Renewable Energy (Oxford Archaeology, 2008);

- Historic Environment Guidance for the Offshore Renewable Energy Sector Guidance (Wessex Archaeology, 2007); and
- Code for Practice for Seabed Development (Joint Nautical Archaeology Policy Committee (JNAPC), 2006).

16.4.2 Data sources

16.4.2.1 Site specific

30. Marine geophysical survey data were acquired by Fugro in 2021 comprising sub-bottom profiler (SBP), sidescan sonar (SSS), magnetometer (Mag) and MBES data. Data were acquired on board the *Fugro Seeker* (inshore half of the offshore cable corridor and a discrete area in the array area) and the *Fugro Mercator* (offshore cable corridor nearest the array). Line spacings varied across the site:
    - Array area – broadly a 75m line spacing and a SSS range of 100m. Closer survey was undertaken in three discrete areas over shallow sand banks, with 25m line spacing and a 50m range in one area and 35m line spacing and a 100m range on two other areas; and
    - Offshore cable corridor – 15m line spacing and a SSS range of 50m (30m when closest inshore) until close to the array area, when line spacing changes to 35m and then 70m with a range of 60m and 100m.
31. All data were provided to Wessex Archaeology for processing and interpretation. Once processed, the geophysical data sets were individually assessed for quality and their suitability for archaeological purposes. All data sets were rated by Wessex Archaeology as good quality and suitable for archaeological assessment.
32. Once all the geophysical anomalies and desk-based information have been grouped, 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 16.6 below.

Table 16.6 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	SBP, MBES
	P2	Feature of possible archaeological interest	
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	

Overview classification	Discrimination	Criteria	Data type
	A2_I	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

33. Further details on the technical specifications, processing and interpretation of the data, together with a detailed account of the results, are provided in ES Appendix 16.1 (Document Reference: 3.3.17).

34. A summary of the results is included in Sections 16.4.1 and 16.4.2 below.

16.4.2.2 Other available sources

35. Other sources that have been used to inform the assessment are listed in Table 16.7.

Table 16.7 Other available data and information sources

Data Set	Spatial Coverage	Year	Notes
North Sea Prehistory Research and Management Framework (NSPRMF)	England's EEZ	2023	The NSPRMF provides a framework and agenda for the management of submerged prehistoric archaeological sites, features and landscapes in the North Sea and eastern English Channel.
The UKHO data for charted wrecks and obstructions	UK	2024	Data for all known charted wrecks and obstructions
The National Heritage List for England (NHLE) maintained by Historic England	England	2024	Official, up to date, register of all nationally protected historic buildings and sites in England – listed buildings, scheduled monuments, protected wrecks, registered parks and gardens, and battlefields (including sites protected under the Protection of

Data Set	Spatial Coverage	Year	Notes
			Military Remains Act 1986 and the Protection of Wrecks Act 1973).
National Marine Heritage Record (NMHR) Records held by Historic England, formally part of the National Record of the Historic Environment (NRHE) dataset	England (to 12nm limit)	2022	Records of heritage assets and documented losses of wrecks and aircraft. Data requested for PEIR (received 22/07/2022) and remains current for ES.
HER	Essex County	2024	HERs are information services that provide access to comprehensive and dynamic resources relating to the archaeology and historic built environment of a defined geographic area. HERs contain details on local archaeological sites and finds, historic buildings and historic landscapes and are regularly updated.
The CITiZAN	UK	2024	CITiZAN highlights the threat of coastal erosion to a wealth of foreshore and intertidal sites. These archaeological features encompass a huge time span, many are of considerable local or national significance
Relevant mapping including Admiralty Charts, historic maps and Ordnance Survey	UK	2024	Information relation to previously charted wrecks, seabed topography and topography
Relevant documentary sources and grey literature	UK	2022 2017 2023	Key sources include: • Strategic support for marine development management: Palaeolithic archaeology and landscape reconstruction' Bynoe *et al*., 2022). • Investigating the Submerged Pleistocene Landscapes of the Wallet, off Clacton (Bynoe, 2017). • Five Estuaries PEIR Volume 4, Annex 11.1: Offshore Archaeology And Cultural Heritage Technical Report (Five Estuaries, 2023a).

16.4.3 Impact assessment methodology

36. ES Chapter 6 EIA Methodology (Document Reference: 3.1.8) explains the general impact assessment methodology applied to North Falls. The following sections describe the methods used to assess the likely significant effects on offshore archaeology and cultural heritage.

37. The impact assessment methodology adopted for offshore archaeology and cultural heritage will define heritage assets, and their settings, likely to be

impacted by the proposed scheme and assess the level of any resulting benefit, harm or loss to their significance. The assessment is not limited to direct (physical) impacts, but also assesses possible indirect (physical) impacts upon heritage assets which may arise as a result of changes to hydrodynamic and sedimentary processes and changes to the setting of heritage assets, whether visually, or in the form of noise, dust and vibration, spatial associations and a consideration of historic relationships between places which may impact their significance.

38. As set out in Principles of CHIA in the UK (IEMA, IHBC and CIfA, 2021), CHIA is concerned with "understanding the consequences of change to cultural significance". The principles of assessment are:

    A. understanding cultural heritage assets; and

    B. evaluating the consequences of change.

39. Understanding cultural heritage assets distinguishes between:

- describing the asset (what it is and what is known about it);
- ascribing cultural significance (a description of what is valued about it); and
- attributing importance (a scaled measure of the degree to which the cultural significance of that asset should be protected).

40. Evaluating the consequences of change also distinguishes between three separate analytical stages:

- understanding change (a factual statement of how a proposal would change a cultural heritage asset or its setting, including how it is experienced);
- assessing impact (a scaled measure of the degree to which any change would impact on cultural significance);
- and weighting the effect (the measure that brings together the magnitude of the impact and the cultural heritage asset's importance).

41. The relationship between these principles and the general approach to EIA ES Chapter 6 EIA Methodology (Document Reference: 3.1.8) is described below.

16.4.3.1 Understanding cultural heritage assets

42. A description of the assets, and their cultural significance, relevant to the assessment of offshore archaeology and cultural heritage is provided in Section 16.4. At this stage of North Falls, many of these assets are not yet fully understood. However, as set out in the Principles, as well as in national planning guidance including the NPSs (see Table 16.4) and NPPF (see Section 16.3.1.2.2 above), proportionality is key and applicants must provide a level of detail that is proportionate to the assets' importance and no more than is sufficient to understand the potential impact of the proposal on their significance. The level of detail provided in Section 16.4, therefore, sufficiently characterises these assets so that potential impacts upon their significance can be understood for the purposes of EIA.

43. Further investigation and data gathering will be progressed post-consent, including high resolution surveys, alongside additional mitigation requirements as set out in the Outline WSI (Offshore) (Document Reference: 7.11) submitted

alongside the ES and DCO application. This is in line with the Principles which describe how, “an understanding of the cultural heritage asset is likely to be an iterative process which regularly reappraises the consequential impact on cultural significance as a proposal evolves or as more evidence emerges from research and investigations”. Section 16.4, therefore, also highlights where there is a need to acquire additional information, and when this will be progressed, as part of an ongoing iterative design process.

44. As defined in the NPPF (MHCLG, 2021, Annex 2) cultural (or heritage) significance is the sum of the heritage values or interests that we, as a society, recognise in a heritage asset and seek to protect or enhance for future generations. A statement of significance should explain why we value a heritage asset. Understanding the significance of an asset should not be confused with a description of that asset which does not articulate ‘what matters and why’. Historic England’s ‘Conservation Principles’ (Historic England, 2017) defines the term significance as encompassed by four headings: archaeological interest, architectural interest, artistic interest and historic interest. These terms are used in articulating the cultural significance of heritage assets for the purposes of this impact assessment.

45. As defined in the Principles (IEMA, IHBC and CIfA, 2021), cultural significance does not have a scale associated with it and it is therefore not appropriate to refer to ‘high’ or ‘low’ significance. This scaling is addressed through the separate consideration of a heritage asset’s importance. Cultural significance is not directly related to designation status nor is it defined in law. However, the reasons for designation may articulate aspects of heritage significance.

46. In describing the cultural significance of heritage assets, reference will also be made to the contribution of setting to that significance. The setting of a heritage asset is described as the surroundings in which a heritage asset is experienced (Historic England, 2017). Elements of an asset’s 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.

47. The importance of a heritage asset is a measure of the degree to which we seek to protect and preserve the cultural significance of that asset through, for example, legislation and planning policy. Determining the importance of an asset is a key decision in impact assessment as it will affect judgements regarding the relative weight to be given to protecting different assets during the design of a proposal.

48. Importance is scaled (unlike cultural significance) and requires the assessor to make a judgement regarding the merits of different heritage assets. It is therefore appropriate to refer to ‘high’ or ‘low’ importance for example. The statutory designation of heritage assets provides examples of how assets can be assigned a level of importance against explicit criteria. Some designated assets are judged to be of national importance, for example Scheduled Monuments, and World Heritage Sites are, again by definition, sites of international importance.

49. In determining the significance of effect for the purposes of EIA, this last analytical stage (attributing importance) broadly equates to ‘sensitivity’ as described in Section 16.3.3.3 below.

16.4.3.2 Evaluating the consequences of change

50. The Principles describe change as, “both the act and the result of making something different from how it was before, whether directly or indirectly, temporarily or permanently, reversibly or irreversibly”. It is also important to note that change may or may not lead to an impact on cultural significance. Before a scaled measure of this change can be determined it is necessary to describe the potential change to a heritage asset or its setting. To this end, a narrative approach describing the nature of potential changes is provided for each impact assessed in Section 16.5.

51. This is followed by the determination of a scaled measure of the degree to which any change would impact cultural significance, which broadly equates to the ‘magnitude of impact’ as described in Section 16.3.3.3 below. This change could have a positive (beneficial) or negative (adverse) outcome. It is not a measure of the reach or extent of the proposal but rather the change to ‘what matters’ about a heritage asset.

52. The final stage is weighting the effect (the measure that brings together the magnitude of the impact and the cultural heritage asset’s importance). For North Falls this is articulated through the significance of effect matrix presented in Table 16.10. Following on from the previous stages of the assessment, which draw out the narrative regarding the importance of a cultural heritage asset, its cultural significance, and how the proposal will impact this significance, this measure is indicative of the weight that should be given to the matter in influencing the design of the proposal or, ultimately, in influencing whether the proposal will be acceptable and permitted.

53. Definitions for this weighted measure of significance of effect (in EIA terms) are provided in Table 16.11.

16.4.3.3 Definitions

54. The sensitivity of a receptor is a function of its capacity to accommodate change and reflects its ability to recover if it is affected. However, while impacts to a heritage asset’s setting or character can be temporary, impacts which result in damage or destruction of the assets themselves, or their relationship with their wider environment and context, are permanent. Once destroyed an asset cannot recover. On this basis, the assessment of the significance of effect of any identified impact is largely a product of the importance of an asset (rather than its sensitivity) and the degree to which any change would impact on cultural significance.

55. For the purposes of this EIA, the criteria for determining the heritage importance of any relevant heritage assets are described in Table 16.8.

56. The categories and definitions of heritage importance do not necessarily reflect a definitive level of importance of an asset. They are intended to provide a provisional guide to the assessment of perceived heritage importance, which is to be based upon professional judgement incorporating the evidential, archaeological, historical, aesthetic, architectural and communal heritage values of the asset or assets. It is important to note that the importance and cultural significance of an asset can be amended or revised as more information comes to light (i.e. as part of further investigations planned post-consent).

57. Table 16.8 includes heritage assets of uncertain heritage importance i.e. where the importance, existence and / or level of survival of an asset has not been ascertained (or fully understood) from available evidence. Although Table 16.8 provides a definition for assets of an uncertain heritage importance, where uncertainty occurs, the precautionary approach is to assign the highest likely level of importance. This precautionary approach represents good practice in CHIA and reduces the potential for impacts to be under-estimated.

Table 16.8 Criteria for Determining Heritage Importance

Importance	Definition
High (perceived International / National Importance)	• World Heritage Sites • Scheduled Monuments • Grade I and II* Listed Buildings or structures • Protected wrecks • Designated historic landscapes of outstanding interest • Conservation Areas containing buildings or structures with high heritage importance, or high concentrations of listed buildings • Assets of acknowledged international / national importance • Assets that can contribute significantly to acknowledged international / national research objectives
Medium (perceived Regional Importance)	• Grade II Listed Buildings or structures • Designated special historic landscapes • Other types and character of Conservation Areas • Assets that contribute to regional research objectives • Assets with regional value, educational interest or cultural appreciation
Low (perceived Local importance)	• 'Locally Listed' buildings or structures • Assets that contribute to local research objectives • Assets with local value, educational interest or cultural appreciation • Assets compromised by poor preservation and / or poor contextual associations
Negligible	• Assets with no significant value or archaeological / historical interest
Uncertain / Unknown	• The importance / existence / level of survival of the asset has not been ascertained (or fully ascertained / understood) from available evidence • Where uncertainty occurs, the precautionary approach is to assign the highest likely level of importance.

58. Magnitude broadly equates as the degree to which cultural significance is positively or negatively changed by the proposal.

59. Direct physical impacts, indirect physical impacts and impacts from a change in setting on the significance of heritage assets are considered relevant. Impacts may be adverse or beneficial. Depending on the nature of the impact and the duration of development, impacts can also be temporary and / or reversible or permanent and / or irreversible.

60. The finite nature of archaeological remains means that physical impacts are almost always permanent and irreversible as the 'fabric' of the asset and, hence, its potential to inform our historical understanding, will be removed. By contrast, impacts resulting from the change in the setting of heritage assets will depend upon the longevity of construction and operation of North Falls and the

sensitivity with which the landscape / seascape is re-instated subsequent to decommissioning / demolition, if applicable.

61. The magnitude of adverse impact with respect to offshore archaeology and cultural heritage directly relates to the extent of harm to, or loss of, key elements of the asset's cultural significance, which may include its setting.

62. The magnitude of beneficial impact with respect to offshore archaeology and cultural heritage directly relates to the level of public benefit associated with an individual impact. Benefits may correspond directly to the Project itself where a project will enhance the historic environment (e.g. through measures which will improve the setting of a heritage asset or public access to it).

63. Alternatively, benefits may occur on the basis of data gathering exercises undertaken for the purpose of a project which will enhance public understanding by adding to the archaeological record (e.g. through the accumulation of publicly available information and data). The measure of beneficial impact (high / medium / low) is, therefore, necessarily situational and specific to a given site, area or subject. One such example of a positive magnitude of impact could be relevant to, for example, new survey data being acquired, which will ultimately be made publicly accessible.

64. The criteria used for assessing the magnitude of impact with regard to archaeology and cultural heritage are presented in Table 16.9.

Table 16.9 Definition of Magnitude of Impact to Heritage Assets

Magnitude	Definition
High Adverse	Key elements of the asset's fabric and / or setting are lost or fundamentally altered, such that the asset's cultural significance is lost or severely compromised.
Medium Adverse	Elements of the asset's fabric and / or setting which contribute to its significance are affected, but to a more limited extent, resulting in an appreciable but partial loss of the asset's cultural significance.
Low Adverse	Elements of the asset's fabric and / or setting which contribute to its cultural significance are affected, resulting in a slight loss of cultural significance.
Negligible	The asset's fabric and / or setting is changed in ways which do not materially affect its cultural significance.
Low Beneficial	Elements of the asset's physical fabric which would otherwise be lost, leading to a slight loss of cultural significance, are preserved *in situ*; or Elements of the asset's setting are improved, slightly enhancing its cultural significance; or Research and recording leads to a slight enhancement to the archaeological or historical interest of the asset. This only applies in situations where the asset would not be otherwise harmed i.e. it is not recording in advance of loss.
Medium Beneficial	Elements of the asset's physical fabric which would otherwise be lost, leading to an appreciable but partial loss of cultural significance, are preserved *in situ*; or Elements of the asset's setting are considerably improved, appreciably enhancing its cultural significance; or Research and recording leads to a considerable enhancement to the archaeological or historical interest of the asset. This only applies in situations where the asset would not be otherwise harmed i.e. it is not recording in advance of loss.
High Beneficial	Elements of the asset's physical fabric which would otherwise be lost, severely compromising its cultural significance, are preserved *in situ*; or Elements of the asset's setting, which were previously lost or unintelligible, are restored, greatly enhancing its cultural significance.

Magnitude	Definition
No impact	No change to the assets fabric or setting which affects its cultural significance.

16.4.3.4 Significance of effect

65. In basic terms, the likely significance of effect is a function of the sensitivity of the receptor and the magnitude of the impact (see ES Chapter 6 EIA Methodology (Document Reference: 3.1.8) for further details). As described above, for offshore archaeology and cultural heritage this equates to the importance of a heritage asset weighed against the magnitude of change to its cultural significance. The determination of significance is guided by the use of a significance of effect matrix, as shown in Table 16.10. Definitions of each level of significance are provided in Table 16.11.

66. Should major or moderate effects be identified within the assessment, these would be regarded within this chapter as significant. Should the assessment indicate any likely significant effect, mitigation measures would be identified, where practicable, in consultation with the regulatory authorities and relevant stakeholders. The aim of mitigation measures is to avoid or reduce the overall significance of effect to determine a residual effect upon a given receptor.

Table 16.10 Significance of effect matrix

		Adverse Magnitude				Beneficial Magnitude			
		High	Medium	Low	Negligible	Negligible	Low	Medium	High
Importance	High	Major	Major	Moderate	Minor	Minor	Moderate	Major	Major
	Medium	Major	Moderate	Minor	Minor	Minor	Minor	Moderate	Major
	Low	Moderate	Minor	Negligible	Negligible	Negligible	Minor	Minor	Moderate
	Negligible	Minor	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Minor

Table 16.11 Definition of significance of effect

Significance	Definition
Major	Change in cultural significance, both adverse or beneficial, which are likely to be important considerations at a national or regional level because they contribute to achieving national or regional objectives. Effective / acceptable mitigation options may still be possible, to offset and / or reduce residual effects to satisfactory levels.
Moderate	Change in cultural significance, both adverse or beneficial, which are likely to be important considerations at a local level. Effective / acceptable mitigation options may still be possible, to offset and / or reduce residual effects to satisfactory levels.
Minor	Change in cultural significance, both adverse or beneficial, which may be raised as local issues but are unlikely to be material considerations in the decision-making process. Industry standard mitigation measures may still apply.

Significance	Definition
Negligible	No material change to cultural significance.
No change	No impact, therefore, no change to cultural significance.

16.4.4 Historic seascape character

67. The approach to the assessment of historic seascape character differs to that outlined above for heritage assets.

68. The historic character of the seascape is described in terms of ability to accommodate change. A key aspect of this ability is how that character is perceived by the public. For this reason, an approach is required which recognises the dynamic nature of seascape and how all aspects of the seascape, no matter how modern or fragmentary, can form part of the character of that seascape.

69. It is not meaningful, therefore, to assign a level of importance to these perceptions of character, which are by nature subjective, nor to assign a measure of magnitude in order to understand the nature of the potential changes. Rather, this change is expressed as a narrative description of the seascape character, how it is perceived by the public and how these perceptions could be affected by North Falls, which may or may not be perceived as important from a historic perspective. In this respect, while damage to, or destruction of, a heritage asset is considered permanent and irreversible, impacts to historic seascape character are dynamic, and may be temporary and reversible.

70. Changes to the historic seascape character and the extent to which these changes can be accommodated are discussed in Section 16.4.4.

16.4.5 Cumulative effects assessment methodology

71. The CEA considers other plans, projects and activities that may result in cumulation with North Falls. ES Chapter 6 EIA Methodology (Document Reference: 3.1.8) provides further details of the general framework and approach to the CEA.

72. For offshore archaeology and cultural heritage, cumulative effects may occur where archaeological receptors also have the potential to be impacted by other existing, consented and / or proposed developments or activities. This includes consideration of the extent of influence of changes to marine physical processes (see ES Chapter 8 Marine Geology, Oceanography and Physical Processes (Document Reference: 3.1.10)) arising from the Project alone and those arising from the Project cumulatively or in combination with other OWF developments.

16.4.6 Transboundary effects assessment methodology

73. The transboundary assessment considers the potential for transboundary effects to occur on offshore archaeology and cultural heritage receptors as a result of North Falls; either those that might arise within the EEZ of European Economic Area (EEA) states or arising on the interests of EEA states e.g. a non UK fishing vessel. ES Chapter 6 EIA Methodology (Document Reference: 3.1.8) provides further details of the general framework and approach to the assessment of transboundary effects.

74. For offshore archaeology and cultural heritage, the potential for transboundary effects has been identified in relation to wrecks of non-British, European nationality which may subject to impact from development and may therefore fall within the jurisdiction of another country. Transboundary impacts may also occur if the cumulative effects of changes to physical processes have the potential to impact archaeology across extended sea areas. In addition, there is potential for developments, individually and cumulatively, to affect larger-scale archaeological features such as palaeolandscapes and to affect the setting of heritage assets and historic landscapes / seascapes which may also extend across these boundaries. This may also include sensitivities in conjunction with local community groups and interests.

16.4.7 Assumptions and limitations

75. The records held by the UKHO, Historic England (NHLE and NMHR), HER and the other sources used in this assessment are not a record of all surviving cultural heritage assets, rather a record of the discovery of a wide range of archaeological and historical components of the marine historic environment. The information held within these datasets is not complete and does not preclude the subsequent discovery of further elements of the historic environment that are, at present, unknown. In particular, this relates to buried archaeological features.

76. Alongside the Project specific survey data this suite of data sources are considered appropriate for the assessment of the existing historic environment for the purposes of EIA.

16.5 Existing environment

16.5.1 Seabed prehistory

16.5.1.1 Description of identified assets

77. The recent geological history of the southern North Sea is directly linked to glacial / interglacial cycles experienced by the area during the Pleistocene (2.5 million to 10 thousand years ago), which resulted in large areas of the southern North Sea being periodically exposed as a terrestrial environment. These glacial cycles, and accompanying changes in sea level, are recorded as Marine Isotope Stage (MIS).

78. The potential for prehistoric sites to be present within the study area, either exposed on or buried within 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.

79. Archaeological material may also be present within secondary contexts, as isolated finds within deposits comprising material from terrestrial phases that may have been reworked by marine or glacial processes, for example.

80. There are no known *in situ* seabed prehistory sites within the study area. However, a number of finds of prehistoric material have been reported from the study area and the immediate vicinity of the offshore cable corridor.

81. Faunal remains recovered from the former marine aggregate license Area 447 and reported through the Marine Aggregates Reporting PAD (BMAPA, 2005) include a woolly mammoth tusk fragment (NMHR ID 1500435) and three mammoth teeth (NMHR ID 1549833, 1591910 and 1532592). The recorded locations of these finds and the location of Area 447, through which the offshore cable corridor runs, are shown on ES Figure 16.1 (Document Reference: 3.2.12).

82. A collection of faunal remains has also been reported from a location to the south-west of the landfall (NMHR Event ID: 1615967, ES Figure 16.1 (Document Reference: 3.2.12)). The Historic England research project *Investigating the Submerged Pleistocene Landscapes of the Wallet, off Clacton* (Bynoe, 2017) aimed to demonstrate the value of derived animal bones for providing targeted locations of submerged Pleistocene deposits. Following the identification of areas of interest as shown by trawler derived archaeological material, SSS and SBP data were assessed followed by diver ground-truthing to search for faunal material and to recover short cores for analysis of seabed sediments.

83. The case study focused upon the analysis of a faunal collection from off the coast of Clacton held by Colchester Museums Service. The collection is dominated by later Pleistocene species including woolly mammoth and woolly rhino with minor components of interglacial species, such as straight-tusked elephant and narrow-nosed rhinoceros (Bynoe, 2017). The collection derives from the area of the Wallet, west of the North Falls cable landfall and an area where geophysical and geotechnical work, carried out as part of the Gunfleet Sands Wind Farm project, has picked up a Pleistocene palaeochannel system immediately offshore from Clacton with Holocene Channels cut into these Pleistocene deposits.

84. Short cores acquired as part of the project revealed the presence of a thin veneer of modern seabed sediments overlying a probable estuarine alluvial clay deposit (Bynoe, 2017). Pockets of organic-rich clay were seen in the estuarine alluvium in one of the cores. Although no faunal material was encountered during diving operations the project was successful in the characterisation of the seabed in the vicinity of the Wallet. The combination of the geophysical data and the short core analysis suggests that there is a thick (up to 4m in the northern section, thinning to c. 1m in the south), stratified, organic-rich alluvium throughout the surveyed area. This overlies a coarser deposit that, in the north-western extent of the survey area, can be interpreted as earlier sands and gravels, possibly either the Crag deposits of the late Pliocene, which locally

overlie the London Clay, or to Pleistocene sands and gravels relating to the Thames-Medway system.

85. The presence of patinated, nonrounded and thermally fractured flint in the deposit overlying the alluvial clays from one of the cores, suggests that the contemporary deposit was subjected to cold, possibly glacial, conditions and indicating that the alluvium is Pleistocene (Bynoe, 2017). However, without a secure date or further palaeoenvironmental evidence this remains uncertain.

86. One further outcome of the Project occurred through community engagement, with, several members of the community coming forward with large collections of faunal remains and lithic material that they had been collecting from the beaches at Holland-on-Sea to Clacton-on-Sea (Bynoe, 2017). The species represented were similar to those reported as coming from the Wallet (i.e. later Pleistocene species such as woolly mammoth and woolly rhino, with occasional interglacial elements such as molars from straight tusked elephants). It was initially thought that these remains may have ended up on the beach as a result of erosion of the gravel deposits relating to the ancestral River Thames at Holland-on-Sea and Jaywick and transportation along the beach, or that they were eroding from similar deposits offshore.

87. However, it was subsequently recognised that the reported finds had been discovered following beach replenishment at Holland-on-Sea to Clacton-on-Sea carried out between 2014 and 2015 (Bynoe et. Al., 2022). The assemblage of finds since 2014 was found to include Early Middle Palaeolithic Levallois stone tools, distinct from pre-existing, locally eroding archaeology recorded before this date. The sands used in this coastal protection scheme derived from offshore Licence Area 447 and, while the number of finds being reported have decreased, bones and stone tools were still being found as of 2022.

88. Onshore contexts in the vicinity of the landfall have also yielded important evidence of early hominin activity, in the form of flint tools and a wooden hunting spear dating from the Hoxnian interglacial (MIS 11, c. 423,000 – 380,000 Before Present (BP)) preserved in a former channel of the river Thames at Clacton (Thornton, 2019). Other early stone tools have been found at Walton's Naze and at Thorpe-le- Soken. Human activity has also been revealed at St Osyth, Jaywick, Clacton, Frinton and Walton and other locations from the Late Upper Palaeolithic era (c. 12,500 BP), the Mesolithic (c. 10,000 BP onwards) and the Neolithic (6,000–3,500 BP).

89. Within the study area, the shallow geology of the study area (Table 16.12) has been established by Wessex Archaeology from the SBP and MBES data supported by a range of secondary sources, including academic papers, monographs, geological information (e.g. BGS mapping), and previous work undertaken by Wessex Archaeology from the East Anglia / Outer Thames Estuary area and the wider region.

Table 16.12 Shallow stratigraphy of the study area (ES Appendix 16.1 (Document Reference: 3.3.17), Table 5)

Unit	Unit Name	Geophysical Characteristics (1)	Sediment Type (2)	Archaeological Potential
4	Holocene Seabed Sediments (post-transgression) (MIS 1)	Generally observed as a veneer or thickening into large sand wave and bank features up to >10m thick. Boundary between surficial sediments and underlying units not always discernible.	Gravelly sand / sandy gravel with shell fragments. Sand waves and ripples indicate sediment is mobile in places.	Considered of low potential in itself, but possibly contains re-worked artefacts and can cover wreck sites and other cultural heritage.
3	Channel Deposits (Pre-Anglian to Early Holocene) (MIS >12 to 1)	Numerous channel, cut and fill, and associated terrestrial features (e.g. overbank deposits) of varying acoustic character.	Expected to be a combination of fluvial, estuarine, and terrestrial deposits, including organic deposits.	Potential to contain *in situ* and derived archaeological material, and palaeoenvironmental material.
2	Red Crag Formation (Pliocene)	Erosive basal reflector above London Clay Formation. Characterised by numerous horizontal parallel internal reflectors	Shelly marine sand and gravel	Pre-Earliest occupation of the UK
1	London Clay Formation (Early Eocene / Ypresian)	Acoustically distinctive, comprising parallel internal reflectors and frequent small scale extensional faults.	Shallow marine clays	Pre-Earliest occupation of the UK
(1) Based on geophysical data (2) Based on historic borehole data (where available) and Cameron *et al*. (1992)				

90. The Eocene London Clay (Unit 1) and Pliocene Red Crag Formation (Unit 2) are not of archaeological interest (as both deposits pre-date the earliest evidence for hominins in Britain). These are overlain by numerous terrestrial channel features and their associated deposits (Unit 3) (e.g. overbank / floodplain deposits) from the Pleistocene through to the Early Holocene. Unit 4 comprises the modern marine sediment deposited since the Holocene marine transgression.

91. The primary unit of interest for seabed prehistory, therefore, is Unit 3, associated with 58 features of palaeogeographic interest interpreted from the geophysical data. These are described in detail in ES Appendix 16.1 (Document Reference: 3.3.17) and the locations are illustrated on ES Figure 16.2 (Document Reference: 3.2.12) (array area) and ES Figure 16.3 (Document Reference: 3.2.12) (offshore cable corridor). In summary, the features comprise:

- Two channel complexes assigned a P1 archaeological rating;

- 17 channels assigned a P1 archaeological rating;
- 30 cut and fills assigned P1 (3) or P2 (27) archaeological ratings, depending on context and confidence of interpretation;
- Two erosion surfaces assigned a P2 archaeological rating; and
- Seven areas of acoustic blanking (suggesting a possible area of shallow gas indicative of preserved organic material within the sediments) assigned a P2 archaeological rating.

92. Significant, potentially well-preserved palaeogeographic features were identified within the following areas:

- Array area: an extensive complex palaeochannel and possible delta, alongside a potential coastline and associated features;
- Offshore cable corridor: two channel complex areas, possibly the remains of the Thames-Medway river, and an area of channelling / possible preserved landscape deposits.

93. Similar palaeogeographic features and channel complexes were interpreted within the offshore export cable corridor for the Five Estuaries which runs parallel and partially overlaps with the North Falls offshore cable corridor (Five Estuaries, 2023a). Cross cutting, complex channels accompanied by acoustic blanking, indicating the presence of shallow gas which suggests the presence of preserved organic deposits, have been observed in the assessments undertaken for both projects. These features, which extend beyond the boundaries of the projects, are considered in Section 16.8 below.

16.5.1.2 Cultural significance of identified assets

94. The interpretation of shallow stratigraphy and associated palaeogeographic features provides context for an understanding of the potential for past inhabitation of these formerly terrestrial landscapes. As such, their significance lies primarily in their archaeological interest or research value, particularly when considered alongside survey data and interpretations produced for other seabed development projects in the North Sea. This is discussed further in terms of CEA and transboundary impacts in Sections 16.7 and 16.8 below.

95. Within the array area 15 palaeogeographic features have been identified (ES Figure 6 of Appendix 16.1 (Document Reference: 3.3.17)). Two main areas have been identified.

96. The dominant feature is a long meandering channel (7018) (possibly representing two separate, converging fluvial channels, a northern and southern channel) with a second channel feature (7016) located further to the NNE, probably originally part of channel 7018 which has been partially eroded away. Both 7016 and 7018 were partially identified during initial assessments associated with the Galloper OWF (see Section 16.8 below). Three areas of acoustic blanking (7020, 7021, and 7022), interpreted as possible shallow gas, have been identified within the southern channel of 7018, suggesting the presence of some organic material within the sediments.

97. To the east of the convergence point of the northern and southern channels of 7018 a break in slope has been observed in the MBES data, interpreted as a

relict delta feature by Wessex Archaeology with the break presenting a possible palaeoshoreline (ES Figure 6 in Appendix 16.1 (Document Reference: 3.3.17)). A number of small mound features have been identified in the MBES data following the approximate orientation of this shoreline and may tentatively represent a barrier island chain associated with the coast / delta.

98. These features are considered of high archaeological potential suggesting the presence of a significant palaeolandscape in the western section of the array area.

99. An additional distinct feature (7030) has also been seen in the east of the area, also interpreted as a possible channel. The eastern edge of the feature appears to have been eroded away, potentially cut by the Lobourg Channel, which formed the main drainage route of the major northern European rivers flowing into the dry North Sea Basin. The Lobourg Channel is thought to have been incised during deglaciation and retreat of the ice sheet at the end of the Anglian, at which point it is thought that the emptying of an ice-dammed lake within the North Sea created a volume of water large enough to breach the chalk ridge along the Weald-Artois high. The breaching of the Weald-Artois ridge had a major impact on the palaeogeography of Britain, turning Britain from an island at times of high sea level, to a peninsula of Europe when sea levels dropped.

100. This feature is, therefore, also of high archaeological potential, and (as described above for channel 7000) further investigation could be important for refining the geological chronology of the region.

101. In the offshore cable corridor 43 palaeogeographic features have been identified (ES Figure 16.3 (Document Reference: 3.2.12)). Two large areas of complex channelling, interpreted as channel complex deposits (7052 and 7062) have been identified comprising combination of large, distinct channels, smaller, shallow channel features, and associated potential floodplain / overbank deposits. These likely represent the remains of a long-lived fluvial system with multiple phases of channel migration over time, potentially a braided river, and may represent an earlier route of the Thames-Medway river system before it was pushed southwards to its current position.

102. In addition to these channel complex features, a total of 14 possible channels have been identified (see ES Appendix 16.1 (Document Reference: 3.3.17) for the full list). Of particular interest is channel 7065 in the nearshore area which had two phases of fill, the second phase containing areas of acoustic blanking (7067, 7068, 7069, and 7070), interpreted as shallow gas, suggesting the preservation of organic material (ES Figure 14 in Appendix 16.1 (Document Reference: 3.3.17)). These nearshore features are potentially important due to their location close to shore just along from the Lower Paleolithic site at Clacton and preserved Mesolithic land surface / peat deposit at Jaywick.

103. There may be a relationship between these channel features and the palaeochannel system studied in the area of the Wallet (Bynoe 2017), although further investigation would be required to confirm this. As stated above, the presence of a thermally fractured flint in the deposit overlying the alluvial clays, suggested that the contemporary deposit was subjected to cold, possibly glacial, conditions and indicating that the alluvium is Pleistocene (Bynoe, 2017). However, without a secure date or further palaeoenvironmental evidence this

remains uncertain. The potential for acquiring samples for palaeoenvironmental assessment and dating from this alluvial deposit as part of planned mitigation is discussed in Section 16.5.1.2 below.

104. In terms of the contribution that 'setting' makes to the significance of these features, 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. For offshore assets, for the most part, submerged archaeological sites are not 'readily appreciated by a casual observer'. Former prehistoric landscapes in the North Sea, are largely experienced conceptually in terms of interpreted data and research and the setting of these assets (in terms of the surroundings in which they are experienced) does not, therefore, form a key part of their significance. However, changes within the physical setting will occur (i.e. the introduction of North Falls into the seascape) and the capacity of these palaeolandscapes to accommodate this change is discussed alongside historic seascape character in Section 16.4.4.

16.5.1.3 Importance of identified assets

105. The rarity of *in situ* prehistoric sites in offshore contexts means that, should such sites be encountered within the offshore sites, these will be of national, or possibly international interest, with significant potential to contribute to acknowledged international and national research objectives. Given the particularly high importance of these *in situ* sites, the features and deposits which have the potential to contain *in situ* prehistoric archaeological material (i.e. interpreted palaeolandsurfaces and palaeolandscape features) should also be considered of high importance. Similarly, should palaeoenvironmental evidence be discovered in the context of an *in situ* prehistoric site this would also be of high importance.

106. Although palaeoenvironmental material encountered beyond the context of an *in situ* prehistoric site still has evidential value for understanding changes in the climate and environment with offshore contexts, isolated discoveries should be considered of low importance for the purposes of assessment.

107. Isolated finds of prehistoric archaeological material within secondary contexts, comprising material from terrestrial phases that may have been reworked by marine or glacial processes, also have evidential value for understanding patterns of population and exploitation of landscapes, for example. However, as these finds are derived, and out of context, they are regarded as being of medium rather than high importance.

108. The heritage importance of the potential heritage assets outlined above are presented in Table 16.13.

Table 16.13 Heritage importance (seabed prehistory)

Asset Type	Definition	Importance
Potential *in situ* prehistoric sites	Primary context features and associated artefacts and their physical setting (if / where present)	High
	Known submerged prehistoric sites and landscape features with the demonstrable potential to include artefactual material	High

Asset Type	Definition	Importance
Potential submerged landscape features	Other known submerged palaeolandscape features and deposits likely to date to periods of prehistoric archaeological interest with the potential to contain *in situ* material	High
Potential derived Prehistoric finds	Isolated discoveries of prehistoric archaeological material discovered within secondary contexts	Medium
Potential palaeoenvironmental evidence	Isolated examples of palaeoenvironmental material	Low
	Palaeoenvironmental material associated with specific palaeolandscape features or archaeological material	High

16.5.2 Maritime and aviation archaeology

16.5.2.1 Description of identified assets

109. There are no known sites within the study area that are subject to statutory protection from the Protection of Wrecks Act 1973, the Protection of Military Remains Act 1986 or the Ancient Monuments and Archaeological Areas Act 1979. There are, however, a number of wrecks (described below) charted by the UKHO. This includes three modern wrecks (UKHO 14554, UKHO 14875 and UKHO 57457) within the North Falls offshore project area which are not of archaeological interest due to their age and are not included in the discussion below.

110. SSS, MBES and magnetometer data interpreted by Wessex Archaeology has demonstrated the presence of 1514 seabed features within the study area 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 16.6. The large number of features reflects considerable historic maritime activity in the study area, the approach to the Thames having been a historically busy area for shipping, with significant military activity in the twentieth century. These seabed features are described in detail in ES Appendix 16.1 (Document Reference: 3.3.17) and the locations are illustrated on ES Figure 16.4 (Document Reference: 3.2.12) (array area) and ES Figure 16.5 (Document Reference: 3.2.12) (offshore cable corridor).

111. A total of 310 features have been identified within the array area and 1204 within the offshore cable corridor, as shown in Table 16.14.

Table 16.14 Anomalies of archaeological potential within the study area

Archaeological discrimination	Array area	Offshore cable corridor
A1	8	33
A2-h	73	405
A2-l	225	760
A3	4	6
Total	310	1204

112. These anomalies are also summarised by probable type in Table 16.15.

Table 16.15 Types of anomaly identified

Anomaly classification	Array area	Offshore cable corridor
Wreck Areas of coherent structure including wrecks of ships, submarines and some aircraft (where coherent structure survives)	2	10
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	5	31
Debris Distinct objects on the seabed, generally exhibiting height or with evidence of structure, that are potentially anthropogenic in origin	22	77
Seabed disturbance An area of disturbance without individual, distinct objects. Potentially indicates wreck debris or other anthropogenic features buried just below the seabed.	9	27
Rope / chain Curvilinear dark reflectors, often with a small amount of height, indicating rope or chain (if ferrous)	23	38
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	0	6
Dark reflector Individual objects or areas of high reflectivity, displaying some anthropogenic characteristics. Precise nature is uncertain	51	167
Mound A mounded feature with height not considered to be natural. Mounds may form over wreck sites or other debris.	25	19
Magnetic No associated seabed surface expression, and have the potential to represent possible buried ferrous debris or buried wreck sites	167	823
Magnetic trend Either a continuous trend, or trend comprising individual magnetic anomalies which appear to be associated, with no associated seabed surface expression or feature. Has the	2	0

Anomaly classification	Array area	Offshore cable corridor
potential to represent possible ferrous debris.		
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.	4	4
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.	0	2
Total	310	1204

113. The A1 anomalies, including identified wrecks are summarised by area in Table 16.16. In accordance with the embedded mitigation set out in Section 16.2.3 each of these A1 anomalies is assigned an AEZ prohibiting the placement of infrastructure or activities from taking place within their boundaries (as detailed in Section 16.5.1.1 below). Further details on each wreck are provided in Wreck Sheet 1 to Wreck Sheet 14 in ES Appendix 16.1 (Document Reference: 3.3.17).

Table 16.16 Known wrecks and unidentified A1 anomalies within the study area

WA ID	UKHO ID	Description
Array area		
7140	14427	Unidentified wreck (30.1 x 9.8 x 1.7m) seen as a distinct irregular area of seabed disturbance in the SSS data and as a large elongate mound in the MBES data. Not directly covered by the 2021 Mag. Dataset, although a Mag. Contact of 12Nt was associated with this wreck in the 2009 data acquired for the Galloper OWF. The UKHO describe the wreck as partially buried and possibly overturned.
70237		Item of debris (2.5 x 0.7 x 0.8m) associated with wreck 7140.
70339	14394	Wreck of the steamship *Mecklenburg* seen as moderately coherent and upright with a generally intact hull outline and some superstructure and internal features. The wreck measures 88.7 x 27.9 x 7.2m and appears more damaged at the bow and stern. A large Mag. Anomaly of 305Nt is associated. The UKHO records that the *Mecklenburg* was lost after hitting a mine in 1916, and initially the mast was still visible at high water. Possibly also associated with A2_h anomalies 70342, 70343 and 70344.
70340		Item of debris (11.4 x 1.2 x 0.6m) associated with wreck 70339.
70341		Debris field located along the northern side of the wreck (12.9 x 5.6 x 0.2m).
70305	N/A	Debris field (23.5 x 14.2 x 0.3m) without an associated wreck. Located close to 70306 and possibly associated.
70306	N/A	Debris field (19.8 x 12.9 x 0.5m, 1291Nt) without an associated wreck. Located close to 70305 and possibly associated.
70525	N/A	Item of debris (13.6 x 6.7 x 0.8m, 2364Nt) without an associated wreck.
Offshore cable corridor		
70558	14444	Unidentified wreck (44.3 x 11.8 x 6.3m) degraded but coherent, appears upright, potentially broken into two sections. Data suggests a partially detached piece of infrastructure, possibly either the bow or stern, exposing possible lower decks frameworks. The framework left suggests this end may have been the bow as it

WA ID	UKHO ID	Description
		comes to a point. Not directly covered by the 2021 Mag. Dataset, but two magnetic anomalies (117Nt and 150Nt) are located within 60.0m of the centre of the wreck. The UKHO records a trawler, upright, intact and partially collapsed. Possibly also associated with A2_h anomaly 70556 and A2_l anomaly 70560.
70557		Item of debris (3.1 x 2.3 x 0.5m) associated with wreck 70558 and with a large associated mag anomaly of 128Nt. Not visible in the SSS data but appears as a mound in the MBES and interpreted as possible ferrous debris.
70642	14522	Unidentified wreck (24.1 x 13.1 x 0.1m) with no obvious structure and a very large anomaly of 5924Nt. The UKHO records an unknown wreck, upturned on a flat seabed.
70747	14548	Possibly the wreck of the HMS *Resono* (29.9 x 8.1 x 4.9m) seen as a distinct elliptical outline of a hull which appears generally intact, with visible internal structure, associated with a very large Mag. Anomaly of 34709Nt. The Wreck appears broken up and possibly partially buried at the western end. The eastern end comes to a gradual point, suggesting the possible remains of the bow. The UKHO records that the HMS *Resono* was built in 1910 by Welton & Gemmel ltd, Beverley, hired in 1915 as a minesweeper, and lost to mines in 1915. Possibly also associated with A2_h anomalies 70752, 70755 and A2_l anomalies 70753, 70756 and 70757.
70748		Debris field (15.0 x 10.5 x 1.5m) associated with wreck 70747.
70749		Item of debris (1.8 x 0.9m) associated with wreck 70747.
70750		Debris field (8.9 x 3.0 x 0.4m) associated with wreck 70747.
70751		Item of debris (1.2 x 0.7 x 0.4m) associated with wreck 70747.
70768	14544	Wreck of the submarine HMSM E6 (50.4 x 10.2 x 3.3m) visible as a narrow coherent wreck with some internal structure visible and a very large 15943Nt anomaly. There is a break in the centre and the southern end is degraded. The UKHO records that the submarine was commissioned in Oct 1913 and sunk in 1915 on antisubmarine patrol, when it hit a mine with a loss of 31 men. Possibly also associated with A2_h anomaly 70771.
70769		Item of debris (1.4 x 0.5 x 0.1m) associated with wreck 70768.
70770		Item of debris (5.7 x 0.6 x 1.3m) associated with wreck 70768.
70785	14543	Probably the wreck of the steamship *Marie Leonhardt* (57.9 x 27.0 x 2.0m) with a very large Mag. Anomaly of 23215Nt. No coherent structure is visible and it is seen in the MBES data as an irregular seabed disturbance amongst an area of sandwaves. The UKHO records that *Marie Leonhardt* was built in 1902 by Schiffswerft Kock and owned at time of loss by the admiralty. It had a triple expansion engine of 283NHP for 9kts. In 1917 the ship was lost on passage from Hartlepool to London with a cargo of coal when it was mined and sunk, with five men lost. Possibly also associated with A2_h anomaly 70787 and A2_l anomalies 70788, 70789 and 70790.
70786		Debris field (7.4 x 5.0 x 0.4m) associated with wreck 70785.
70988	15074	Unidentified wreck (6.4 x 2.4 x 1.2m) seen as an area of disturbance with a very large anomaly of 1666Nt. There is no coherent structure visible and this is interpreted as a well broken-up and possibly dispersed wreck. The UKHO records the location of a small, possibly wooden vessel.
71019	87044	Unidentified wreck (4.1 x 3.3 x 0.6m) seen as a compact group of distinct, short linear and angular dark reflectors in the SSS data and as an elongate mound in the MBES data, within large sand waves indicating it may be partially buried. This position was not directly covered by the Mag. Data. The UKHO records the vague outline of an unknown wreck. Interpreted as an extremely degraded wreck.

WA ID	UKHO ID	Description
71540	14540	Wreck of the drifter HMS *Lord St Vincent* (24.2 x 11.1 x 0.8m) with a very large complex Mag. Anomaly of 1315Nt. The wreck has no discernible structure and is highly degraded The UKHO records this as the location of part of the wreck of the drifter type vessel HMS *Lord St Vincent*, built in 1929 by J Chambers Ltd, Lowestoft with one boiler, and a triple expansion engine of 50nhp. The vessel was hired as armed patrol vessel from 1939 and converted into a boom defence vessel from 1940. The vessel was mined in 1941. Possibly also associated with A2_h anomalies 71539, 71542 71546 and 71547. An A3 record for another part of this wreck is recorded as 71545 (UKHO 14534).
71541		Item of debris (3.9 x 0.8 x 0.3m) associated with wreck 71540.
71560	14970	Wreck of the *Mac 5* (69.3 x 19.3 x 2.4m) seen with some internal structure visible and partially buried with a highly broken up northern end and a very large Mag. Anomaly of 1591Nt. The UKHO records that *Mac 5* was mined in 1940.
71771	N/A	Previously unrecorded wreck seen as a highly distinctive group of dark reflectors consisting of two parallel linear features crossed by additional regular perpendicular linears. Visible in the MBES data as a seabed disturbance, rectangular in plan. The primary feature is an ovoid mound, which has some slatted features visible and some small rounded mounds, situated on a generally clear but slightly uneven seabed. Also with a large Mag. Anomaly of 255Nt. Interpreted as possibly modern ferrous wreck. Possibly also associated with A2_l anomaly 71768.
71769		Item of debris (5.6 x 0.5 x 0.1m) associated with wreck 71771.
71770		Item of debris (5.5 x 0.3 x 0.1m) associated with wreck 71771.
71772		Item of debris (2.7 x 1.2 x 0.5m) associated with wreck 71771.
71773		Item of debris (3.4 x 1.9 x 1.5m) associated with wreck 71771.
71276	N/A	Debris field (24.3 x 19.8 x 0.9m, 1427Nt) without an associated wreck.
71448	N/A	Debris field (7.9 x 7.5 x 0.7m, 1473Nt) without an associated wreck.
71476	N/A	Debris field (14.8 x 4.1 x 1.5m, 1504Nt) without an associated wreck.
71650	N/A	Debris field (99.8 x 0.2 x 0.1m, 1537Nt) without an associated wreck. Possibly also associated with A2_l anomaly 71649.
71575	N/A	Rope or chain (20.6 x 0.2 x 0.2m, 1183Nt. The higher archaeological rating is related to the unusually large magnetic anomaly, which suggests other buried ferrous debris may be located within the vicinity.
71138	N/A	Very large magnetic anomaly of 1029Nt.
71214	N/A	Very large magnetic anomaly of 1028Nt.
71222	N/A	Very large magnetic anomaly of 1268Nt.
71273	N/A	Very large magnetic anomaly of 1005Nt.
71474	N/A	Very large magnetic anomaly of 1740Nt.

114. In addition to the wrecks listed in Table 16.16 there are 11 A3 historic records of possible archaeological interest with no corresponding geophysical anomaly (Table 16.17). These are all recorded locations of UKHO wrecks or obstructions for which no remains were visible in the geophysical data assessed by Wessex Archaeology (ES Appendix 16.1 (Document Reference: 3.3.17)). In accordance with the embedded mitigation set out in Section 16.2.3 each of these A3 records is assigned an AEZ as a precautionary measure (as detailed in Section 16.5.1.1 below). For each of these A3 records it is possible that the wrecks are well

dispersed and / or buried, or that the record may be inaccurately positioned, and the wreck located elsewhere.

Table 16.17 A3 historic records within the study area

WA ID	UKHO ID	Description
Array area		
70176	14462	The recorded position of UKHO 14462, an unknown wreck. It was first identified in 1971, however it was not located during surveys in 1996. It is recorded in the UKHO database as being no longer visually conspicuous and has been classified as 'dead'.
70402	14387, 14388 and 14389	This position corresponds to three UKHO wrecks: • 14387 the steamship *Franz Nasen*, mined on 05/01/1916; • 14388, the tanker *La Flandre*, mined on 21/02/1916; and • 14389, the *Apollo*, also mined on 21/02/1916. A sonar contact was reported at the location in in 1947 although subsequent surveys have been unable to locate any remains. In 1996 the record was amended to dead. All three are recorded as the locations of a reported sinking and may represent a recorded loss location only, However, as a sonar contact was found in this position previously it has been retained as a precaution.
70443	70226	This position corresponds to UKHO 70226, the wreck of the steamship *Texelstroom*. It was sunk by mine on 06/10/1915. It has not been identified in surveys of the area undertaken in 1947 or 1971, and is believed unlikely at this position. However, this is an area of large sandwaves indicating highly mobile sediment which could completely cover any material and has retained as a precaution.
70492	70253	This position corresponds to UKHO 70253, the wreck of the steamship *Athamas*. It was beached after detonating a mine, but was later refloated. The vessel was salvaged, and the record amended to dead in 1947. However, there may be buried debris relating to the vessel and it has been retained as a precaution.
Offshore cable corridor		
70741	14550	This position corresponds with UKHO 14550, a possible location of the wreck of the *Marie Leonhardt* (see also 70785 in Table 16.16). The wreck was not observed on subsequent surveys save from a small contact and a magnetic anomaly and amended to dead. Although this location is approximately 55.0m outside the study area, the 100m AEZ partially overlaps with the study area and this record has, therefore, been retained as a precaution.
70777	14546	This position corresponds to UKHO 14546, the wreck of the steamship *Michail Ontchoukoff*¸ mined in 1916. It was first reported as being dispersed in 1917 and has not been seen since 1923. It is possible this position is unreliable, or that the wreck is completely dispersed, buried or has been salvaged. However, as remains have been reportedly found in this position previously it has been retained as a precaution.
71545	14534	This position corresponds to UKHO 14534, the recorded location of part of the wreck of the drifter, HMS *Lord St Vincent* (see 71540 in Table 16.16). It was last surveyed in 1968, with some scour but no evidence of the wreck. However, as remains have been found in this position previously it has been retained as a precaution. Possibly associated with A2_l anomaly 71543 situated 40.0m to the north-east and A2_h anomaly situated 60.0m to the north-east.
71670	14995	This position corresponds to UKHO 14387, the wreck of a Wellington aircraft. It was initially identified in 1988, and confirmed as aircraft by divers in 1999. This is located outside the study area, however an AEZ will bring it within the area. There is a seabed disturbance located 40.0m to the south of this position which may be related, however as this is also outside the study area this anomaly has not been retained, but it is located within the AEZ.

WA ID	UKHO ID	Description
70947	77249	This position corresponds to UKHO 77249, a recorded obstruction in the UKHO database. First identified in 2010 and described as a small contact in a scour hole with a height of 0.6m in 0.3m scour. Not observed in surveys in 2014 and 2019 and the record was amended to dead. As remains have been found here previously it has been retained as a precaution.
70984	87002	The position corresponds to UKHO 87002, a recorded obstruction. It was first identified in 2016 as a feature with geophysical dimensions of 3.8 x 2.2 x 1.0m within scour measuring 11.1 x 0.7m. As remains have been identified at this location previously it has been retained as a precaution.

115. Additionally, the named wrecks described above are also recorded by the NMHR under the following reference numbers: HMS *Lord St Vincent* (908123 and 908126), *Marie Leonhardt* (908127), *Mac 5* (908121), HMS *Resono* (908130); HMSM E6 (1590261) and *Mecklenburg* (1440437).

116. Two further wrecks are recorded by the NMHR which are not reflected in the UKHO records within the study area or the Wessex Archaeology gazetteer (ES Appendix 16.1 (Document Reference: 3.3.17)).

117. The wreck of a British steamship *Haytor* (908095) is recorded close to the location of 70558 (Table 16.16). As both records reference the same UKHO wreck (14444), and as examination of the wider UKHO data shows the location of the *Haytor* recorded under a different ID number (14472) outside the study area, it is assumed that this record was updated subsequent to incorporation in the nmhr and has not yet been amended in the corresponding NMHR record. The location is located within the AEZ for 70558.

118. The second wreck is recorded in the north of the array area. The record for this 1915 wreck of Norwegian cargo vessel *Selma* (1457715) references UKHO wreck 14458 and notes the position as approximate. The corresponding UKHO record is a 'dead' wreck, not considered to exist and no confirmed remains have been seen at this location, suggesting it is a recorded loss location only. No remains were recorded at this location by Wessex Archaeology (ES Appendix 16.1 (Document Reference: 3.3.17)).

119. Of the total 1514 seabed features, 1463 are discriminated as A2 anomalies of possible archaeological interest, comprising 478 discriminated at A2_h (anomaly of likely anthropogenic origin but of unknown date, may be of archaeological interest or a modern feature) and 985 as A2-l (anomaly of possible anthropogenic origin but interpretation is uncertain, may be anthropogenic or a natural feature).

120. A number of these A2 anomalies are described by Wessex Archaeology (ES Appendix 16.1 (Document Reference: 3.3.17)) as possibly associated with wreck sites, as listed in Table 16.16 above. The remaining 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.

121. Seabed features of possible archaeological interest have also been identified within the offshore export cable corridor for Five Estuaries which runs parallel and partially overlaps with the North Falls offshore cable corridor (Five Estuaries, 2023a). The seabed features, listed in gazetteer format in the PEIR for Five Estuaries were mapped (using the co-ordinates listed in the gazetteer) alongside those within the North Falls offshore project area to allow for comparison between the two datasets. Whilst there is no overlap between the array areas, 37 seabed features listed in the Five Estuaries gazetteer also fall within the North Falls offshore cable corridor. Within the same overlapping areas the North Falls assessment, undertaken by Wessex Archaeology, lists 167 seabed features are listed.

122. Anomalies identified as being of 'high' archaeological potential are defined as, "anomalies considered to map material of archaeological interest such as wrecks or crash sites, buried, confirmed and potential palaeolandscapes, and their margins" (Five Estuaries, 2023a).

123. Anomalies identified as being of 'medium' archaeological potential are defined as, "anomalies that consist of defined structural outlines or coherent material distributions with strong backscatter, or clearly upstanding objects with shadow, or pronounced scour features; or a combination of these, interpreted as of possible archaeological interest but where further investigation would be required for more detailed interpretation" (Five Estuaries, 2023a).

124. It is important to note that the 'high' and 'medium' potential categories used for the Five Estuaries assessment do not correspond to the A1 and A2 discrimination flags used by Wessex Archaeology for the North Falls assessment. For example, where anomalies have been recorded in both assessments, A1 anomalies recorded by Wessex Archaeology have been categorised as both high or medium potential. Conversely, high potential anomalies recorded in the Five Estuaries assessment correspond to anomalies discriminated as both A1 or A2.

125. A further category of 'low' archaeological potential (anomalies considered to be of anthropogenic origin but likely related to modern activity with little or no archaeological significance such as modern debris, ropes, chains or fishing gear) is defined but these features are not listed in the PEIR gazetteer (Five Estuaries, 2023a). Similarly, magnetic anomalies below 100Nt without corresponding SSS or MBES features (a category which is included in Wessex Archaeology's A2 discrimination) and previously recorded wrecks and obstructions which have not been seen in the geophysical data (a category captured through Wessex Archaeology's A3 discrimination) are not listed in the PEIR gazetteer.

126. Given these differences in how the seabed features are categorised / discriminated and how the anomalies are captured within the gazetteers a meaningful comparison between the two datasets is difficult on the basis of the publicly available information.

127. For example, there are 22 high potential anomalies interpreted for Five Estuaries which are also located within the North Falls offshore cable corridor. Eight of these correspond to anomalies identified by Wessex Archaeology within the North Falls offshore cable corridor. One of these is a 'new' wreck

identified in both datasets (71771/MA0038). The Wessex Archaeology interpretation records an ‘A1’ wreck (71771), three items of associated ‘A1’ debris (71770, 71772 and 71773) and a possibly associated ‘A2’ magnetic anomaly (71768 measured at 40Nt). The Five Estuaries PEIR records MA0038 as a high potential wreck, associated medium potential features MA0326 and MA0322.

128. Differences in assessment results can be influenced by a number of considerations including data acquisition between the two projects, how the data have been processed, interpreted and grouped and in how individuals have picked and discriminated anomalies. It is important to note that all ‘wrecks’ within the areas of overlap (71771/MA0038), or in close proximity to the North Falls offshore cable corridor (70988/MA0034 and 71760/MA0301), have been identified in both assessments.

129. With regard to any additional seabed features, although it is possible for an experienced archaeological geophysicist to distinguish between anthropogenic and natural material, and to provided judgement on the likelihood of a features to be of archaeological interest (high / medium or A1/A2), the specific archaeological interest of an feature cannot be determined without further investigation. The approach to delivering this further investigation, and mitigation, for North Falls (post-consent) is set out in the Outline WSI (Offshore) (Document Reference: 7.11). Differences between the mitigation proposed for Five estuaries and North Falls are discussed as part of the impact assessment (Section 16.5) and CEA (Section 16.7) below.

130. In addition to known heritage assets, and seabed features of possible archaeological interest, there is also 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. Military aircraft crash sites are of particular importance as all aircraft lost in military service are automatically protected under the Protection of Military Remains Act 1986.

131. The NMHR groups recorded losses at arbitrary points on the seabed called Named Locations, these represent general loss locations and do not (unless by chance) relate to actual seabed remains. Within 5km of the study area there are 392 losses grouped at eight Named Locations, summarised as follows:

- Clacton On Sea Essex:
    - 18 second world war aircraft lost between 1940 and 1944 including eight German, nine British and one American military aircraft; and
    - nine ships or boats including two pre-19th century losses from 1418 and 1633 and seven vessels lost between 1874 and 1909.
- Cork Hole Essex:
    - An 1822 wreck of English brig which stranded on the Roughs Shoal;
- Cork Sand Essex:
    - 12 ships or boats including three pre-19th century losses from 1564, 1737 and 1750, eight vessels lost in the 19th century and one fishing vessel lost during the second world war.

- Gunfleet Essex:
    - Four British second world war aircraft lost between 1940 and 1943; and
    - 252 ships or boats including:
        - a 1318 wreck of English cargo vessel which stranded on the Gunfleet Sand;
        - 11 17th century losses from 1634 to 1697, including eight records relating to the loss of colliers on 27th of August 1696 in strong winds at Gunfleet Sand;
        - 56 18th century losses from 1716 to 1798, including seventeen records relating to the loss of colliers on Gunfleet Sand during a storm on November 13th, 1777;
        - 177 19th century losses of ships and boats from 1801 up to the start of the first world war;
        - Two first world war losses in 1914 and 1918;
        - Three second world war losses in 1939, 1940 and 1942; and
        - Two post war losses from 1948 and 1962
- Kent Coastal Waters
    - 16 records describing both Dutch and English ships lost during the 'The Four Days' Battle' which took place during the Second Anglo-Dutch War between 1st and 4th June 1666 largely south-east of the Galloper Sand off the Thames Estuary.
- Offshore The Naze Essex
    - Two British fighter aircraft lost in 1941 and 1944; and
    - Eight ships or boats including one pre-19th century loss in 1764, six vessels lost between 1839 and 1911 and a barge lost during the second world war.
- River Thames Coastal Waters
    - British training aircraft, an Airspeed Oxford, which crashed into the Thames Estuary either following gun action (friendly fire) or mechanical failure in 1941; and
    - Six ships or boats lost between 1832 and 1926 and a barge lost during the second world war.
- The Galloper Thames Estuary:
    - 41 ships or boats including two pre-19th century losses in 1754 and 1774, 29 vessels lost between 1807 and 1911 and ten craft lost during the first world war.
- The Naze Essex
    - A British fighter aircraft lost in 1940;
    - A German craft lost in 1831; and

- An English barge lost in 1910.

- Walton On The Naze Essex:
  - Five second world war aircraft lost between 1940 and 1944 including two German and three British military aircraft; and
  - 14 ships or boats including:
    - An 18th century loss from 1789;
    - 12 19th and 20th century losses of ships and boats from 1807 up to the start of the first world war;
    - A Dutch cargo vessel lost in 1940.

132. It is possible that any of the unnamed wrecks identified within the study area may be correlated to one of these records of losses or that the A2 anomalies of potential archaeological interest may also represent remains associated with any one of these losses.

133. The potential for previously unidentified wreck and aircraft remains is further highlighted by the results of the various phases of site investigation and analysis for the Galloper and Greater Gabbard OWFs. For example, as part of the archaeological assessment of pre-construction survey data from the Galloper OWF export cable route, along an average 250m wide area of geophysical survey coverage centred along the route, a total of 603 anomalies were identified (Wessex Archaeology, 2018a). Ground-truthing of 240 targets corresponding to geophysical anomalies identified by Wessex Archaeology was carried out using a Remote Operated Vehicle (ROV) in conjunction with UXO investigations and clearance (Wessex Archaeology, 2018b). In total, 78 targets were identified as being of archaeological interest including various items of metallic, wreck related debris, several anchors, the remains of aircraft including strips of fabric identified as probable parachute material and a number of UXO, for example.

134. A find of particular note was the bell of the steamship *Carica Milica*, which was discovered along with wreck related debris. The steamship was a cargo vessel that was built in 1928 and sunk by a mine in 1939. The UKHO charted position of the wreck of the *Carica Milica*, however, is c. 5.9km to the south-west of the discovery location of the ship's bell. It remained unclear, however, if the wreck debris encountered in the area of the bell, including wooden structural elements such as frames and planking as well as ferrous material including possible machinery components, a beam or frame, fixtures, bars, a metal pipe with a flange and other unidentified material, was contemporary or relating to another, unidentified wreck.

135. Another discovery of note resulted in the recovery of aircraft wreckage located approximately 20m east of the OSP foundations within the Galloper OWF, found to be part of the tail and upper fuselage of a B-17 bomber probably lost between spring 1943 and summer 1944 (Wessex Archaeology, 2019). A fragment of mandible (jaw bone), was also recovered, identified as being from an adult male aged at least 30 years and very probably one of the aircrew. Most of the finds recovered were small, fragmentary and in poor condition, and no intact aircraft structure was located. This discovery serves to highlight the

difficulties with locating these types of sites in the marine environment. The Site had previously been identified by Wessex Archaeology as magnetometer contact (70161) but was only identified as an aircraft crash site during the ROV investigation. Given the proximity to the OSP and corresponding cable routes the aircraft material could not be avoided and instead was recovered and subject to a post-excavation assessment archiving and publication.

136. A number of finds have also been recovered from aggregate dredged from the former marine aggregate licence Area 447, through which the offshore cable corridor passes. These are recorded by the NMHR as comprising:

- Several items relating to ordnance including:
    - bar shot likely dating to the 17th century (NMHR ID 1593039);
    - an expended naval shell, a solid shot marked with a broad arrow, used since the 1600s to mark government property' (NMHR ID 1592663);
    - the metal barrel of a Tokarev TT-33 pistol of Second World War to Cold War date (NMHR ID 1591558);
    - a bolt from a Browning M2 machine gun (a type mass produced after and which was fitted to American combat aircraft during the Second World War, including the P51 Mustang fighter and the B17 bomber) (NMHR ID 1592650); and
    - a barrel extension and bolt from a further Browning machine gun (NMHR ID 1567628).
- Items of aircraft including:
    - A Second World War British Hawker Hurricane tail wheel strut (NMHR ID 1499580);
    - An L-shaped scrap of riveted and non-ferrous metal, painted red and possibly from an aircraft (NMHR ID 1531084);
    - An aircraft landing light with a German manufacturer plate partially preserved (NMHR ID 1567521); and
    - A British Army microphone hand set dating to the Second World War and used in Vickers Wellington bombers (NMHR ID 1567625).
- Items of wreck including:
    - A patent log rotator made from a copper tube with welded on fins, most likely dating from the 19th-20th century, although it could have been as early as the 18th century (NMHR ID 1497362);
    - A modern fork, spoon and shoemaker's last, the silver fork engraved with 'BAADH & WINTER, KOBENHAVEN' and the silver spoon with the engraving ' ARGO-ADLER BREMEN 2' (NMHR ID 1531588);
    - A fragment of a brass gauge probably manufactured in the late 19th century or possibly the early 20th century (NMHR ID 1591909); and

- A heavily corroded wrought iron object, tentatively identified as an anchor arm (NMHR ID 1592676).

- Animal related items which might have been lost / discarded overboard including:
  - Two modern horseshoes made of steel or iron (NMHR ID 1531075);
  - A 28cm long bone identified as a horse metacarpal (NMHR ID 1567631); and
  - A fragment of cattle pelvis (NMHR ID 1591683).

137. Within the study area, therefore, there is high potential for the presence of a range of archaeological material which has not been seen in the geophysical data. There are many factors which affect the visibility and subsequent identification of wreck remains on the seafloor during hydrographic surveys (e.g. wooden-hulled vessels buried within seabed sediments are less likely to be visible on geophysical survey data). As such, the potential for remains to exist depends on an understanding of the variable survivability and visibility of wrecks on the seabed, with factors of consideration including the age of the vessel, the construction material, the seabed sediment type, the prevailing hydrodynamic and sedimentary regimes of the area and the occurrence of any seabed activities in that location.

138. Nearshore, the offshore cable corridor is characterised by outcropping bedrock between flat and featureless seabed. Moving seawards, towards the centre, however, again large sandwaves and megaripples predominate, becoming flat and featureless with isolated areas of seabed ripples, towards the east. Within the array area, the seabed in the west is predominantly flat and featureless, whilst the eastern seabed contains large sandwaves with megaripples and two large shallow banks in the north-east and south-east of the array site.

139. The potential for undetected, buried archaeological material may be considered higher in these areas of mobile sand waves and where greater depths of finer grained sediment would promote the survival of buried archaeological material.

16.5.2.2 Cultural significance of identified assets

140. The cultural significance of unidentified wrecks and debris, A1 and A2 anomalies and potential wrecks, aircraft and isolated finds (which are yet to be discovered) is currently unknown. The archaeological interest (or otherwise) of these features will be further examined post-consent (e.g. investigation of individual anomalies (ground-truthing) through ROV and / or diver survey). Once the character, nature and extent of selected features are more fully understood, their cultural significance can be described to inform any requirements for further work on a case by case basis.

141. The cultural significance of shipwrecks lies largely in their historic and archaeological interest, in terms of their historical associations with people or events and with their research value.

142. The *Mecklenburg* (70339, UKHO 14394, NMHR 1440437) was a Dutch cargo vessel which foundered near the Galloper Light Vessel after hitting a mine laid by UC-7. En route from Tilbury to Flushing in ballast, *Mecklenburg* was a steel-built, screw-driven, steamer built by Fairfield Co. Ltd. In Glasgow in 1909. The

vessel was owned at time of loss by Stoomvaart Maatschappij Zeeland, a Dutch ferry operator, and other sources indicate that this was a passenger ship (rather than a cargo vessel) and that all passengers and crew were saved. A number of finds have been raised from the site and reported to the Receiver of Wreck (RoW) including a porthole with the maker's name "J Rory – Rainhill, near Liverpool", recovered from the collapsed stern (Droit 115/05), a small and well-worn porthole (Droit 132/05) and a brass door vent and glass lampshade (Droit 133/05). The wreck was seen in the geophysical data as moderately coherent and upright with some superstructure and internal features visible.

143. The HMS *Resono* (70747, UKHO 14548, NMHR 908130) was a British trawler, a steamer, built of steel in 1910 by Welton and Gemmel Ltd, Beverley, which foundered after being mined in 1915 on Admiralty service as a minesweeper. Members of the crew were lost during the incident and HMSM E6 (70768) was lost on the same day. HMS *Resono* is credited with saving the crew of another vessel *Ulrikken*, a month previously. The wreck was seen in the geophysical data as broken up and possibly partially buried.

144. The submarine HMSM E6 (70768, UKHO 14544, NMHR 908130) was a British E-class submarine built by Vickers Barrow-in-Furness and commissioned in 1913. On 26th December 1915, E6 went to carry out an anti-submarine patrol in the North Sea. A trawler (HMS *Resono*, 70747) had been sunk by a mine in the same position and, although a British torpedo boat signalled E6 to avoid the minefield, E6 ignored the warning and hit a mine with the loss of 31 men. The NMHR records that site was assessed under the Protection of Wrecks Act 1973 but did not meet the criteria for protection. The wreck was seen in the geophysical data as a narrow coherent wreck with some internal structure visible and a break in the centre.

145. The steamship *Marie Leonhardt* (70785, UKHO 14543, NMHR 908127) was a British cargo vessel which foundered after being mined in 1917 en route from Hartlepool for London with coal. Built in 1902 by Schiffswerft H. Kock *Marie Leonhardt* was owned at time of loss by the Admiralty (Everett and Newbiggin). Five men were lost. The wreck was seen in the geophysical data without coherent structure visible in an area of sandwaves.

146. The steam drifter HMS *Lord St Vincent* (71540, UKHO 14540, NMHR 908126) was a fishing vessel, built in 1929 by John Chambers Ltd., Lowestoft, hired by the Admiralty as an Auxiliary Patrol Drifter in August 1939 and converted to a barrage balloon vessel in September 1940. The vessel was lost in 1941 after detonating a German mine with one casualty. The wreck was seen in the geophysical data without discernible structure and highly degraded. Another part of the drifter is recorded under UKHO 14534 (A3 record 71545, NMHR 908123).

147. The *Mac 5* (71560, UKHO 14970, NMHR 908121) was originally built as a Motor Torpedo Boat for the British Royal Navy in 1946 and was reclassified as a Minesweeper Attendant Craft in 1940. The *Mac 5* is presumed to have been mined in 1940. The wreck was seen in the geophysical data with some internal structure visible and partially buried with a highly broken up northern end.

148. Each of these wrecks was lost after being mined during the first or second world war and their associations with the high levels of military activity in the Thames Region and accompanying loss of life, is of particular cultural significance.

149. The study East Coast War Channels in the First and Second World War (Firth 2014) examines the spatial extent of navigation channels and minefields between the Thames and the Scottish border during both wars and the heritage assets that are associated with these channels. Together with the presence of military installations at the landfall (see Section 16.4.3) the context of the East Coast war channels represents the wider setting of 20th century military activity within which the study area is located. The use and loss of the wrecks against the wider backdrop of hostile military action along the east coast means that their setting should be considered to contribute to their significance, although this corresponds more broadly to the cumulative research value as discussed in 16.7.

150. Similarly, although there are no known aircraft crash sites within the study area the high numbers of aircraft losses reported across the regions during world war two, and the presence of a known wreck of a Wellington aircraft (A3 record 71670, UKHO 14995) just outside the offshore cable corridor further demonstrates this military setting.

151. However, in terms of type and survival, these wrecks are each considered to represent average examples of wrecks from this period, exhibiting characteristics which are relatively well represented in the known wreck resource around the UK. The one exception might be the HMSM E6 submarine, although this was assessed under the protection of Wreck Act 1973 and found not to meet the criteria for national designation. Furthermore, the research value of the vessels described as broken up or poorly preserved may be limited. The archaeological interest of the wrecks will be defined further post-consent following the acquisition of additional data, including ground-truthing through ROV and / or diver survey where appropriate.

16.5.2.3 Importance of identified assets

152. The importance of unidentified wrecks and debris, A1 and A2 anomalies and potential wrecks, aircraft and isolated finds (which are yet to be discovered) is currently unknown and these are, therefore, assessed as being of high importance as a precautionary measure. However, for ‘potential’ sites each individual discovery will be considered independently and any requirements for further data gathering or analysis will be considered on a case-by-case basis proportionate to the importance of the discovery.

153. The named wrecks are not considered to represent examples which could be considered of national importance warranting protection at a national level. On the basis that they may be considered as assets of regional interest, due to their association with the military activities of the first and second world wars, they are assessed as heritage assets of medium importance.

154. Isolated finds of maritime or aviation origin within secondary contexts will have evidential value for patterns of activities offshore, and are assessed as being of medium importance.

155. The heritage importance of the heritage assets outlined above are presented in Table 16.18.

Table 16.18 Heritage importance (maritime and aviation archaeology)

Asset type	Definition	Importance
Known maritime heritage assets	Named wrecks and associated debris (A1)	Medium
	Debris identified as possible wreck sites or associated debris (A1)	High
	Un-named wrecks and associated debris fields / debris (A1)	
	Previously recorded wrecks not seen in geophysical data (A3)	
Additional anomalies	Anomalies identified by geophysical assessment that could be of anthropogenic origin (A2)	High
Potential wrecks	Wrecks within the study area that are yet to be discovered	High
Potential derived maritime finds	Isolated artefacts lost from a boat or ship or moved from a wreck site	Medium
Potential aircraft	Aircraft within the study area that are yet to be discovered	High
Potential derived aviation finds	Isolated artefacts lost from an aircraft or moved from a crash site	Medium

16.5.3 Intertidal archaeology

16.5.3.1 Description of identified assets

156. The potential for encountering previously undiscovered *in situ* archaeological sites within the intertidal zone is anticipated to be very low. As well as the use of trenchless techniques to install the cable beneath the intertidal zone, which reduces the potential for interactions with heritage assets, historic coastal erosion and subsequent coastal management regimes from the 18th century onwards have significantly reduced the potential for buried remains. Furthermore, a search of the Essex HER shows that there are no known, extant heritage assets present within the intertidal zone. Records from the Essex HER predominantly refer to documentary evidence for former sites or sites located above high water, as discussed below. The locations are shown on ES Figure 16.6 (Document Reference: 3.2.12).

157. The desk-based review was supported by a heritage walkover survey which took place on 5th to 6th October 2022. The results of the walkover survey are presented in ES Appendix 25.5: Heritage Walkover Survey (Document Reference: 3.3.52) and are referenced where relevant to the description of archaeological potential included below.

158. Prior to the development of seaside resorts in the 19th and 20th centuries the Tendring coastline was predominantly rural in character. The landfall was previously characterised by the Gunfleet estuary (now Holland Haven) with two promontories either side at Frinton and Little Holland (Thornton, 2019). The estuary previously extended between the modern outer limits of Frinton and Clacton, although the coastline was subsequently shaped by ongoing erosion since the Middle Ages, shrinking the area of the former estuary at its mouth. The remains of earlier historic activities within the river estuary, such as the

construction of timber or brushwood fish traps (known as weirs or kiddles) during the medieval period were largely destroyed by coastal erosion with only a few surviving (Thornton, 2019). There was a large concentration of traps and fish (processing) sheds at Clacton in the 15th century, roughly where the coastal resort was constructed, although only a few survived by the time the resorts were under construction in the 19th century.

159. The HER record (MEX10491) describes how the site of the former Gunfleet estuary was used as a port and haven in the medieval period but gradually silted up in the post-medieval period. There are documentary records for a landing place called Gunfleet Quay and the HER record also refers to the channel between the coast and the Gunfleet Sands providing a safe anchorage for larger ships, including the opposing British and Dutch fleets during the Dutch Wars of the later 17th century, as also reflected in the records of losses from the NMHR described in Section 16.4.2 above.

160. A study on the history of the Gunfleet estuary and Holland Haven undertaken by the Clacton Victoria County Historic (VCH) Group is refenced in Thornton (2019). The study suggests that, whilst the estuary was probably already subject to drainage during the later Middle Ages, with the 'level of Gunflete haven' recorded in 1542, the mouth of the estuary remained partially open until the late 17th century when the Tendring Level Commission built a sea wall blocking its mouth, with a sluice to allow the Holland Brook's water to drain out at low water. Originally constructed of earth and timber, from the mid-19th century stone was gradually introduced and groynes were added in an attempt to build up the beaches in front of the sea wall. Despite continuous raising and improving of the sea wall, storms and floods persisted in damaging the defences and the land behind and in 1932 the Essex Rivers Catchment Board (ERCB) took over management and later built a new a new concrete sea wall with a modern mechanically operated sluice.

161. One of the Essex HER sites visited during the walkover survey was 'Mr Barton's Pans (MEX1049138). Located at the mouth of the Gunfleet Estuary, the features are thought to be copperas settling pans, recorded on the 1783 plan of Tendring levels. The now comprise a line of roughly rectangular ponds and were observed during the walkover survey running parallel to the sea wall on the marshland side of the wall, although the detail of the pans were difficult to establish due to the nature of the long vegetation (ES Appendix 25.5 Plate 1 (Document Reference: 3.3.52)). An undated circular earthwork in the vicinity of Holland Haven is also recorded in the Essex HER (MEX10111) as possibly associated with copperas works, although only a roughly rectangular-shaped area of rocks was observed on the beach during the walkover survey (ES Appendix 25.5 Plate 7 (Document Reference: 3.3.52)).

162. The recorded location of a 'red hill' (salt making site) within the intertidal zone (MEX10282) was also visited, at low tide, although no evidence for salt making was observed.

163. The majority of the Essex HER records refer to former military installations.

164. Three Martello Towers, part of a network of small defensive forts that were built in the south-east of England during the Napoleonic War between 1805 and 1808, are known to have been present 'guarding the Holland marshes. Towers

G, H and I are recorded as having been sold at auction in April 1819. The first tower, G (MEX10392), was on Tower Hill, H (MEX1039273) stood in the centre of the present Frinton Golf Course, and the last of the three towers, I, was near Battery Point, Frinton, outside the study area. All three are reported to have been pulled down immediately. No evidence of remains were observed at the former location of the Battery Point Tower I (MEX1039272) nor the Holland Marsh Tower H (MEX1039273) during the walkover survey (ES Appendix 25.5 (Document Reference: 3.3.52)).

165. During the Second World War, former military installations recorded at the coast include a Heavy Anti-Aircraft gun site 'C4 Clacton: Little Holland' (MEX49905) and Minefield No. 45/40 on land east of Holland Bridge (MEX49906). Eight pillboxes are also recorded at the landfall, four are extant, and located on or above the seawall:

- Hexagonal concrete type FW3/22 pillbox standing on the top of the sea wall overlooking the North Sea east of Chevaux de Frise Point (MEX31496) and observed *in situ* during the walkover survey (ES Appendix 25.5 Plate 3 (Document Reference: 3.3.52));
- Hexagonal, concrete type FW3/22 pillbox at Pillbox at Holland Haven Country Park (MEX31492) and observed *in situ* during the walkover survey (ES Appendix 25.5 Plate 5 (Document Reference: 3.3.52));
- Base of a pillbox on top of the sea wall at Chevaux de Frise Point (MEX31495) and observed *in situ* during the walkover survey (ES Appendix 25.5 Plate 4 (Document Reference: 3.3.52)); and
- Hexagonal, concrete type FW3/22 pillbox standing on the wall at Sandy Point (MEX31497) and observed *in situ* during the walkover survey (ES Appendix 25.5 Plate 2 (Document Reference: 3.3.52)).

166. Four are recorded as destroyed and may have eroded or demolished remains which survive within the intertidal zone:

- Aerial photographs taken in 1946 and 1960 show an hexagonal pillbox, probably a type FW3/22, on the seashore under the cliff face. A very clear ground level photograph taken in 1953, looking to the north-east from a point on the seashore, shows the pillbox lying on the beach, although this section of the coastline has now been completely eroded away (MEX1034361);
- An aerial photograph taken in 1946 shows an hexagonal FW3/22 pillbox, probably with a protective 'skirt', on the cliff edge at Holland Haven. A very clear ground level photograph taken in 1953 shows this pillbox on the beach where it lay after the cliff edge had eroded (MEX1034362). This pillbox was included in the walkover survey and possible remnants of a concrete base were recorded at the location. However, it is not certain that the amorphous concrete block which was seen is part of the former pillbox or unassociated debris on the beach (ES Appendix 25.5 Plate 6 (Document Reference: 3.3.52));
- Two photos taken in the 1980's show a pillbox standing on the sea wall with the still extant Holland Haven Country Park pillbox (MEX31492) in the background. This was of the same FW3/22 type with additional 'skirt' as the

others along this stretch. However, the sea wall has been extensively rebuilt all along this stretch of the coastline and the pillbox was clearly demolished as a result of this (MEX31493). This pillbox was included in the walkover survey (ES Appendix 25.5 (Document Reference: 3.3.52)) but no remains were observed; and

- It is reliably reported that a pillbox once stood on the sea wall at Holland Gap. The seaward corner where the pillbox stood is known locally as Battery Point and old military maps show the words “Gun Emplacement (Disused)” which probably refers to a first world war gun site (MEX31498). This pillbox was included in the walkover survey (ES Appendix 25.5 (Document Reference: 3.3.52)) but no remains were observed.

167. However, with the use of trenchless techniques to install the cable beneath the intertidal zone any fragmentary remains which may be present would not be impacted.

168. There may be potential at greater depths for the survival of *in situ* prehistoric remains and deposits of paleoenvironmental interest associated with the palaeolandscapes as described in Section 16.4.1 above. Although there are no records of prehistoric activity within the intertidal zone, significant prehistoric finds are known from the vicinity of the landfall. The depth of sedimentary sequences of archaeological interest at the landfall will be further clarified through the geoarchaeological assessment of geotechnical data post-consent, which will inform the design of trenchless techniques and nearshore cable installation.

16.5.3.2 Cultural Significance of Identified Assets

169. The majority of the HER records relate to previously recorded assets which are no longer present, although there is potential for the presence of fragmentary remains of second world war defensive structures. Their cultural significance, therefore, is currently unknown although the archaeological interest (or otherwise) of any remains which come to light during the course of the Project will be described to inform any requirements for further work on a case by case basis.

170. Previously recorded assets are no longer present within their ‘setting’ and setting does not, therefore, contribute to their significance. However, whilst buried archaeological sites may not be ‘readily appreciated by a casual observer’ surviving defensive structures, such as the pillboxes described above, will be encountered within their original, intended coastal setting, a contextual setting which was fundamental to their use in the defence of Britain during the two world wars. In this respect, should such remains be present, their setting would contribute to their significance. However, below MHWS this contribution is limited through their survival as fragmentary, buried remains as opposed to *in situ* extant structures.

16.5.3.3 Importance of identified assets

171. Should prehistoric sites be encountered within the intertidal zone, particularly in context with nearshore evidence of prehistoric occupation, these will be of national, or possibly international interest, with significant potential to contribute to acknowledged international and national research objectives. Given the particularly high importance of these *in situ* sites, any palaeoenvironmental

evidence discovered in the context of an *in situ* prehistoric site would also be of high importance.

172. Although palaeoenvironmental material encountered beyond the context of an *in situ* prehistoric site still has evidential value for understanding changes in the climate and environment within offshore contexts, isolated discoveries should be considered of low importance for the purposes of assessment.

173. Isolated finds of prehistoric archaeological material within secondary contexts, also have evidential value for understanding patterns of population and exploitation of former landscapes, for example. However, as these finds are derived, and out of context, they are regarded as being of medium rather than high importance.

174. The fragmentary and buried remains of second world war coastal defences and isolated finds relating to military activities are also assessed as being of medium importance.

175. The heritage importance of the potential heritage assets outlined above are presented in Table 16.19.

Table 16.19 Heritage importance (intertidal archaeology)

Asset Type	Definition	Importance
Potential *in situ* prehistoric sites	Primary context features and associated artefacts and their physical setting (if / where present)	High
Potential palaeoenvironmental evidence	Isolated examples of palaeoenvironmental material	Low
	Palaeoenvironmental material associated with prehistoric settlements or archaeological evidence for prehistoric activities	High
Intertidal heritage assets	WW2 coastal defences (fragmentary and buried remains on beach)	Medium
Potential derived intertidal finds	Isolated artefacts and findspots dating to all periods which are located within the intertidal zone	Medium

16.5.4 Historic seascape character

176. The historic seascape character of coastal and marine areas around England has been mapped through a series of eight separate Historic Seascape Characterisation (HSC) projects funded by Historic England and undertaken between 2008 to 2014. This has since been followed by an initiative to consolidate the existing projects into a single national database (LUC, 2017a, 2017b, 2017c). The programme uses Geographic Information System (GIS) to map data that can be queried to identify the key cultural processes that have shaped the historic seascape within a given area.

177. The consolidated national Geographical Information System (GIS) dataset was mapped against the study area to identify the primary cultural processes which have shaped the historic seascape of the study area. This includes both the current character types (ES Figure 16.7 (Document Reference: 3.2.12)) and the previous (prehistoric and historic) (ES Figure 16.8 and ES Figure 16.9

(Document Reference: 3.2.12)) character types for which information is available. The accompanying character texts were used to identify the primary values and perceptions for each character type summarised in Table 16.20.

178. A qualification of change since production of the HSC baseline as well as potential changes to the character should the DCO application for North Falls be successful is also included in Table 16.20.

Table 16.20 Summary of historic seascape character types

Broad character types	Character sub-types	Description, values and perceptions	Qualification of change since HSC baseline	Capacity to accommodate change with North Falls
Communications	Submarine telecommunications cable	Mapped as a minor character type within the study area, crossing the easternmost edge of the array boundary through the existing Galloper OWF. Submarine telecommunications cables are mostly undetected in the marine environment. However, they are a highly reliable form of transferring information and are critical to our present-day life. They can be perceived as obstacles to certain sea users such as fishermen and dredgers.	No identified change.	As submarine telecommunications cables are mostly undetected in the marine environment it is unlikely that perceptions of this character type will be altered by construction activities or by the presence of installed infrastructure.
Cultural topography	Cultural topography (inter-tidal): Sandy foreshore	The intertidal zone at the landfall is characterised by the sandy foreshore of Holland Haven, Clacton and Frinton-on-Sea. These are primarily visited for leisure, forming one of the principle areas by which most people engage directly with the intertidal and marine zones.	No identified change.	The presence of landfall infrastructure will remain largely undetectable and therefore not perceived by the public. No change to perceptions of the foreshore are anticipated.
	Cultural topography (marine): Coarse sediment plains Fine sediment plains Mixed sediment plains Mud plains Sand banks with sand waves Palaeochannel	These marine cultural topographies overall are highly valued due to their biodiversity and habitat range and have high archaeological potential and can contribute to our understanding of past landscape use. These types of seabed sediments each provide distinct preservation conditions for wrecks and implications for the potential form and survival of underlying palaeolandscapes.	New plans and projects (as described below for the industry character type) have further restricted access to these deposits and the underlying palaeolandscapes (through the physical presence of cables and foundations, for example) or reduced the extent of deposits, through dredging for example. However, a beneficial impact is the ongoing accumulation of publicly available data acquired as part of the consenting process prior to activities which is considered to be of public value.	The primary perceptions which associate marine cultural topography with high archaeological potential could be further enhanced through the accumulation of publicly available data, including discoveries reported through the PAD during construction activities. As the final design of layouts will take the locations of heritage assets and palaeolandscape features into account, change can potentially be offset by professionally executed and published archaeological studies.

Broad character types	Character sub-types	Description, values and perceptions	Qualification of change since HSC baseline	Capacity to accommodate change with North Falls
Fishing	Bottom trawling Fishing ground Longlining Pelagic trawling Potting	The dominant character types relating to commercial fishing are relatively limited in extent within the study area with three main areas mapped in the HSC. Pelagic trawling characterises a constrained area along the offshore cable corridor focused on the Goldmer Gat, Rough Shoals and South East Spit sea areas. Longlining is mapped to the north of the array area, whilst fishing grounds are mapped to the west and south of the array area, including the North Falls sea area. Bottom trawling is also mapped as a seafloor character type to the western extent of the offshore cable corridor and the array area boundary with an area of potting in the nearshore area only. Thornton (2019) describes how coastal villages and quays would all have probably had a few boat fishermen, although the ports of St Osyth and Harwich had larger fleets of fishing vessels. However, most of these local fishing industries had declined by the 18th and 19th centuries, with the exception of Harwich.	No identified change. ES Chapter 14 Commercial Fisheries (Document Reference: 3.1.16) describes how the study area supports a range of commercial fisheries from the UK and Europe (Belgium, the Netherlands, France). The offshore cable corridor is mostly targeted by local UK vessels under 15m in length that operate a range of gear including pots, trawls, nets and longlines for species such as whelks, sole, bass, thornback ray and others. The array area is targeted by larger UK vessels over 15m, potting for whelks and beam trawling for sole and other demersal species. The array area is fished by Belgian and Dutch beam trawlers, Belgian demersal trawlers and French pelagic trawlers.	Although there will be areas where fishing activities are temporarily displaced as a result of construction works, fishing activities will still be permitted in the offshore project area which are not undergoing construction activities. Similarly, fishing activities will not be prohibited during the operation phase of North Falls although temporary restrictions may apply during construction and around major maintenance activities.
Industry	Energy industry: Hydrocarbon installation Hydrocarbon pipeline Renewable energy installation (wind)	The North Sea as a whole has always been important to the energy industry, most notably for its natural oil and gas resources which have been heavily exploited since the 1960s. Here, however, hydrocarbon character types are mapped in the study area in a very	The BritNed Interconnector, which has been operational since 2009, crosses the array area whilst the proposed NeuConnect Interconnector crosses the offshore cable corridor. There are a large number of OWFs operational within the region including Thanet and	Overall, perceptions of the North Sea energy industry place greater emphasis upon nuclear power and renewable energy. The HSC states that Britain has the best offshore wind resource in Europe and changing perceptions associated with the construction of North

Broad character types	Character sub-types	Description, values and perceptions	Qualification of change since HSC baseline	Capacity to accommodate change with North Falls
		limited inshore area only, indicating that this does not form a dominant part of the historic character. More recently nuclear power and renewable energy sources have become viewed as more important as a result of increasing concerns about CO2 emissions from energy generation using fossil fuels. This is reflected in the mapped extents of the Galloper and Greater Gabbard OWFs with renewable energy already a dominant character type within the study area.	Gunfleet Sands (operational since 2010), London Array (operational since 2013), Greater Gabbard (operational since 2012) and Galloper (operational since 2018). Consent has also been granted for the East Anglia TWO OWF and permissions are currently being sought for the Five Estuaries.	Falls are therefore likely to be seen as part of this natural progression for energy generation and as a positive change from fossil fuels to renewable energy. This is further qualified by UK climate change policies. The larger and more dispersed WTGs planned for North Falls will be different in character to the existing Greater Gabbard and Galloper WTG sizes and layouts but represent fewer discrete locations for avoidance in determining the final layouts.
	Extractive industry (minerals): Aggregate dredging	The HSC maps the offshore cable corridor crossing Aggregate Area 108/1 and Aggregate Area 447 neither of which currently remain licenced as aggregate extraction areas. The HSC describes that, whilst the growth and development of the offshore extraction and construction industries have increasingly threatened the submerged archaeological resource, the feature of these submerged environments has been recognised at a national level through initiatives such as the Aggregates Levy Sustainability Fund (ALSF) which have driven forward new insights into the reporting, mitigation, assessment evaluation and potential of the marine historic environment. Therefore, whilst public perceptions of these extensive industrial processes on the present seascape can generate complex and mixed feelings in different regions and places, the surveys and assessments, and increased	Further marine aggregate areas have been licenced within the Thames region since the HSC baseline including the North Inner Gabbard aggregate production area 498 (operational since 2015), Shipwash Area 507 (operational since 2016), Longsand Area 508 (operational since 2014), Longsand Area 509 (operational since 2015) and Longsand Area 510 (operational since 2015). Licences for further areas are also in planning including Thames D Area 1802, South Falls Area 1801, Outer OTE Area 528/2, East Orford Ness Area 1809 and Thames D Area 524. Survey and evaluation of each area forms an essential part of the as part of the consenting process which further informs understanding of the marine historic environment, together with finds reported through the Marine Aggregates Industry reporting protocol.	The survey and evaluation of the seabed within the study area will further contribute to this knowledge and understanding. As the final design of layouts will take the locations of heritage assets and palaeolandscape features into account, change can potentially be offset by professionally executed and published archaeological studies. Opportunities to engage in cross industry data sharing to map the extents of palaeolandscapes, seabed features and finds and to engage with academic intuitions undertaking research in the offshore Thames region in order to maximise the benefit of data acquisition would further support this public benefit (see Section 16.7).

Broad character types	Character sub-types	Description, values and perceptions	Qualification of change since HSC baseline	Capacity to accommodate change with North Falls
		knowledge of the marine historic environment for an area, which will feed into the local and national monuments records, and inform future curatorial decisions, provide an opportunity for beneficial cumulative knowledge regarding marine archaeology.		
	Processing industry: Spoil and waste dumping	The North Falls array area and offshore cable corridor overlap closed disposal sites, including a disposal site for the Galloper OWF and the Warren Spring disposal site. Offshore disposal sites are mostly undetected in the marine environment. However, they can be perceived as potential sources of contaminant in the marine environment.	No identified change.	As disposal sites are mostly undetected in the marine environment it is unlikely that perceptions of this character type will be altered by construction activities or by the presence of installed infrastructure.
Military	Military practice area	Military practice areas are used by the armed forces for training and military exercises. As outlined in Section 16.4 above, there are strong military association with the Thames region offshore and a large number of military losses and adjacent military installations at the landfall. The following military exercise areas are located in proximity to the offshore project area: • Kentish Knock (X5119); • North Galloper (X5121); • Outer Gabbard (X5117); • South Galloper (X5120); and • Gunfleet (X5118).	No identified change.	It is anticipated that the Project would not impact on any military activities and there would be no change to the current character of these areas.

Broad character types	Character sub-types	Description, values and perceptions	Qualification of change since HSC baseline	Capacity to accommodate change with North Falls
Navigation	Maritime safety: Buoyage Daymark Safety area	The mapped maritime safety features correspond to coastal area including a modern communications tower mapped as a daymark and modern groynes. Buoyage features are described as a combination of buoys, beacons, and lights, largely located to the north of the offshore cable corridor and corresponding to the approaches to Harwich. This is not represented as a dominant character of the study area itself.	No identified change.	Short term construction activities at the landfall, and the presence of landfall infrastructure and offshore export cables, which will remain largely undetectable and therefore not perceived by the public, are considered unlikely to result in a meaningful change to the perceived character of maritime safety.
	Navigation activity: Ferry crossing Harbour pool Navigation route	‘Navigation’ has always been important to the region’s offshore areas, although the coastal character has been more strongly influenced by agriculture and the subsequent development of seaside resorts and the leisure industry. Boats would have operated out of the former Gunfleet Estuary and there are historical references to ‘Gunfleet Quay’. However, the primary commercial centre for navigational activities across the region has developed at Harwich at the north of the Tendring Peninsula.	No identified change.	Construction and maintenance activities and additional vessel traffic would occur in the context of busy shipping channels with Harwich to the North and the Thames and Medway to the south. It is anticipated that no change to the perception of this character type would occur as a result of construction activities.
	Navigation feature: Navigation channel (disused)			
	Navigation hazard: Hazardous water Maritime debris Shoals and flats Water turbulence Wreck hazard	Historically, the sea has been perceived as a dangerous place which often behaves in unexpected and unpredictable ways. Based on the UKHO definition, wrecks become dangerous in shallow water when they are either exposed and / or found less than 10m below the sea-level. Wrecks have most relevance from their roles as	Survey and evaluation for new plans and projects have extended public understanding of these hazards and, in particular, new wrecks and finds have been identified as a direct results of activities. This ongoing accumulation of publicly available data acquired as part of the consenting process prior to	The primary perceptions which associate hazardous water and wrecks with local heritage and stores relating to dangers of the high seas, to recreational diving and to wrecks as habitats could be enhanced through the provision of publicly available data on seabed features identified during geophysical survey, and in the event of unexpected

Broad character types	Character sub-types	Description, values and perceptions	Qualification of change since HSC baseline	Capacity to accommodate change with North Falls
		hazards to navigational activity or as indicators of areas and routes of past navigational, naval or trading activity. For example, the study East Coast War Channels in the First and Second World War (Firth 2014), examines the spatial extent of navigation channels and minefields between the Thames and the Scottish border during both wars and the heritage assets that are associated with these channels. Hazardous water includes wrecks and other hazards such as submerged rocks, shoal or flats. Navigational hazards have always been a preoccupation for sailors, but they became prominent in people's consciousness, including in tales and myths, evoking rhymes and songs, due to the danger associated within them. Wrecks, although fatal for many, added to the local heritage of stories about dangers on the high seas. There are also now perceived as recreational opportunities, with many wrecks dived by both amateur dive groups and professional organisations. Many wrecks are also valued for their strong contribution to habitat diversity and by the fishing community as they attract certain prey species. See Section 16.4.2.1 for detail on wrecks within the study area.	activities is considered to be of public value.	discoveries reported through the PAD during construction activities. During operation, the Project may result in a change to the perception of navigational hazards on the basis that the introduction of wind turbines represents additional navigation hazards. They are, however, equipped with navigational features such as warning lights. On this basis, this character sub-types are considered to have the capacity to accommodate this level of change.
Recreation	Leisure sailing	The North Falls offshore cable corridor overlaps with three mapped areas of recreational sailing (Inshore, Thames	No identified change.	Short term construction activities at the landfall, and the presence of landfall infrastructure and offshore export

Broad character types	Character sub-types	Description, values and perceptions	Qualification of change since HSC baseline	Capacity to accommodate change with North Falls
		Racing Area, Thames Racing Area (Copperas Ground) and Thames Sailing Area). Recreation and tourism is an important industry in the region.		cables, which will be undetectable once installed and therefore not perceived by the public are considered unlikely to result in a meaningful change to the perceived character of leisure sailing.
Previous character types	Palaeolandscape component	Within the study area, the HSC describes the known existence of a general palaeolandscape, considered to be a mixture of estuarine plateau and marshlands' with a further emphasis on the interpreted palaeochannel systems of the Outer Thames Estuary. In England, value is becoming more positive on these remains and resource due to growing interest in submerged landscapes fuelled by the media and popular culture. In particular there is a developing interest within certain sectors of society who come into contact with the resource (e.g. fishermen and aggregate dredgers). Submerged landscapes are becoming ever more recognised and valued within the archaeological community. See Section 16.4.1.1 for detail on submerged prehistoric landscapes within the study area. The palaeolandscape component sub-types as mapped for the HSC are illustrated on ES Figures 16.4 and 16.5 (Document Reference: 3.2.12).	As stated for the cultural topography character type above, new plans and projects have further restricted access to these deposits and the underlying palaeolandscapes (through the physical presence of cables and foundations, for example) or reduced the extent of deposits, through dredging for example. However, a beneficial impact is the ongoing accumulation of publicly available data acquired as part of the consenting process prior to activities which is considered to be of public value.	There is the potential for positive enhancement of primary perceptions associated with a growing interest in submerged landscapes through the provision of publicly available data on palaeolandscapes following the further archaeological and geoarchaeological assessment of survey data. As the final design of layouts will take palaeolandscapes into account, this change can be offset by the accumulation of publicly available data acquired by the Project prior to construction which is considered to be of public value.
	Naval battlefield	Within the study area, the HSC describes areas of enemy Contact minelaying, torpedo raids and air	With the archaeological assessment of offshore survey data there is a growing body of data on military wrecks and	There is the potential for positive enhancement through the provision of publicly available data on the wider

Broad character types	Character sub-types	Description, values and perceptions	Qualification of change since HSC baseline	Capacity to accommodate change with North Falls
		attacks on the east coast shipping industry (1940-45) associated with East Coast War Channels (Firth 2014). See Section 16.4.2 for detail on Second World War maritime activity within the study area.	aircraft and adjacent military installations along the coast and on the foreshore. The ongoing accumulation of publicly available data acquired as part of the consenting process prior to activities is considered to be of public value.	setting and character of 20th century military activity within the study area.
	WW2 defence area	Within the study area, the HSC describes a general area combining a number of different military defensive features and structures. See Section 16.4.3 for detail on Second World War coastal defences within the study area.		

16.5.5 Future trends in baseline conditions

179. In the event that North Falls is not developed an assessment of the future conditions for offshore archaeology and cultural heritage has been carried out and described within this section.

180. The existing environment for offshore archaeology and cultural heritage as set out above has been shaped by a combination of factors, with the most prevalent being changes in global sea levels and associated climatic and environmental conditions which have affected the burial and preservation of prehistoric archaeology, and latterly that of maritime and aviation archaeology. Historic England (2022) recognise, 'that the marine and inter-tidal zones are dynamic and have always undergone natural environmental change and changing patterns of use and exploitation which are nothing new'.

181. Cycles of burial and exposure resulting from marine physical processes, including storm events which can result in the stripping of shallow sediment from the seabed and beach, have an ongoing effect upon the preservation of archaeological material. Exposed heritage assets are at greater risk from erosion and degradation as a result of the effects of physical processes than those which remain buried and are consequently provided with greater protection from continued sediment cover. These cycles of burial and exposure are anticipated to continue although the effect upon individual heritage assets is difficult to predict as this will depend upon site specific conditions and will vary depending upon the nature of any exposed archaeology.

182. As outlined in ES Chapter 8 Marine Geology, Oceanography and Physical Processes (Document Reference: 3.1.10) (Section 8.5.10) the baseline conditions for marine geology, oceanography and physical processes will continue to be controlled by waves and tidal currents driving changes in sediment transport and then seabed morphology. However, the long-term established performance of these drivers may be affected by environmental changes including climate change driven sea-level rise. This will have the greatest impact at the coast where more waves will impinge on the low-lying beaches and estuaries, potentially increasing their rate of erosion. Climate change will have little effect offshore where landscape-scale changes in water levels (water depths) far outweigh the effect of minor changes due to sea-level rise.

183. A number of other projects and plans are proposed within the region (see Table 16.23 for example). Survey and evaluation, and finds encountered as a result of activities, create new opportunities for discovery although this increasing awareness of the marine historic environment also comes a heightened awareness of the threats from vandalism, the theft of artefacts or the non-disclosure of removed artefacts from shipwrecks. Archaeological protocols for commercial activity mean that finds from the dredging, fishing and offshore renewables industries are now routinely reported although Historic England (2022) also recognize the need for, 'new ways of engaging the public through developing dive trails, by community engagement and raising awareness through the latest technology, allowing non-divers and non-specialists to access information on maritime heritage'.

16.6 Assessment of significance

16.6.1 Likely significant effects during construction

16.6.1.1 Impact 1: Direct (physical) impact to known heritage assets

184. Direct (physical) impacts, as stated in the NPS for Renewable Energy Infrastructure (EN-3) (DESNZ. 2023b), encompass direct effects from the physical siting of the Project. Direct impacts to heritage assets, either present on the seafloor or buried within seabed deposits, may result in damage to, or total destruction of, archaeological material or the relationships between that material and the wider environment (stratigraphic context or setting). These relationships are crucial to developing a full understanding of an asset. Such impacts may occur if heritage assets are present within the footprint of elements of North Falls (i.e. foundations or cables) or within the footprint of activities such as seabed clearance, anchoring or the placement of jack up barges.

16.6.1.1.1 Magnitude of impact

185. With the application of the embedded mitigation (see Section 16.2.3), it is anticipated that all direct impacts to known heritage assets as a result of the Project would be avoided.

186. A total of 51 AEZs have been recommended within the study area by Wessex Archaeology (ES Appendix 16.1 (Document Reference: 3.3.17)). The AEZs are illustrated on ES Figure 16.4 (array area) and ES Figure 16.5 (offshore cable corridor) (Document Reference: 3.2.12) and are listed in Table 16.21 below, comprising the following buffers round A1 and A3 classified anomalies:

- Buffers of 50m around A1 anomalies which are well constrained, with distinct outlines and which do not appear to be highly degraded or dispersed;
- Buffers of 100m around A1 anomalies with more dispersed sites where the extents are less certain, and around recorded wreck or obstruction positions.

Table 16.21 AEZs within the study area

WA ID	Classification	Position (WGS84 UTM31N)		AEZ
		Easting	Northing	
Array area				
70305	Debris field	431912	5732071	50m buffer around current feature extent
70306	Debris field	431923	5732065	50m buffer around current feature extent
70339	Wreck	424074	5730848	50m buffer around current feature extent
70340	Debris	424074	5730827	50m buffer around current feature extent
70341	Debris field	424076	5730863	50m buffer around current feature extent
7140	Wreck	424996	5734549	50m buffer around current feature extent
70237	Debris	424995	5734532	50m buffer around recorded position

WA ID	Classification	Position (WGS84 UTM31N)		AEZ
		Easting	Northing	
70525	Debris	423989	5722886	50m buffer around current feature extent
70176	Recorded wreck	425293	5738325	100m around recorded position
70402	Recorded wreck	427910	5729730	100m around recorded position
70443	Recorded wreck	424619	5727831	100m around recorded position
70492	Recorded wreck	427474	5726090	100m around recorded position
Offshore cable corridor				
70557	Debris	418813	5736434	50m around recorded position
70558	Wreck	418803	5736381	50m buffer around current feature extent
70642	Wreck	411207	5742760	50m buffer around current feature extent
70741	Recorded wreck	406318	5745286	100m around recorded position
70747	Wreck	405908	5745091	50m buffer around current feature extent
70748	Debris field	405891	5745089	50m buffer around current feature extent
70749	Debris	405929	5745094	50m around recorded position
70750	Debris field	405921	5745086	50m buffer around current feature extent
70751	Debris	405915	5745062	50m around recorded position
70768	Wreck	405622	5744767	50m buffer around current feature extent
70769	Debris	405629	5744778	50m around recorded position
70770	Debris	405624	5744784	50m around recorded position
70777	Recorded wreck	405393	5744902	100m around recorded position
70785	Wreck	405090	5744624	50m buffer around current feature extent
70786	Debris field	405043	5744645	50m around recorded position
70947	Recorded obstruction	400777	5745344	100m around recorded position
70984	Recorded obstruction	399456	5748216	100m around recorded position
70988	Wreck	398623	5747595	50m around recorded position
71019	Wreck	397383	5748701	50m around recorded position
71138	Magnetic	396160	5748940	50m around recorded position
71214	Magnetic	395553	5749074	50m around recorded position
71222	Magnetic	395605	5748730	50m around recorded position
71273	Magnetic	395084	5748653	50m around recorded position
71276	Debris field	395196	5748452	50m buffer around current feature extent
71448	Debris field	394082	5746525	50m around recorded position
71474	Magnetic	393916	5746086	50m around recorded position

WA ID	Classification	Position (WGS84 UTM31N)		AEZ
		Easting	Northing	
71476	Debris field	393845	5746056	50m buffer around current feature extent
71540	Wreck	391840	5744484	100m buffer around current feature extent
71541	Debris	391868	5744513	50m around recorded position
71545	Recorded wreck	392134	5744211	100m around recorded position
71560	Wreck	391127	5743745	50m buffer around current feature extent
71575	Rope / chain	390225	5743549	50m buffer around current feature extent
71650	Debris field	385696	5740930	50m buffer around current feature extent
71670	Recorded wreck	384193	5741915	100m around recorded position
71769	Debris	378210	5741581	50m around recorded position
71770	Debris	378192	5741584	50m around recorded position
71771	Wreck	378196	5741587	50m buffer around current feature extent
71772	Debris	378215	5741566	50m around recorded position
71773	Debris	378207	5741565	50m around recorded position

187. AEZs are not recommended at this time for features assigned an A2 archaeological discrimination. The positions of these features will be avoided by means of micrositing during detailed project design, where practicable. The archaeological assessment of pre-construction survey data, including high resolution geophysical data undertaken for the purposes of UXO identification, will further clarify the nature and extent of these anomalies and the scheme design will be modified to either avoid heritage assets (i.e. implement new AEZs where appropriate) or undertake additional mitigation. A2s are considered further as 'potential' heritage assets under Impact 2 below.

188. It should be noted that, as relevant to overlapping areas of the offshore cable corridor, the recommendations for AEZs for Five Estuaries differ from that applied for North Falls. As set out in the Five Estuaries Outline Marine WSI submitted with the PEIR, AEZs of 100m are recommended around high potential anomalies, whilst AEZs of 50 are recommended around medium potential anomalies and previously recorded wrecks and obstruction which have not been seen in the geophysical data (Five Estuaries, 2023b). Therefore, AEZs have been recommended by Five Estuaries for all 37 of the seabed features located where the Five Estuaries offshore cable corridor overlaps with that of North Falls. Key considerations are as follows.:

- The Crown Estate (2021) guidance on WSIs advises that, "provision will be made for AEZs around confirmed archaeological sites and geophysical anomalies of high archaeological potential that can be safeguarded in situ";

- All previously recorded wrecks and obstructions (confirmed archaeological sites) have been assigned AEZs by both projects;
- The approach taken for Five Estuaries is precautionary and applies AEZs to seabed features of medium, as well as high, potential on the basis that these, “are probably of anthropogenic origin and of archaeological significance” (Five Estuaries, 2023b);
- The approach taken for North Falls is to apply AEZs to high potential A1 and A3 anomalies only;
- Where AEZs around high and medium potential seabed features (Five Estuaries) correspond to A2 anomalies (North Falls) the mitigation is the same (avoid or investigate), as described under Impact 2 below;
- The approach taken for North Falls recommends micrositing to avoid A2s (without the application of AEZs) thereby acknowledging that these features are of uncertain archaeological interest, and could also be non-archaeological (e.g. of natural origin or of recent date); and
- As set out in Table 16.1, Historic England concurs with the approach taken for North Falls, as stated in their PEIR consultation letter: “It is stated that AEZs will not be applied to A2 anomalies. These remains will be avoided where practicable through micro-siting. If they cannot be avoided then further assessment will be needed to ascertain the nature of the features and define the appropriate mitigation. This approach seems sensible, but the investigation approaches that will be used will need to be detailed within subsequent Offshore WSI documents”.

189. As required by Historic England, the approach to further assessment and investigation of features (post-consent) is set out in the Outline WSI (Offshore) (Document Reference: 7.11) as described under Impact 2 below. A commitment to post-consent investigation is similarly captured in the Outline WSI which accompanied the PEIR for Five Estuaries (Five Estuaries, 2023b).

190. In conclusion, although the approaches to applying AEZs are different, the overall approach to further investigation and mitigation post-consent (avoid or investigate) is the same. The approach taken for Five Estuaries encourages a greater focus on avoidance, whilst the approach taken for North Falls places greater emphasis on investigating a higher number of features where the archaeological interest is uncertain. Both approaches are considered to accord with industry guidance (e.g. The Crown Estate, 2021).

16.6.1.1.2 Significance of effect

191. With the application of AEZs direct impacts to known heritage assets will be avoided, and there will be no change during construction.

16.6.1.1.3 Additional mitigation

192. AEZs may be reduced, enlarged or removed in agreement with Historic England if further relevant information becomes available. However, unless modified by agreement, it is important that AEZs are retained throughout the lifetime of North Falls and monitoring of AEZs may be required by the regulator and Historic England to ensure adherence both during construction and in the future operation of the OWF.

193. The approach to the implementation, revision and monitoring of AEZs has been set out in the Outline WSI (Offshore) (Document Reference: 7.11) submitted alongside the ES and DCO application.

16.6.1.1.4 Residual effect

194. Adherence to AEZs as set out in the Outline WSI (Offshore) (Document Reference: 7.11) will ensure there are no residual effects on known heritage assets with respect to Impact 1.

16.6.1.2 Impact 2: Direct (physical) impact to potential heritage assets

195. It is not possible to avoid heritage assets that have not yet been discovered (potential heritage assets). Therefore, unavoidable direct impacts may occur if archaeological material is present within the footprint of the Project associated with the following activities:

- Seabed preparation (including UXO and boulder clearance, where required);
- Installation of wind turbine foundations and foundations for other offshore infrastructure;
- Installation of ancillary infrastructure;
- Installation of offshore cabling;
- Seabed contact by legs of jack-up vessels and / or anchors; and
- Cable installation at the landfall.

196. For the purpose of this assessment, potential heritage assets are regarded as comprising the following asset types:

- Potential *in situ* prehistoric sites, submerged landscape features, derived or isolated prehistoric finds and palaeoenvironmental evidence;
- Potential wrecks and derived or isolated maritime finds (including both A2 seabed features and any further discoveries of material not seen in the geophysical data);
- Potential aircraft and derived or isolated aviation finds (including both A2 seabed features and any further discoveries of material not seen in the geophysical data); and
- Potential intertidal finds.

16.6.1.2.1 Magnitude of impact

197. Until the final design and layouts are confirmed, there will remain uncertainty in the precise nature and extent of any direct impacts, however, it is anticipated that, within the intertidal zone, the use of trenchless techniques, with entry on the landward side of the cliffs, and exit below Mean Low Water Springs (MLWS) in the marine zone, will mean that impacts to potential intertidal archaeological material can be avoided. The depth of sedimentary sequences of archaeological interest at the landfall will be further clarified through the geoarchaeological assessment of geotechnical data (to be acquired post-application / post-consent) and will inform the design of trenchless techniques and nearshore cable installation so that trenchless techniques will pass beneath

Quaternary deposits of potential archaeological interest and therefore, no impact will occur.

198. All direct impacts that result in damage to, or disturbance of, *in situ* prehistoric, maritime and aviation sites and potential submerged landscape features and potential palaeoenvironmental evidence (where associated with palaeolandscape features or archaeological material) will be adverse, permanent and irreversible. The 'fabric' of the asset and, hence, its potential to inform our historical understanding, will be removed.

199. In practice, the magnitude of the impact will not be fully understood until after the potential heritage asset has been encountered and the impact has occurred. The extent of any impact will depend on the presence, nature and depth of any such remains, in association with the depth, location and nature of construction-related groundworks and contact with the seabed. However, as a precautionary approach, it should be assumed that key elements of the asset's fabric could be lost or fundamentally altered, such that the asset's heritage significance is lost or severely compromised. Therefore, in accordance with the definitions set out in Table 16.9, without further mitigation, there is potential for direct impacts of high adverse magnitude upon potential *in situ* heritage assets.

200. Isolated or derived artefacts, either of prehistoric, maritime or aviation origin within reworked deposits may be considered less sensitive to change than in-situ material, as their relationship with their context or physical setting is less relevant to understanding their significance. Therefore, in accordance with the definitions set out in Table 16.9, without mitigation, there is potential for direct impacts of low adverse magnitude upon potential isolated finds. Should such finds be encountered during construction activities, although removal from the marine context will still result in the destruction of that contextual relationship, albeit a secondary context (i.e. not *in situ*), isolated artefacts have capacity to accommodate physical changes, therefore resulting in only a slight loss of heritage significance.

16.6.1.2.2 Significance of effect

201. As set out in Table 16.13, Table 16.18 and Table 16.19, *in situ* prehistoric, maritime and aviation sites are assessed as being of potentially high heritage significance (importance), as are potential submerged landscape features and potential palaeoenvironmental evidence (where associated with palaeolandscape features or archaeological material). In accordance with the significance matrix in Table 16.10, direct (physical) impacts to these heritage asset types would therefore lead to effects of major adverse significance, as a worst-case scenario.

202. Isolated or derived finds in secondary contexts are assessed as being of medium heritage significance (importance). Should they be encountered during construction activities, direct (physical) impacts to isolated finds are considered to give rise to effects of minor adverse significance.

16.6.1.2.3 Additional mitigation

203. Further archaeological assessment of high-resolution geophysical data and geoarchaeological assessment of geotechnical data will be undertaken post-application / post-consent in order to reduce, as far as practicable, the potential for unintended impacts during construction.

204. The examination of potential prehistoric deposits through the assessment of preconstruction geotechnical and geophysical data will further contribute to the body of scientific data available for the study of seabed prehistory within the Thames offshore region (see Section 16.7). There will be archaeological input into any future sampling programmes and all available geotechnical data (e.g. samples / geotechnical logs acquired as part of engineering-led ground investigation works) will be subject to geoarchaeological assessment during the post-application / post-consent stages of the Project.

205. Specifically, the assessment of the existing environment informed by the interpretation of shallow stratigraphy and associated palaeogeographic features described in Section 16.4.1 above suggest the following specific objectives for targeted geotechnical samples and geoarchaeological assessment:

- Dating and palaeoenvironmental assessment of sediments associated with the channel system and potential delta in the west of the array area to confirm the palaeogeographic interpretation;
- Dating and palaeoenvironmental assessment of the channel in the east of the array area to examine the potential cross cutting relationship with the Lobourg Channel, associated with the breaching of the Weald-Artois ridge and the connection of the North Sea with the English Channel, which could be important for refining the geological chronology of the region; and
- Dating and palaeoenvironmental assessment to examine nearshore features, potentially important due to their location close to shore just along from the Lower Palaeolithic site at Clacton and preserved Mesolithic land surface / peat deposit at Jaywick. This could include targeted sampling to further examine the Pleistocene alluvial deposits investigated at The Wallet as part of the Historic England research project (Bynoe, 2017).

206. Mappable data from Five Estuaries (as a minimum) would be sought post-consent to inform planning for geoarchaeological assessment as part of further investigation and mitigation. In addition, as part of planning the post-consent geotechnical work, consultation will be undertaken with relevant academic institutions and researchers in order to identify opportunities to provide data which may also support academic research of the submerged landscape off Clacton (e.g. Bynoe, 2017).

207. If *in situ* prehistoric sites are identified as a result of such work then mitigation measures to record and / or protect such sites will be agreed in consultation with Historic England.

208. Similarly, the archaeological assessment of high-resolution geophysical data to be acquired post-application / post-consent, together with ground-truthing of identified anomalies of potential archaeological significance, where required, will help to confirm and clarify further the potential for maritime and aviation heritage assets.

209. As stated above, AEZs are not recommended at this time for features assigned an A2 archaeological discrimination although the design will be micro-sited to avoid the recorded locations where practicable. As geophysical anomalies

having potential archaeological interest, it is recognised that these features could also be modern (A2_h) or natural (A2_I in origin).

210. Where features cannot be avoided, then additional work may be required (to be undertaken post-consent) to establish the archaeological interest of the feature (e.g. investigation of individual anomalies (ground-truthing) through ROV and / or diver survey). Once the character, nature and extent of selected features are more fully understood, appropriate mitigation measures (proportionate to the significance of the asset) to avoid, reduce or off-set impacts can be determined on a case by case basis. For example, if features of archaeological interest are confirmed during these further investigations, which are considered to be of sufficient significance to warrant preservation *in situ*, then they will be subject to the same mitigation as described for known heritage assets (AEZs) described in Section 16.5.1.1 above.

211. As an example, in a recent review of ground truthing using, an ROV, undertaken for the Dudgeon OWF, of 113 anomalies which were investigated (comprising six A1 features and 107 A2 features) 65 were found to be of no archaeological interest, 42 of low or medium archaeological importance and six of high importance (Dudgeon OWF, 2022). Three of the six features of high importance had previously been discriminated as A1 by Wessex Archaeology and already had AEZs applied. Prior to construction, new AEZs were applied to the three A2 anomalies which were upgraded to being confirmed archaeological sites. The features confirmed as being of low or medium archaeological importance were avoided through the design, or relocated beyond the construction footprint following recording. Two of the other A1s (all large magnetic only anomalies) were found to be of no archaeological interest (a metal pipe and buried wire / metal debris) and nothing was found at the third location, resulting in the removal of three AEZs.

212. Although measures will be taken to reduce, as far as practicable, the potential for impact to previously undiscovered heritage assets it is still possible that unexpected discoveries may be encountered during construction. However, possible measures to further reduce the significance of potential impacts include ensuring that prompt archaeological advice is received in the event of a discovery and through recording and conserving any objects that have been disturbed.

213. In the event of an unexpected discovery, of an isolated find or where discoveries of multiple chance finds from a specific location might be indicative of a wider debris field representing previously unknown *in situ* archaeological material, this will be reported through a formal PAD, based upon the established Protocol for Archaeological Discoveries: Offshore Renewables Projects (The Crown Estate, 2014) (ORPAD). This will establish whether the recovered objects are of archaeological interest and allow for the application of appropriate mitigation measures where necessary. In the event of the discovery of *in situ* archaeological material, this will include the provision of a temporary exclusion zone to prevent further impacts from taking place until advice had been received. For all new discoveries, any further mitigation which may be required will be considered on a case by case basis, proportionate to the significance of the discovery.

214. The approach to the implementation of the above embedded mitigation measures has been set out in the Outline WSI (Offshore) (Document Reference: 7.11) submitted alongside the ES and DCO application.

16.6.1.2.4 Residual effect

215. If further seabed features are identified during the course of post-application / post-consent investigations, including the archaeological assessment of pre-construction survey data, these will be subject to the same mitigation measures (avoid, reduce or offset) as set out in Section 16.5.1.1 above. Should the presence of additional known heritage assets be confirmed, adherence to AEZs as set out in the Outline WSI (Offshore) (Document Reference: 7.11) will ensure there are no residual effects.

216. With regard to potential prehistoric sites, with the additional investigation of potential prehistoric deposits post-application / post-consent, and the application of additional mitigation in the event of the discovery of any prehistoric archaeological material, residual effects will be reduced or offset to levels considered non-significant in EIA terms (i.e. anticipated to be no worse than minor adverse significance).

217. In the event of unforeseen impact to potential sites, the implementation of a formal PAD will ensure that any *in situ* archaeological material will be provided with a temporary exclusion zone to prevent further impacts from taking place until advice had been received, that finds are promptly reported, archaeological advice obtained, and any recovered material is stabilised, recorded and conserved.

218. Although the precise nature of the impact, and the heritage significance of any material impacted, cannot be fully understood until the impact has occurred, it is anticipated that the appropriate application of these additional mitigation measures, specifically tailored to the significance of a discovery, means that the residual effects will be no higher than minor adverse significance for options 1 and 2.

219. As discussed in Section 16.2.2, option 3 would have a lesser effect on the seabed due to requiring no project specific offshore export cables to shore, however the residual effect is anticipated to remain no higher than minor adverse significance, for the reasons described above.

16.6.1.3 Impact 3: Indirect impact to heritage assets from changes to physical processes

220. As set out in ES Chapter 8 Marine Geology, Oceanography and Physical Processes (Document Reference: 3.1.10) (Section 8.6.2), during the construction phase of North Falls, there is the potential for foundations and cable installation activities to disturb sediment, potentially resulting in changes in seabed levels or, in the case of nearshore cable installation, shoreline morphology due to deposition or erosion.

221. With regard to shoreline morphology, ES Chapter 8 Marine Geology, Oceanography and Physical Processes (Document Reference: 3.1.10) determines that, while nearshore installation activities would result in some localised and short-term disturbance to the beach and nearshore zone, there would be no long-term effect on sediment transport processes.

222. For Impact 2a in ES Chapter 8 Marine Geology, Oceanography and Physical Processes (Document Reference: 3.1.10) (changes in seabed level due to seabed preparation for installation of WTG and OSP / OCP foundations) the predicted thickness of sediment resting on the seabed would only amount to a maximum of 1mm. After this initial deposition, this sediment will be continually re-suspended to reduce the thickness even further to a point where it will be effectively zero.

223. For Impact 2b in ES Chapter 8 Marine Geology, Oceanography and Physical Processes (Document Reference: 3.1.10) (changes in seabed level due to drill arisings for installation of piled foundations for WTGs and OSP / OCPs) after initial deposition (approximately 40mm over a seabed area local to each foundation (within 300m)) this sediment will be continually re-suspended to reduce the thickness even further to a point where it will be effectively zero.

224. For Impact 4 in ES Chapter 8 Marine Geology, Oceanography and Physical Processes (Document Reference: 3.1.10) (changes in seabed level due to offshore export cable installation) conceptual evidence-based assessment of deposition from the plume generated from cable installation indicates that the changes in seabed elevation are effectively immeasurable within the accuracy of any numerical model or bathymetric survey and, in many parts of the offshore cable corridor, export cable installation is unlikely to result in the release of the volumes of sediment considered under the worst case scenario.

225. For Impact 6 in ES Chapter 8 Marine Geology, Oceanography and Physical Processes (Document Reference: 3.1.10) (changes in seabed level due to offshore array and platform interconnector cable installation), deposition of suspended sediment would form a linear mound (likely to be tens of centimetres high) parallel to the cable. Due to the dispersion by tidal currents, and subsequent deposition and re-suspension, the deposits across the wider seabed would be very thin (millimetres). Changes in seabed level due to array cable installation (including any deposition arising from sandwave levelling), therefore, would be minor and of a low magnitude near- field, and negligible magnitude far-field.

226. Given these low / negligible changes in bed level, and that changes will be short term and limited in extent (i.e. in vicinity of installed infrastructure), it is concluded that there is no pathway for change to the fabric of any heritage asset as an indirect result of this effect.

16.6.1.4 Impact 4: Changes to the setting of heritage assets

227. During construction, the presence of construction vessels and general construction activities taking place within and adjacent to the offshore project area have the potential to change the setting of offshore assets. However, as assessed in Section 16.4.1.2 and 16.4.2.2, the setting of marine heritage assets is not considered to form a key part of their significance, which lies primarily in their historical and research value. Any changes associated with construction would be temporary and short term and the baseline setting of individual heritage assets is already influenced by passing vessels in this area associated with industry, fishing and recreation. Changes to the setting of marine heritage assets during construction, therefore, are concluded to result in no impact.

228. There are no known extant heritage assets within the intertidal zone. Should the buried and fragmented remains of Second World War pillboxes be present, they would be encountered within their intended coastal setting, a contextual setting which was fundamental to their use in the defence of Britain during the Second World War. However, below MHWS the contribution of setting to their significance would be limited through their survival as fragmentary, buried remains as opposed to *in situ* extant structures. Given the temporary and short term nature of any changes associated with construction at the landfall, changes to the setting of intertidal heritage assets during construction, therefore, are also concluded to result in no impact.

16.6.2 Likely significant effects during operation

16.6.2.1 Impact 1: Direct (physical) impact to known heritage assets

229. As all known heritage assets will be avoided through the retention of AEZs throughout the lifetime of North Falls, there is no pathway for impact during routine or unscheduled maintenance activities.

16.6.2.2 Impact 2: Direct (physical) impact to potential heritage assets

16.6.2.2.1 Magnitude of impact

230. Direct impacts to potential heritage assets are unlikely to occur as a result of intrusive maintenance as any impacts would already have occurred during installation of the OWF infrastructure during the construction phase and would already have been subject to appropriate and proportionate additional mitigation measures, as and where necessary. There will be no impact at the landfall during the operation phase as there will be no groundworks within or disturbance of intertidal deposits.

231. There is, however, potential for impacts to occur if archaeological material is present within the footprint of jack-ups or vessel anchors deployed during planned or unscheduled maintenance activities, if these are located in areas which were not previously subject to disturbance. In practice, the nature and extent of individual impacts cannot be fully understood until after the impact has occurred. Therefore, as for construction activities, and as a worst case, there is potential for direct impacts of high adverse magnitude upon potential *in situ* heritage assets and low adverse magnitude upon potential isolated finds.

16.6.2.2.2 Significance of effect

232. As set out in Table 16.13, Table 16.18 and Table 16.19, *in situ* prehistoric, maritime and aviation sites are assessed as being of potentially high heritage significance (importance), as are potential submerged landscape features and potential palaeoenvironmental evidence (where associated with palaeolandscape features or archaeological material). In accordance with the significance matrix in Table 16.10, direct (physical) impacts to these heritage asset types would therefore lead to effects of f major adverse significance, as a worst-case scenario.

233. Isolated or derived finds in secondary contexts are assessed as being of medium heritage significance (importance). Should they be encountered during operation activities, direct (physical) impacts to isolated finds are considered to give rise to effects of minor adverse significance.

16.6.2.2.3 Additional mitigation

234. The archaeological assessment of post-construction monitoring data will further reduce, as far as practicable, the potential for unintended impacts during operation. If further features of archaeological interest are identified these will be subject to the same mitigation as described for known heritage assets described in Section 16.5.1.1.3 above with the primary approach being avoidance.

235. In the event of an unexpected discovery, the ongoing implementation of a formal PAD, throughout the operation phase, will allow for such discoveries to be efficiently reported, for advice to be provided and for any further mitigation to be considered on a case by case basis, proportionate to the significance of the discovery.

236. The approach to the implementation of these mitigation measures has been set out in the Outline WSI (Offshore) (Document Reference: 7.11) submitted alongside the DCO application.

16.6.2.2.4 Residual effect

237. Although the precise nature of the impact, and the heritage significance of any material impacted, cannot be fully understood until the impact has occurred, it is anticipated that the implementation of a formal PAD, and the appropriate application of additional mitigation measures if required, specifically tailored to the significance of a discovery, means that the residual effects will be no higher than minor adverse significance for options 1 and 2.

238. As discussed in Section 16.2.2, option 3 would have a lesser effect on the seabed due to requiring no project offshore export cable maintenance, however the residual effect is anticipated to remain no higher than minor adverse significance, for the reasons described above.

16.6.2.3 Impact 3: Indirect impact to heritage assets from changes to physical processes

239. As set out in ES Chapter 8 Marine Geology, Oceanography and Physical Processes (Document Reference: 3.1.10) (Section 8.6.3), during the operational phase of North Falls, there is the potential for the presence of foundations to cause changes to the tidal and wave regimes due to physical blockage effects (operational Impacts 1 to 6 in ES Chapter 8 Marine Geology, Oceanography and Physical Processes (Document Reference: 3.1.10)). These changes could potentially affect the sediment regime and / or seabed morphology.

240. For Impact 3 in ES Chapter 8 Marine Geology, Oceanography and Physical Processes (Document Reference: 3.1.10) (changes to the sediment transport regime due to the presence of structures on the seabed) it is concluded that the effects of impacts 1 and 2 (changes to the tidal or wave regime due to the presence of structures on the seabed) would result in a reduction in the sediment transport potential across the areas where such changes are observed and that areas of increased tidal flow around each WTG foundation would result in increased sediment transport potential. However, these changes would be both low in magnitude and largely confined to local wake or wave shadow effects attributable to individual WTG foundations and, therefore, would be small in geographical extent. Away from the immediate vicinity of the

installed foundations, therefore, there would be no pathway for indirect impact to heritage assets.

241. Similarly, for Impacts 5 and 6 (morphological and sediment transport effects due to cable protection measures) in ES Chapter 8 Marine Geology, Oceanography and Physical Processes (Document Reference: 3.1.10) it is concluded that effects would not extend far beyond the direct footprints. Any impacts to heritage assets within these footprints will already have been addressed through consideration of the direct (physical) impacts associated within construction (Impact 1 in Section 16.5.1.1).

16.6.2.4 Impact 4: Changes to the setting of heritage assets

242. During the operational life of North Falls the presence of the WTGs and OSPs (or an OSP and OCP) will introduce a change to the setting of offshore assets. However, as assessed in Section 16.4.1.2 and 16.4.2.2, the setting of individual offshore heritage assets corresponds more broadly to their location (and collective research value) within wider palaeolandscapes and maritime and aviation networks, such as 20th century military activities. As such, changes to the setting of offshore heritage assets during operation will not affect their cultural significance resulting in no impact.

243. Should buried and fragmented remains of Second World War pillboxes be present within the intertidal zone, due to their distance from the offshore infrastructure, and the limited contribution of setting to their significance, changes in their setting will not affect their cultural significance resulting in no impact.

244. The context of the potential change to setting of coastal heritage assets from the presence of offshore infrastructure is discussed further in Section 25.6.2.1 of ES Chapter 25 Onshore Archaeology and Cultural Heritage (Document Reference: 3.1.27). In summary, the assessment concludes that, whilst the presence of permanent visible offshore infrastructure could have an ongoing impact on the setting of coastal heritage assets for the duration of the operational phase, due to the distances involved, the significance of magnitude of impact would be low adverse, as a worst-case scenario. Following detailed setting assessment (ES Appendix 25.4 (Document Reference: 3.3.51)), it was concluded that only two assets, Bawdsey Manor Registered Park and Gardens (Grade II NHLE 1001465) and Bawdsey Manor Pulhamite Cliffs (Grade II Listed Building NHLE 1406805) would be subject to any effects and that the significance of these effects would be low adverse significance.

16.6.3 Likely significant effects during decommissioning

16.6.3.1 Impact 1: Direct (physical) impact to known heritage assets

245. As all known heritage assets will be avoided through the retention of AEZs throughout the lifetime of North Falls, there is no pathway for impact during decommissioning.

16.6.3.2 Impact 2: Direct (physical) impact to potential heritage assets

16.6.3.2.1 Magnitude of impact

246. Direct impacts to potential heritage assets are unlikely to occur as a result of decommissioning as any impacts would already have occurred during

installation of the OWF infrastructure during the construction phase and would already have been subject to appropriate and proportionate additional mitigation measures, as and where necessary.

247. There is, however, potential for impacts to occur if archaeological material is present within the footprint of jack-ups or vessel anchors deployed during decommissioning activities, if these are located in areas which were not previously subject to disturbance. In practice, the nature and extent of individual impacts cannot be fully understood until after the impact has occurred. Therefore, as for construction activities, and as a worst case, there is potential for direct impacts of high adverse magnitude upon potential *in situ* heritage assets and low adverse magnitude upon potential isolated finds.

16.6.3.2.2 Significance of effect

248. As set out in Table 16.13, Table 16.18 and Table 16.19, *in situ* prehistoric, maritime and aviation sites are assessed as being of potentially high heritage significance (importance), as are potential submerged landscape features and potential palaeoenvironmental evidence (where associated with palaeolandscape features or archaeological material). In accordance with the significance matrix in Table 16.10, direct (physical) impacts to these heritage asset types would therefore lead to effects of major adverse significance, as a worst-case scenario.

249. Isolated or derived finds in secondary contexts are assessed as being of medium heritage significance (importance). Should they be encountered during decommissioning activities, direct (physical) impacts to isolated finds are considered to give rise to effects of minor adverse significance.

16.6.3.2.3 Additional mitigation

250. The archaeological assessment of any further geophysical data will further reduce, as far as practicable, the potential for unintended impacts during decommissioning. If further features of archaeological interest are identified these will be subject to the same mitigation as described for known heritage assets described in Section 16.5.1.1.3 above with the primary approach being avoidance.

251. In the event of an unexpected discovery, the ongoing implementation of a formal PAD, throughout the decommissioning phase, will allow for such discoveries to be efficiently reported, for advice to be provided and for any further mitigation to be considered on a case by case basis, proportionate to the significance of the discovery.

252. The approach to the implementation of these mitigation measures will be agreed in consultation with Historic England in accordance with industry standards and guidance at the time of decommissioning.

16.6.3.2.4 Residual effect

253. Although the precise nature of the impact, and the heritage significance of any material impacted, cannot be fully understood until the impact has occurred, it is anticipated that the implementation of a formal PAD, and the appropriate application of additional mitigation measures if required, specifically tailored to the significance of a discovery, means that the residual effects will be no higher than minor adverse significance for all national grid connection point options.

16.6.3.3 Impact 3: Indirect impact to heritage assets from changes to physical processes

254. As concluded in ES Chapter 8 Marine Geology, Oceanography and Physical Processes (Document Reference: 3.1.10) (Section 8.6.4) changes associated with decommissioning would be comparable to or less than those identified for the construction phase. Whilst there is potential for WTG foundation and cable removal activities to cause changes in suspended sediment concentrations and / or seabed or shoreline levels because of sediment disturbance effects, the types of effect would be comparable to those identified for the construction phase:

- Impact 1 Changes in suspended sediment concentrations due to foundation removal;
- Impact 2 Changes in seabed level due to foundation removal;
- Impact 3 Changes in suspended sediment concentrations due to removal of parts of the export cable;
- Impact 4 Changes in seabed level due to removal of parts of the export cable;
- Impact 5 Changes in suspended sediment concentrations due to removal of parts of the array cables;
- Impact 6 Changes in seabed level due to removal of parts of the array cables; and
- Impact 7 Indentations on the seabed due to decommissioning vessels.

255. The magnitude of impacts would be comparable to or less than those identified for the construction phase. Accordingly, given the construction phase assessments concluded “no change” or “negligible adverse effects” for marine geology, oceanography and physical processes receptors, it is anticipated that the same would be valid for the decommissioning phase regardless of the final decommissioning methodologies.

256. Therefore, there will be no pathway for indirect impacts to heritage assets.

16.6.3.4 Impact 4: Changes to the setting of heritage assets

257. Decommissioning may result in a further change to the setting of heritage assets with the removal of the WTGs, OSPs and associated infrastructure. The presence of vessels, personnel and infrastructure associated with decommissioning activities will also temporarily affect the setting. However, as for construction the significance of this effect would be no impact.

16.7 Potential monitoring requirements

258. Monitoring requirements are described in the IPMP submitted alongside the DCO application and will be further developed and agreed with stakeholders prior to construction based on the IPMP and taking account of the final detailed design of North Falls.

259. The requirements for monitoring for offshore archaeology and cultural heritage have been set out in the Outline WSI (Offshore) (Document Reference: 7.11). This is anticipated to comprise the archaeological assessment of post-

construction marine geophysical data to include an assessment of AEZs to confirm that impacts have not occurred during or post-construction and that the size and extent of the AEZs remain fit for purpose.

16.8 Cumulative effects

16.8.1 Identification of potential cumulative effects

260. The first step in the CEA process is the identification of which residual effects assessed for North Falls on their own have the potential for a cumulative effect with other plans, projects and activities. This information is set out in Table 16.22. Only effects assessed in Section 16.5 as negligible adverse or above are included in the CEA (i.e. those assessed as 'no impact' are not taken forward as there is no potential for them to contribute to a cumulative effect).

Table 16.22 Potential cumulative impacts

Impact	Potential for cumulative effect	Rationale
Construction		
Direct (physical) impact to known heritage assets	No	Direct cumulative impacts to known heritage assets are unlikely to occur due to the application of AEZs identified through EIA for constructed and planned projects as part of the consenting process.
Direct (physical) impact to potential heritage assets	Yes	Although the effect of unavoidable impacts will be mitigated by agreed measures as part of the consenting process for each of the constructed and planned projects, the impacts will still have occurred and permanent damage or destruction will have taken place. The assessment of cumulative impacts, therefore, needs to consider the effect of multiple unavoidable impacts from multiple projects upon the archaeological resource.
Indirect impact to heritage assets from changes to physical processes	Yes	As set out in ES Chapter 8: Marine Geology, Oceanography and Physical Processes (Document Reference: 3.1.10), although there is not a sufficient level of information known at this stage, there is a potential temporal overlap in installation activities for the NeuConnect Interconnector, which bisects the North Falls offshore cable corridor, and the construction of cables and foundations for North Falls. Depending on their construction programmes there is also a potential temporal overlap in construction of Five Estuaries and East Anglia TWO OWFs.
Impacts to the setting of heritage assets	No	Changes to the setting of both marine and intertidal heritage

Impact	Potential for cumulative effect	Rationale
		assets during construction are assessed as no impact.
Operation		
Direct (physical) impact to known heritage assets	No	Direct cumulative impacts to known heritage assets are unlikely to occur due to the continued avoidance and retention of AEZs throughout the life of constructed and planned projects.
Direct (physical) impact to potential heritage assets	Yes	There is potential for multiple unavoidable impacts associated with operations and maintenance activities (e.g. cable repairs and vessel anchors / jack up legs) during the operation phases of multiple projects.
Indirect impact to heritage assets from changes to physical processes	Yes	As set out in ES Chapter 8 Marine Geology, Oceanography and Physical Processes (Document Reference: 3.1.10), impacts could potentially coalesce with those arising from other wind farms.
Impacts to the setting of heritage assets	No	Changes to the setting of both marine and intertidal heritage assets during construction are assessed as no impact.
Decommissioning		
Direct (physical) impact to known heritage assets	No	Direct cumulative impacts to known heritage assets are unlikely to occur due to the continued avoidance and retention of AEZs throughout the life of constructed and planned projects.
Direct (physical) impact to potential heritage assets	Yes	There is potential for multiple unavoidable impacts associated with decommissioning considered cumulatively with activities associated with other projects.
Indirect impact to heritage assets from changes to physical processes	No	In relation to marine geology, oceanography and physical processes, as no cumulative impacts are anticipated during the decommissioning phase (see ES Chapter 8 Marine Geology, Oceanography and Physical Processes (Document Reference: 3.1.10)), there is no pathway for cumulative impacts to heritage assets.
Impacts to the setting of heritage assets	No	Changes to the setting of both marine and intertidal heritage assets during decommissioning are assessed as no impact

16.8.2 Other plans, projects and activities

261. The second step in the cumulative assessment is the identification of the other plans, projects and activities that may result in cumulative effects for inclusion in the CEA (described as 'project screening'). This information is set out in Table 16.23 below, together with a consideration of the relevant details of each, including current status (e.g. under construction), planned construction period, closest distance to North Falls, status of available data and rationale for including or excluding from the assessment.

262. The Project screening has been informed by the development of a CEA project list which forms an exhaustive list of plans, projects and activities within the study area relevant to North Falls. The list has been appraised, based on the confidence in being able to undertake an assessment from the information and data available, enabling individual plans, projects and activities to be screened in or out.

Table 16.23 Summary of projects considered for the CEA in relation to offshore archaeology and cultural heritage (project screening)

Project	Status	Construction period	Closest distance from the array area (km)	Closest distance from the offshore cable corridor (km)	Confidence in data	Included in the CEA (Y/N)	Rationale
Interconnectors							
NeuConnect Interconnector	Pre-consent	2023-2028	2.5km	0km	High	Yes	Projects have a footprint which may overlap with North Falls resulting in potential cumulative direct (physical) impact to potential heritage assets. For indirect impact to heritage assets from changes to physical processes (ES Chapter 8 Marine Geology, Oceanography and Physical Processes Table 8.48 (Document Reference: 3.1.10)), there is potential for temporal overlap of cable installation activities with NeuConnect. Nautilus Interconnector, SEA Link and Tarchon Interconnector.
BritNed Interconnector	Operational since 2009	N/A	0km	9.3km	High	Yes	
Nautilus Interconnector	Pre-application	2025-2028	Cable route currently unknown (although the offshore study area for Nautilus intersects with the North Falls offshore project area)		Low	Yes	
South & East Anglia (SEA) Link	Pre-application	2026-2030	5.4	0	Medium	Yes	
Lion Link	Pre-application	2027-2030	Cable route unknown	Cable route unknown	Low	Yes	
Tarchon Energy Ltd – EA Green Interconnector	Pre-planning	2027-2030	Cable route currently unknown (although with potential to be in proximity to the North Falls offshore project area)		Low	Yes	

Project	Status	Construction period	Closest distance from the array area (km)	Closest distance from the offshore cable corridor (km)	Confidence in data	Included in the CEA (Y/N)	Rationale
Offshore wind farms							
Greater Gabbard OWF	Operational since 2012	N/A	0km	3.9km	High	Yes	The results of surveys and evaluations, and the distribution of reported discoveries cumulatively form part of a collective body of information regarding the marine historic environment within the Thames region. These offshore renewables projects should be considered to have the potential to result in multiple direct (physical) impact to potential heritage assets which traverse the boundaries of the OWFs such as palaeolandscapes, and maritime and aviation networks relating to conflicts, migration and trade routes, for example.
Galloper OWF	Operational since 2018	N/A	0km	6.4km	High	Yes	
Five Estuaries OWF	In planning	Late 2020s	0km	12.94km	High	Yes	
East Anglia TWO OWF	Consent granted	Construction planned mid 2020s	31.5km	36.7km	High	Yes	
Thanet OWF	Operational since 2010	N/A	24.9km	36.2km	High	Yes	
London Array OWF	Operational since 2013	N/A	20.6km	15.5km	High	Yes	

Project	Status	Construction period	Closest distance from the array area (km)	Closest distance from the offshore cable corridor (km)	Confidence in data	Included in the CEA (Y/N)	Rationale
Gunfleet Sands OWF	Operational since 2010	N/A	39km	6km	High	Yes	For indirect impact to heritage assets from changes to physical processes, there is a potential cumulative effect on wave and tidal regime, and from ongoing maintenance activities with Greater Gabbard OWF, Galloper OWF and potential for interaction between the dredging plumes from the cable / foundation installation for Five Estuaries. East Anglia TWO, Thanet, Gunfleet and London Array are screened out for CEA in ES Chapter 8 Marine Geology, Oceanography and Physical Processes (Document Reference: 3.1.10) (Table 8.48). As such there is no pathway for indirect impacts to heritage assets from these wind farms.
Aggregates							
Outer OTE aggregate exploration and option area 528/2	Unknown	2016-2024	9.4km	14km	Low	Yes	The results of surveys and evaluations, and the distribution of reported discoveries form part of a

Project	Status	Construction period	Closest distance from the array area (km)	Closest distance from the offshore cable corridor (km)	Confidence in data	Included in the CEA (Y/N)	Rationale
Thames D aggregates production agreement area 524	Unknown	2022-2036	0km	10.3km	Incomplete	Yes	collective body of information regarding the marine historic environment within the Thames region. These marine aggregate license areas should be considered to have the potential to result in multiple direct (physical) impact to potential heritage assets which traverse the boundaries of the OWFs such as palaeolandscapes, and maritime and aviation networks relating to conflicts, migration and trade routes, for example. For indirect impact to heritage assets from changes to physical processes (ES Chapter 8 Marine Geology, Oceanography and Physical Processes Table 8.48 (Document Reference: 3.1.10)), there is potential for some interaction between the dredging plumes from the aggregate exploration and option areas and plumes from cable / foundation installation / decommissioning and operation and maintenance
Southwold East aggregates production agreement area 430	Operational since 2012	2012-2025	50.1km	48.4km	High	Yes	
North Inner Gabbard aggregate production agreement area 498	Operational since 2015	2012-2030	24.7km	24km	High	Yes	
Shipwash aggregate production agreement area 507	Operational since 2016	2012-2031	19.6km	9.8km	High	Yes	
Longsand production agreement area 508	Operational since 2014	2014-2029	13.9km	5.8km	High	Yes	
Longsand aggregate production agreement area 509	Operational since 2015	2015-2030	13.8km	2.1km	High	Yes	

Project	Status	Construction period	Closest distance from the array area (km)	Closest distance from the offshore cable corridor (km)	Confidence in data	Included in the CEA (Y/N)	Rationale
Longsand aggregate production agreement area 510	Operational since 2015	2015-2030	9.5km	3.5km	High	Yes	activities with the Thames D aggregates production agreement area 524. All other aggregates sites were operational at the time of the North Falls characterisation surveys and are a component of the baseline environment.
North Falls East aggregate production agreement area 501	Operational since 2017	2017-2032	13.2km	25.3km	High	Yes	

16.8.3 Assessment of cumulative effects

16.8.3.1 Direct (physical) impact to potential heritage assets

263. As set out in the Historic Environment research report Investigating the Submerged Pleistocene Landscapes of the Wallet, off Clacton (Bynoe, 2017) there is a need for a greater appreciation of the Pleistocene submerged landscapes around the coast of England. This type of research is identified as essential in order to move towards a coherent understanding of the relationship between the currently terrestrial fragments of Palaeolithic landscapes and those that have been obscured by Holocene sea-level rise.

264. It is recognised that each of the projects included in Table 16.23 will have resulted in unavoidable direct (physical impacts) to potential heritage assets, which when considered in isolation and, assuming the application of appropriate mitigation, might only be determined to be of negligible or minor adverse significance at worst. However, when considered collectively on a regional scale, these multiple unavoidable impacts may be considered of greater adverse significance. It is possible that unique aspects of former landscapes, or of the *in situ* maritime and aviation archaeological resource, may be lost as a result. In addition, if a site is damaged or destroyed, comparable sites elsewhere may increase in importance as a result of greater rarity and any future direct impacts will be of greater significance.

265. For example, ES Figure 16.9 (Document Reference: 3.2.12) maps the extents of interpreted palaeogeographic features within the North Falls study area alongside the mapped extent of palaeolandscapes as a component of HSC. This demonstrates the potential for these features to extend beyond the Project boundaries, and which may well connect to those identified in other project assessments. For example, the palaeochannels 7016 and 7019 were partially identified during initial assessments associated with the Galloper OWF (described in Section 16.4.1). The interpretation of palaeogeographic features within the offshore export cable corridor for the Five Estuaries, which runs parallel and partially overlaps with the North Falls offshore cable corridor, also suggests the presence of features which extend beyond the Project boundaries. It is possible, therefore, that cumulative effects could occur through multiple unavoidable impacts upon the same features, for example.

266. As for construction impact 2 *(direct (physical) impact to potential heritage assets)* (Section 16.5.1.2), until the final design and layouts are confirmed, there will remain uncertainty in the precise nature and extent of any cumulative direct impacts, and the magnitude of those impacts will not be fully understood until after the potential heritage asset has been encountered and the impact has occurred. However, as a precautionary approach, it should be assumed that key elements of the asset's fabric could be lost or fundamentally altered, such that the asset's heritage significance is lost or severely compromised. Therefore, in accordance with the definitions set out in Table 16.9, without further mitigation, there is potential for direct impacts of high adverse magnitude upon potential heritage assets. Cumulative direct (physical) impacts therefore would give rise to effects of major adverse significance, as a worst-case scenario.

267. These considerations for cumulative effects also consider how the setting of heritage assets, as part of wider palaeolandscapes and maritime and aviation networks, may contribute to considerations of cultural significance at a regional scale even if changes to that setting would not cause material harm on an individual basis.

268. However, each of the projects screened in for CEA in Table 16.23 will have completed archaeological assessments in advance of construction, at varying scales of resolution, which are relevant to the wider understanding of the Thames Region. Decommissioned sites may yield additional information, such as the finds from Area 447 reported through the Marine Aggregates PAD (BMAPA, 2005) and described in Section 16.4.1. When considered cumulatively alongside the planned archaeological assessment for North Falls (as set out in Section 16.5.1.2.3) there is potential for significant effects to be offset through the accumulation of data on a regional scale.

269. These archaeological assessments may include palaeolandscape features mapped through interpretations of SBP and MBES data and geoarchaeological assessment of geotechnical data to better understand the potential for terrestrial landscapes and inhabitable environments where prehistoric populations may have settled when sea levels were lower. Similarly, studies have also shown that historic maritime and aviation networks can be mapped, such as the East Coast War Channels (Firth 2014), whilst the group value of individual wrecks, or crash sites, for example, also collectively form part of the variously perceived historic seascape characters (e.g. wartime conflict, fishing areas, transport, leisure industry etc.) of the Thames Region.

270. However, despite the significant data that is being produced through the consenting process, the extent of these networks and seascapes and landscapes from various periods remain largely unmapped. Whilst EIA assessments for the consented and operational projects in Table 16.23 may be in the public domain (in the form of downloadable reports) the results of further survey and assessment, undertaken post-consent, and mappable project datasets are not publicly available. For example, whilst the interpretation of the SBP and MBES for Five Estuaries is available in the public domain in report form (Five Estuaries, 2023a), the location and extent of the features described are not available as a mappable dataset.

271. 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). Whilst analysis at a strategic level is beyond the scope of an individual project, the contribution of publicly available data from North Falls has the potential to contribute to the ongoing industry wide build-up of data which would form the basis for such a study. At a project level, mappable data from Five Estuaries (as a minimum) would be sought post-consent to inform planning for geoarchaeological assessment as part of planned investigation and mitigation.

272. Research agendas and academic research focusing 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 NMHR (Historic England); and
- North Sea Prehistory Research and Management Framework (https://researchframeworks.org/nsprmf).

273. Through the delivery of further investigation and mitigation post-consent, with account of current research agendas, policy frameworks and academic or industry led research initiatives, North Falls has the potential to contribute to this overall cumulative beneficial impact.

274. In addition to scientific research objectives, North Falls also has the potential to contribute significantly to wider public interest. Marine heritage assets, and in particular shipwreck sites, are often connected to significant past events and, in themselves, retain and reflect stories of the crew, vessel construction, trade, immigration, emigration and conflict, for example. As such, discoveries within the offshore sites have the potential to be of significant interest to the public, creating opportunities for outreach and education, particularly with local audiences.

275. Should North Falls be granted consent, the approach to realising this public benefit, 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. A commitment to the delivery of this beneficial effect, including the completion of studies to professional archaeological standards and to making the results of such work publicly available, is set out in the Outline WSI (Offshore) (Document Number: 7.11).

16.8.3.2 Indirect impact to heritage assets from changes to physical processes

276. The cumulative effects on Marine Geology, Oceanography and Physical Processes are assessed in ES Chapter 8 Marine Geology, Oceanography and Physical Processes (Document Reference: 3.1.10) (Section 8.8). Of the projects considered for the CEA in Table 16.23, the NeuConnect Interconnector, Nautilus Interconnector, Sea Link, Tarchon Energy Interconnector, Greater Gabbard OWF, Galloper OWF, Five Estuaries and aggregate areas 528/2 and 524 were screened in for assessment in ES Chapter 8 Marine Geology, Oceanography and Physical Processes (Document Reference: 3.1.10) (Table 8.48).

277. In summary:

- The cumulative effect of North Falls with the NeuConnect Interconnector constructing in this area at the same time is assessed as negligible. The cable routes of the Nautilus, Tarchon Energy and Sea Link Interconnectors are not yet known and therefore these have not been considered further in ES Chapter 8 Marine Geology, Oceanography and Physical Processes (Document Reference: 3.1.10).
- The cumulative effect of the construction programme of Five Estuaries overlapping with North Falls construction programme is assessed as negligible.
- The cumulative effect of operational wave and tidal current impacts with adjacent wind farms is assessed as negligible.
- The 'Thames D aggregates production agreement area 524' is located less than 0.5km from the array area. However, given that the impact on the hydrodynamic regime from aggregate dredging is restricted to the boundaries of the licenced or proposed dredge area, the cumulative effect is expected to be negligible.

278. As all potential cumulative effects upon changes to the hydrodynamic regime are assessed as negligible, there is no pathway for significant effects upon the survival of archaeological material and indirect impacts will not occur.

16.9 Transboundary effects

279. All impacts to wrecks will be avoided through the application of AEZs and there will be no transboundary effects upon wrecks of non-British nationality. Due to the localised nature of disturbance, which will not cross territorial borders, there will be no transboundary effects upon larger-scale archaeological features, such as palaeolandscapes, or the setting of heritage assets and historic landscapes and seascapes which may also extend across national boundaries.

280. Similarly, transboundary impacts with respect to ES Chapter 8 Marine Geology, Oceanography and Physical Processes (Document Reference: 3.1.10) have been scoped out of assessment and transboundary impacts to heritage assets, therefore, will not occur as a result of changes to marine physical processes effects.

16.10 Interactions

281. There are potential interactions between the offshore archaeology and cultural heritage topic and other topics that have been considered within this ES. Table 16.24 provides a summary of the principal interactions and sign-posts to where those issues have been addressed.

Table 16.24 Offshore archaeology and cultural heritage interactions

Topic and description	Related chapter (Volume 3.1)	Where addressed in this chapter	Rationale
Construction			

Topic and description	Related chapter (Volume 3.1)	Where addressed in this chapter	Rationale
Indirect impact to heritage assets from changes to physical processes	ES Chapter 8 Marine Geology, Oceanography and Physical Processes (Document Reference: 3.1.10)	Section 16.5.1.3	Significant changes to physical processes may impact the preservation / survival of buried / exposed heritage assets.
Indirect (non-physical) impacts upon the setting of heritage assets (designated and non-designated)	ES Chapter 25 Onshore Archaeology and Cultural Heritage (Document Reference: 3.1.27)	Addressed in ES Chapter 25 Onshore Archaeology and Cultural Heritage (Document Reference: 3.1.27)	Impacts to the setting of heritage assets onshore may occur associated with activities associated with the installation of offshore infrastructure.
Operation			
Indirect impact to heritage assets from changes to physical processes	ES Chapter 8 Marine Geology, Oceanography and Physical Processes (Document Reference: 3.1.10)	Section 16.5.2.3	Significant changes to physical processes may impact the preservation and survival of buried or exposed heritage assets.
Indirect (non-physical) impacts upon the setting of heritage assets (designated and non-designated)	ES Chapter 25 Onshore Archaeology and Cultural Heritage (Document Reference: 3.1.27)	Addressed in ES Chapter 25 Onshore Archaeology and Cultural Heritage (Document Reference: 3.1.27)	Impacts to the setting of heritage assets onshore may occur associated with the presence of offshore infrastructure.
Decommissioning			
As for construction			

282. Interactions between offshore archaeology and marine physical processes (ES Chapter 8 Marine Geology, Oceanography and Physical Processes (Document Reference: 3.1.10)) have been discussed as part of the impact assessment above. This has demonstrated that no significant impacts are expected for any single archaeological receptor as a result of the construction, operation or decommissioning of North Falls. As such, there is no potential for the accumulation of residual effects on a single archaeological receptor. Potential impacts upon the setting of onshore heritage assets from offshore infrastructure are addressed in ES Chapter 25 Onshore Archaeology and Cultural Heritage (Document Reference: 3.1.27).

16.11 Inter-relationships

283. The impacts identified and assessed in this chapter have the potential to interrelate with each other. The areas of potential inter-relationships between impacts are presented in Table 16.25. This provides a screening tool for which impacts have the potential to interact. Table 16.26 provides an assessment for each receptor (or receptor group) as related to these impacts.

284. Within Table 16.26 the impacts are assessed relative to each development phase (i.e. construction, operation or decommissioning) to see if (for example) multiple construction impacts affecting the same receptor could increase the significance of effect upon that receptor. Following this, a lifetime assessment

is undertaken which considers the potential for impacts to affect receptors across all development phases.

Table 16.25 Inter-relationships between impacts - screening [does impact 1 affect the same receptor as impact 2, impact 3 etc y/n]

Construction	Impact 1: Direct impact to known heritage assets	Impact 2: Direct impact to potential heritage assets	Impact 3: Indirect impact to heritage assets from changes to physical processes	Impact 4: Impacts to the setting of heritage assets and historic seascape character
Impact 1: Direct impact to known heritage assets	-	No	No	No
Impact 2: Direct impact to potential heritage assets	No	-	Yes	Yes
Impact 3: Indirect impact to heritage assets from changes to physical processes	No	Yes	-	Yes
Impact 4: Impacts to the setting of heritage assets and historic seascape character	No	Yes	Yes	-
Operation	**Impact 1: Direct impact to known heritage assets**	**Impact 2: Direct impact to potential heritage assets**	**Impact 3: Indirect impact to heritage assets from changes to physical processes**	**Impact 4: Impacts to the setting of heritage assets and historic seascape character**
Impact 1: Direct impact to known heritage assets	-	No	No	No
Impact 2: Direct impact to potential heritage assets	No	-	Yes	Yes
Impact 3: Indirect impact to heritage assets from changes to physical processes	No	Yes	-	Yes
Impact 4: Impacts to the setting of heritage assets and historic seascape character	No	Yes	Yes	-

Decommissioning	Impact 1: Direct impact to known heritage assets	Impact 2: Direct impact to potential heritage assets	Impact 3: Indirect impact to heritage assets from changes to physical processes	Impact 4: Impacts to the setting of heritage assets and historic seascape character
Impact 1: Direct impact to known heritage assets	-	No	No	No
Impact 2: Direct impact to potential heritage assets	No	-	Yes	Yes
Impact 3: Indirect impact to heritage assets from changes to physical processes	No	Yes	-	Yes
Impact 4: Impacts to the setting of heritage assets and historic seascape character	No	Yes	Yes	-

Table 16.26 Inter-relationships between impacts – phase and lifetime assessment

Receptor	Highest Significance Level				
	Construction	Operation	Decommissioning	Phase assessment	Lifetime assessment
Potential heritage assets	Minor adverse	Minor adverse	Minor adverse	No greater than individually assessed impact. While impacts to known heritage assets can be avoided, potential heritage assets may be subject to direct physical impact, indirect impacts from changes to physical processes and from changes to their setting (i.e. an artefact removed from the seabed). Once an impact has occurred (i.e. a new heritage asset has been discovered / encountered) the application of additional mitigation (such as additional recording, AEZs, micro-siting or relocation) means that the magnitude of each, spatially discrete impact (should an impact occur), will be no greater across all phases than each phase in isolation.	No greater than individually assessed impact As for the phase assessment, once a new heritage asset is discovered or encountered, the application of additional mitigation means that the magnitude of each, spatially discrete impact (should an impact occur), will be no greater across the Project lifetime.

16.12 Summary

285. This chapter has provided a characterisation of the existing environment for offshore archaeology and cultural heritage based on both existing and site specific survey data, which has established that there will be at worst minor adverse residual effects on heritage assets during the construction, operation and decommissioning phases of North Falls.

286. The assessment of the geophysical data within the study area resulted in a total of 58 features of palaeogeographic interest:

- Two channel complexes assigned a P1 archaeological rating;
- 17 channels assigned a P1 archaeological rating;
- 30 cut and fills assigned P1 (3) or P2 (27) archaeological ratings, depending on context and confidence of interpretation;
- Two erosion surfaces assigned a P2 archaeological rating; and
- Seven areas of acoustic blanking (suggesting a possible area of shallow gas indicative of preserved organic material within the sediments) assigned a P2 archaeological rating.

287. Significant, potentially well-preserved palaeogeographic features were identified within the following areas:

- an extensive complex palaeochannel and possible delta, alongside a potential coastline and associated features in the array area;
- two channel complex areas, possibly the remains of the Thames-Medway river, and an area of channelling / possible preserved landscape deposits in the offshore cable corridor.

288. A programme of geoarchaeological assessment and analysis is planned post-application / post-consent to provide further understanding of the Quaternary sedimentary sequence within the study area, to ground-truth palaeogeographic interpretations and to mitigate potential impacts to submerged prehistoric archaeology.

289. Wessex Archaeology has identified 1514 seabed features of archaeological interest (A1) or potential archaeological interest (A2 and A3). Of the 41 A1 anomalies, 12 have been identified as wrecks, all but one (71771) being previously recorded by the UKHO and NMHR. Seabed features interpreted as A2 have been identified as being of possible anthropogenic origin and have the potential to represent archaeological material on the seabed of maritime or aviation origin. Magnetic only anomalies (without visible surface expression) have the possibility to be buried objects with ferrous content that are of archaeological potential. There are 10 A3 historic records of wrecks and obstructions which have not been seen in the geophysical data.

290. In addition to the known wrecks and identified anomalies described above, there is also potential for the presence of further maritime and aviation archaeological material to be present, which has not been seen in the geophysical data. This may comprise isolated finds of material, or wrecks or

aircraft crash sites, potentially buried and concealed within or beneath marine seabed sediments.

291. There are no known, extant heritage assets within the intertidal zone although the fragmentary remains of former military structures may survive, However, the potential for encountering previously undiscovered *in situ* archaeological sites within the intertidal zone is anticipated to be very low. As well as the use of trenchless techniques to install the cable beneath the intertidal zone, which reduces the potential for interactions with heritage assets, historic coastal erosion and subsequent coastal management regimes from the 18th century onwards have significantly reduced the potential for buried remains.

292. There may be potential at greater depths for the survival of *in situ* prehistoric remains and deposits of paleoenvironmental interest associated with the palaeolandscapes described in Section 16.4.1 above. The depth of sedimentary sequences of archaeological interest at the landfall will be further clarified through the geoarchaeological assessment of geotechnical data post-consent, which will inform the design of trenchless techniques and nearshore cable installation.

293. With the application of mitigation, it is anticipated that all direct impacts to known heritage assets as a result of North Falls will be avoided. The approach to the implementation of these mitigation measures has been set out in the Outline WSI (Offshore) (Document Reference: 7.11) submitted alongside the ES and DCO application. The WSI has been prepared in accordance with industry standards and guidance including Archaeological Written Schemes of Investigation for Offshore Wind Farm Projects (The Crown Estate, 2021).

294. Subject to approval by Historic England, AEZs will be implemented around all 41 A1 anomalies and the 10 A3 historic records (Table 16.21), to be retained for the Project's lifetime. AEZs are not recommended at this time for features assigned an A2 archaeological discrimination. The positions of these features will be avoided by means of micro-siting during detailed project design, where practicable. The archaeological assessment of pre-construction survey data, including high resolution geophysical data undertaken for the purposes of UXO identification, will further clarify the nature and extent of these anomalies and the scheme design will be modified to avoid heritage assets where practicable. If features cannot be avoided, then additional work may be required to establish the archaeological interest of the feature (e.g. investigation of individual anomalies (ground-truthing) through ROV and / or diver survey) and to record features prior to removal, as appropriate.

295. It is not possible to avoid heritage assets that have not yet been discovered (potential heritage assets). In order to minimise this potential impact, further archaeological assessment of high-resolution geophysical data and geoarchaeological assessment of geotechnical data will be undertaken post-application / post-consent in order to reduce, as far as practicable, the potential for unintended impacts during construction. In the event of an unexpected discovery, this will be reported using a formal PAD which will establish whether the recovered objects are of archaeological interest and recommend appropriate mitigation measures where necessary. Through the PAD, any possible *in situ* heritage assets encountered on the seabed will be immediately provided with a temporary exclusion zone to prevent further impacts from taking

place until advice had been received. Following confirmation of the presence of archaeological material, additional mitigation measures to record or conserve the site will be agreed in consultation with Historic England.

296. Potentially beneficial effects have also been identified in relation to cumulative impacts, through the collation of mappable data for other plans and projects, and academic research where available, in the Thames Region. Whilst a regional, strategic assessment is considered to be beyond the scope of North Falls as an individual project, should North Falls be granted consent, the approach to realising this public benefit, 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. A commitment to the delivery of this beneficial effect, including the completion of studies to professional archaeological standards and to making the results of such work publicly available, is set out in the Outline WSI (Offshore) (Document Number: 7.11).

Table 16.27 Summary of potential impacts on offshore archaeology and cultural heritage

Potential impact	Receptor	Importance	Magnitude	Significance of effect	Embedded & additional mitigation measures proposed	Residual effect	Cumulative residual effect
Construction							
Impact 1: Direct impact to known heritage assets	Wrecks and anomalies of archaeological interest (A1)	Medium / High	High	Major adverse	AEZs	No impact	No impact
	A3 historic record	High	High	Major adverse	AEZs	No impact	
	Additional anomalies of possible archaeological interest (A2)	High	High	Major adverse	Avoid location	No impact	
					Additional mitigation to reduce or offset impacts	Minor adverse	
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	Potential beneficial effect (described but currently not quantifiable, to be realised through regional mapping of accessible data and provision of publicly accessible data post-consent)
	Intertidal assets	Medium / High	No impact	No impact	None	No impact	
	Isolated finds	Medium	Low	Minor adverse	PAD	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 Impact	N/A	No Impact	No Impact

Potential impact	Receptor	Importance	Magnitude	Significance of effect	Embedded & additional mitigation measures proposed	Residual effect	Cumulative residual effect
Impact 4: Impacts to the setting of heritage assets	Known and potential heritage assets	Medium to High	No Impact	No Impact	N/A	No Impact	No Impact
Operation							
Impact 1: Direct impact to known heritage assets	Known heritage assets	Medium to High	High	Major adverse	AEZs	No impact	No Impact
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	Potential beneficial effect (described but currently not quantifiable, to be realised through regional mapping of accessible data and provision of publicly accessible data post-consent)
	Isolated finds	Medium	Low	Minor adverse	PAD	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 Impact	N/A	No Impact	No Impact
Impact 4: Impacts to the setting of heritage assets	Known and potential heritage assets	Medium to High	No Impact	No Impact	N/A	No Impact	No Impact
Decommissioning							
Impact 1: Direct impact to known heritage assets	Known heritage assets	Medium to High	High	Major adverse	AEZs	No impact	No Impact

Potential impact	Receptor	Importance	Magnitude	Significance of effect	Embedded & additional mitigation measures proposed	Residual effect	Cumulative residual 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	Potential beneficial effect (described but currently not quantifiable, to be realised through regional mapping of accessible data and provision of publicly accessible data post-consent)
	Isolated finds	Medium	Low	Minor adverse	PAD	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 Impact	N/A	No Impact	No Impact
Impact 4: Impacts to the setting of heritage assets	Known and potential heritage assets	Medium to High	No Impact	No Impact	N/A	No Impact	No Impact
Cumulative							
Direct (physical) impact to potential heritage assets	Known and potential heritage assets	High	High	Major adverse	Further assessment of geophysical and geotechnical data.	Minor adverse	Potential beneficial effect (described but currently not quantifiable, to be realised through regional mapping of accessible data and provision of publicly accessible data post-consent)
Indirect impact to heritage assets from changes to physical processes	Known and potential heritage assets	Medium to High	No impact	No impact	N/A	No impact	No impact

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