The Sizewell C Project

6.3 Volume 2 Main Development Site

Chapter 23 Marine Historic Environment

Revision: 1.0

Applicable Regulation: Regulation 5(2)(a)

PINS Reference Number: EN010012

May 2020

Planning Act 2008
Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009

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23. Marine Historic Environment

23.1 Introduction

23.1.1 This chapter of **Volume 2** of the **Environmental Statement (ES)** presents an assessment of the potential effects on the marine historic environment arising from the construction and operation of the main development site (referred to throughout this volume as the 'proposed development'). This includes an assessment of potential impacts, the significance of effects, the requirements for mitigation and the residual effects.

23.1.2 Detailed descriptions of the main development site, the proposed development and the different phases of development are provided in **Chapters 1** and **4** of this volume of the **ES**. A description of the anticipated activities for the decommissioning of the Sizewell C power station, including a summary of the types of environmental effects likely to occur is provided in **Chapter 5** of this volume. A glossary of terms and list of abbreviations used in this chapter is provided in **Appendix 1A** of **Volume 1** of the **ES**.

23.1.3 For the purposes of this chapter, the 'site' is defined as the main development site located below the mean high water mark (MHWM). The historic environment assessment landward of MHWM is presented in **Chapter 16** of this volume. Proposed works above the MHWM are, therefore, not referred to in this chapter. These include (but are not limited to) works associated with the Sizewell B relocated facilities proposals and the off-site developments considered in this volume of the **ES**.

23.1.4 This assessment has been informed by data from other assessments in this volume as follows:

- **Chapter 13** of this volume: Landscape and Visual Impact Assessment.
- **Chapter 16** of this volume: Terrestrial Historic Environment.
- **Chapter 20** of this volume: Coastal Geomorphology and Hydrodynamics.

23.1.5 This assessment has also been informed by data presented in the following technical appendices:

- **Appendix 23A** of this volume: Sizewell C Offshore and Intertidal Historic Environment Desk-Based Assessment. September 2014.

- **Appendix 23B** of this volume: Marine Historic Environment Gazetteer of Archaeological Sites and Recorded Losses.
- **Appendix 23C** of this volume: Geoarchaeological and palaeoenvironmental assessment of vibrocores recovered east of Sizewell.

23.1.6 Please note that the red line boundary used in the figures within the appendices was amended after these documents were finalised, and therefore does not reflect the boundaries in respect of which development consent has been sought in this application. However, the amendment to the red line boundary does not have any impact on the findings set out in this document and all other information remains correct.

23.1.7 This assessment has also been prepared in accordance with the legislation, policy and guidance and methodology set out within **Appendix 6S** of **Volume 1** of the **ES**.

23.2 Legislation, policy and guidance

23.2.1 **Appendix 6S** of **Volume 1** of the **ES** identifies and describes legislation, policy and guidance of relevance to the assessment of the potential marine historic environment impacts associated with the Sizewell C Project.

23.2.2 This section lists the specific legislation, policy and guidance of relevance to the assessment of the proposed development that is further described in **Appendix 6S** of **Volume 1** of the **ES**.

a) International

23.2.3 International agreements of relevance to the marine historic environment assessment include the UNESCO Convention on the Protection of the Underwater Cultural Heritage (Ref. 23.1). A summary of the requirements is provided in **Appendix 6S** of **Volume 1** of the **ES**.

b) National

i. Legislation

23.2.4 Legislation of relevance to the marine historic environment assessment includes the following:

- The Ancient Monuments and Archaeological Areas Act 1979 (Ref. 23.2).

- The Planning (Listed Building and Conservation Areas) Act 1990 (Ref. 23.3).
- The Infrastructure Planning (Decisions) Regulations 2010 (Ref. 23.4).
- The Protection of Military Remains Act 1986 (Ref. 23.5).
- The Protection of Wrecks Act 1973 (Ref. 23.6).

23.2.5 The overarching National Policy Statement (NPS) for Energy (EN-1) (Ref. 23.7) and NPS for Nuclear Power Generation (EN-6) (Ref. 23.8) provide the primary policy framework within which the development will be considered. Although the NPS EN-1 and EN-6 provide the primary policy against which application for development consent for the proposed development would be decided, the UK Marine Policy Statement (Ref. 23.9) and National Planning Policy Framework (Ref. 23.10) also provide relevant considerations to the determination of application. A summary of the relevant planning policy, together with consideration of how the policy requirements have been taken into account is provided in **Appendix 6S** of **Volume 1** of the **ES.**

c) Regional

23.2.6 Within the East Inshore and East Offshore Marine Plans Objective 5 seeks *"to conserve heritage assets, nationally protected landscapes and ensure that decisions consider the seascape of the local area"* (Ref. 23.11).

23.2.7 No regional policy over and above that described in **Chapter 3** of **Volume 1** of the **ES** is deemed relevant to the assessment for this site.

d) Local

23.2.8 Local policies are described in **Chapter 3** of **Volume 1** of the **ES**. Additional policies deemed relevant to the assessment for this site are described in **Appendix 6S** of **Volume 1** of the **ES**. Those relevant to the marine historic environment include the Suffolk Coastal District Council Local Plan Core Strategy and Development Management Policies (Ref. 23.12) and the Suffolk Coastal District Council Final Draft Local Plan (Ref. 23.13). A summary of the relevant requirements is provided in **Appendix 6S** of **Volume 1** of the **ES**.

e) Guidance

23.2.9 This assessment has been undertaken in accordance with the following guidance documents:

- Good Practice Advice in Planning Note 2: Managing Significance in Decision-Taking in the Historic Environment (Ref. 23.14).
- Conservation Principles, Policies and Guidance (Ref. 23.15).
- Good Practice Advice in Planning Note 3: The Setting of Heritage Assets (Ref. 23.16).
- Code of Practice for Seabed Developers (Ref. 23.17).
- Research and Archaeology: Framework for the East of England (2000, 2011 and draft updates 2018-19) (Ref. 23.18, Ref. 23.19 and Ref. 23.20).
- People and the Sea: A Maritime Archaeological Research Agenda for England (Ref. 23.21).
- National and local archaeological standards and guidance.

23.3 Methodology

a) Scope of the assessment

23.3.1 The generic Environmental Impact Assessment (EIA) methodology is detailed in **Chapter 6** of **Volume 1** of the **ES.**

23.3.2 The full method of assessment for the marine historic environment that has been applied for the Sizewell C Project is included in **Appendix 6S** of **Volume 1** of the **ES**.

23.3.3 This section provides specific details of the marine historic environment methodology applied to the assessment of the proposed development and a summary of the general approach to provide appropriate context for the assessment that follows. The scope of assessment considers the impacts of the construction and operational phases of the proposed development.

23.3.4 The scope of this assessment has been established through a formal EIA scoping process undertaken with the Planning Inspectorate. A request for an EIA scoping opinion was initially issued to the Planning Inspectorate in 2014, with an updated request issued in 2019.

23.3.5 Comments raised in the EIA scoping opinion received in 2014 and 2019 have been taken into account in the development of the assessment methodology. These are detailed in **Appendices 6SA** to **6C** of **Volume 1** of the **ES.**

b) Consultation

23.3.6 The scope of the assessment has also been informed by ongoing consultation and engagement with statutory consultees throughout the design and assessment process. A summary of the general comments raised with regards to marine historic environment assessment are provided in **Appendix 6S** of **Volume 1** of the **ES**.

c) Study area

23.3.7 The geographical extent of the study area comprises the main development site below MHWM as shown in **Figure 23.1** and agreed with Historic England, as shown in **Appendix 6S** of **Volume 1** of the **ES**.

23.3.8 An initial desk-based assessment (DBA) was undertaken for the proposed development in 2011 and updated in 2014, to consider an extended area up to 10 kilometre (km) from the main development site. This was undertaken prior to the finalisation of the main development site boundary and plans for the necessary marine infrastructure had been developed. The proposed development has a smaller footprint than originally considered in the DBA. Updated data searches were undertaken in July 2018 to ensure that the assessment included current information, and it was agreed in consultation with Historic England that further updated searches would not be required prior to submission of the Development Consent Order (DCO) application.

23.3.9 Consultation was undertaken with Historic England to inform the development of the spatial scope and data search study area, which was agreed for this assessment as being set at the site boundary for the main development site seawards from MHWM. Confirmation that the proposed spatial scope was adequate, was received from Historic England in their response to Stage 3 consultation and scoping.

23.3.10 The site and study area is illustrated in **Figure 23.1**.

d) Assessment scenarios

23.3.11 The marine historic environment assessment comprises the assessment of the entire construction and operational phases, for the proposed main development site, rather than specific assessment years.

e) Assessment criteria

23.3.12 As described in **Chapter 6** of **Volume 1** of the **ES**, the EIA methodology considers whether impacts of the proposed development would have an effect on any resources or receptors. Assessments broadly consider the

magnitude of impacts and value/sensitivity of resources/receptors that could be affected in order to classify effects.

23.3.13 A detailed description of the assessment methodology used to assess the potential effects on the marine historic environment arising from the proposed development is provided in **Appendix 6S** of **Volume 1** of the **ES**. A summary of the assessment criteria used in this assessment is presented in the following sub-sections.

i. Sensitivity (heritage significance)

23.3.14 Heritage assets that may be affected by the proposed development have been assigned a level of heritage significance (value) in accordance with the definitions set out in **Appendix 6S** of **Volume 1** of the **ES.** Heritage significance is rated within the range of high–medium–low–very low.

23.3.15 The assessment criteria for assigning the levels of sensitivity to receptors is set out in **Table 23.1**.

Table 23.1: Assessment of the value or sensitivity of receptors for marine historic environment

Heritage Significance	Description	Example Asset Class
High	Asset has significance for an outstanding level of archaeological, architectural, historic and/or artistic interest.	All designated heritage assets or non-designated assets of demonstrably schedulable quality, e.g. protected wreck.
Medium	Asset has significance for a high level of archaeological, architectural, historic and/or artistic interest.	Locally listed structures and those of merit.
Low	Asset has significance for elements of archaeological architectural, historic or artistic interest.	Locally-significant archaeological site.
Very low	Due to its nature of form/condition/survival, cannot be considered as an asset in its own right.	Non-extant Historic Environment Record (HER).

ii. Magnitude

23.3.16 The magnitude of change is based on the consequences that the proposed development would have on the significance of the historic environment resource and has been considered in terms of high-medium-low-very low, as set out in **Appendix 6S** of **Volume 1** of the **ES**.

23.3.17 Potential changes have also been considered in terms of duration, whether the impact is permanent, temporary or reversible, adverse (negative) or

beneficial (positive) and whether the change is likely to give rise to cumulative effects. For example, any potential loss of significance resulting from disturbance of archaeological/geoarchaeological assets associated with construction activity would be permanent.

23.3.18 The criteria for the assessment of magnitude are shown in **Table 23.2.**

Table 23.2: Assessment of magnitude of impact on the marine historic environment

Magnitude	Summary Rationale (Negative)	Summary Rationale (Positive)
High	Loss of significance of an order of magnitude that would result from irreversible total or substantial demolition/ disturbance of a heritage asset or from the disassociation of an asset from its setting. This would generally be considered substantial harm.	Sympathetic restoration of an at-risk or otherwise degraded heritage asset and/or its setting and bringing into sustainable use with robust long-term management secured.
Medium	Loss of significance arising from partial disturbance or inappropriate alteration of asset which will adversely affect its importance. Change to the key characteristics of an asset's setting, which gives rise to lasting harm to the significance of the asset but which still allows its archaeological, architectural or historic interest to be appreciated. Impacts of this magnitude would generally be considered less than substantial harm on the heritage significance of an asset.	Appropriate stabilisation and/or enhancement of a heritage asset and/or its setting that better reveal the significance of the asset or contribute to a long-term sustainable use or management regime.
Low	Minor loss to or alteration of an asset which leave its current significance largely intact. Minor and/or short-term changes to setting which do not affect the key characteristics and in which the historical context remains substantially intact. Impacts of this magnitude would generally be considered less than substantial harm on the heritage significance of an asset.	Minor enhancements to a heritage asset and/or its setting that that better reveal its significance or contribute to sustainable use and management.
Very low	Minor alteration of an asset which does not affect its significance in any discernible way. Minor and/or short-term or reversible change to setting	Minor alteration of an asset which does not affect its significance in any discernible way. Minor and/or short-term or reversible change to setting which does not affect the

Magnitude	Summary Rationale (Negative)	Summary Rationale (Positive)
	which does not affect the significance of the asset. Impacts of this magnitude would generally be considered of limited harm to heritage significance.	significance of the asset.

iii. Effect definitions

23.3.19 The effects are classified on the basis of the magnitude of impact to the assessed heritage significance of the asset, and a narrative discussion given to support the conclusion.

23.3.20 The definitions of effect for the marine historic environment are shown in **Table 23.3**.

Table 23.3: Classification of effects

		Heritage Significance			
		Very low	**Low**	**Medium**	**High**
Magnitude	**Very low**	Negligible	Negligible	Minor	Minor
	Low	Negligible	Minor	Minor	Moderate
	Medium	Minor	Minor	Moderate	Major
	High	Minor	Moderate	Major	Major

23.3.21 Following the classification of an effect as presented in **Table 23.3**, a clear statement and rationale is provided as to whether the effect is significant or not significant. As a general rule, major and moderate effects are considered to be significant and minor and negligible effects are considered to be not significant. However, professional judgement is also applied where appropriate.

23.3.22 The assessment of the predicted significance of the effects is reported following incorporation of environmental measures embedded within design, as set out within **section 23.5** of this chapter.

f) Assessment methodology

23.3.23 Direct effects on heritage assets are those which result from physical damage or disturbance which gives rise to a loss of heritage significance. Consequently, it is only those assets which might be physically disturbed by (i.e. within the footprint of) the proposed development which are potentially subject to direct effects.

23.3.24 Indirect effects have been defined as those which result in change to heritage significance but do not give rise to physical damage or disturbance to the asset. In this context, these effects would generally arise through change to the settings of heritage assets.

23.3.25 As archaeological features are not always evident, a DBA was undertaken in January 2011, provided in **Appendix 23A** of this volume and updated in September 2014, to examine the potential presence of archaeological heritage assets within the site boundary and to ascertain the potential for heritage assets to be affected. Such heritage sites might include wrecks located on, or immediately below, the modern seabed. An updated data search was undertaken in July 2018, as shown in **Appendix 23B** of this volume.

23.3.26 As conclusions from DBAs are predictive, there are some cases where the potential presence of heritage assets or their heritage significance remains difficult to state with confidence. The results of further survey work, comprising marine geophysical survey in 2015 and 2017, were also considered in the July 2018 updated search.

23.3.27 In addition to heritage sites such as wrecks, the potential for submerged palaeolandscape deposits with geoarchaeological and palaeoenvironmental potential were also established within the DBA and investigated through marine geophysical surveys and geotechnical site investigations undertaken in 2011 and 2015, shown in **Appendix 23C** of this volume. Geotechnical site investigations were designed in consultation with Historic England and carried out in accordance with an agreed written scheme of investigation (WSI) for archaeological investigation under a marine licence.

23.3.28 Assessment of settings is primarily associated with designated heritage assets or non-designated heritage assets of equivalent significance (where such assets are identified), and most applicable to terrestrial sites but also applicable in marine settings. The settings assessment is provided in **Chapter 16** of this volume.

23.3.29 Heritage assets were identified through:

- a search of the records held within the Historic England National Record of the Historic Environment (NRHE) and the Suffolk County Council (SCC) HER, and updated data searches were undertaken in September 2014 and July 2018;
- a search of the National Heritage List for England (NHLE), which identifies all designated heritage assets in England. An initial search carried out in 2011 was updated in September 2013 and July 2018;

- a search of the records held within the UK Hydrographic Office (UKHO) Wreck List, obtained in July 2018;
- analysis of the Historic Landscape Characterisation (HLC) data for Suffolk, conducted in February 2014;
- a review of the available Light Detecting and Ranging (LiDAR) data from Environment Agency Geomatics and Channel Coastal Observatory obtained in July 2018;
- aerial photography from the Channel Coastal Observatory obtained in July 2018; and
- marine geophysical data held by UKHO and The Crown Estate marine data exchange, obtained in July 2018.

23.3.30 A programme of non-intrusive (marine geophysical surveys) and intrusive site investigations (geotechnical site investigations) were carried out at locations across the site below MHWM in order to identify both known and previously unrecorded heritage assets, such as historic shipwrecks.

23.3.31 Identified archaeological and historical sites, features and finds identified within the study area are discussed in **Appendix 23A** of this volume**,** illustrated on **Figure 23.2** and listed in **Appendix 23B** of this volume.

g) Assumptions and limitations

23.3.32 The following limitations have been identified in this assessment:

- DBA is a predictive tool and relies on a series of assumptions and extrapolations to develop an understanding of the potential extent and character of archaeological assets within the site.
- Geophysical survey is based on taking physical measurements that may have a number of causes, and conclusions from this type of survey remain predictive, but allow more refined inferences to be drawn on the basis of the nature and morphology of discrete anomalies.
- Geotechnical site investigations are used to ground-truth the geophysical survey data and sample deposits beneath the modern seabed. While this approach considers a sample area of a site, it allows a clear understanding of the location, nature and significance of the deposits, and their geoarchaeological potential, which can be considered robust.

- Where assessment conclusions are based on DBA or geophysical survey, the implications for the robustness of conclusions is based on a reasonable worst-case is provided.
- The extent of dredging associated with marine infrastructure construction and operation will depend on the detailed design and construction methods which are yet to be confirmed, so conservative areas have been assessed in the **ES** and shown in **Figure 23.1**, and will need to be licensed by the Marine Management Organisation; see **Chapter 3** of this volume.

23.4 Baseline environment

23.4.1 This section presents a description of the baseline environmental characteristics within the site.

23.4.2 The current baseline environmental information is drawn from the Sizewell C main development site marine DBA, geophysical and geoarchaeological survey, and the 2018 updated datasets. Further detail can be found in **Appendices 23A, 23B** and **23C** of this volume.

a) Current baseline

i. Site description

23.4.3 The current Sizewell–Minsmere coastline is characterised by low, vegetated dunes, sitting behind a barrier beach of sand and shingle. The area has a relatively low tidal range leading to the formation of the narrow beach that is typical of this part of the Suffolk coast. The intertidal beach primarily comprises shingle, with the seaward limit of the beach typified by an abrupt beach-step meeting a sub-tidal, low sloping, sandy bed.

23.4.4 The subtidal beach features an inner longshore bar 50–150 metres (m) from shore of -1.0 to -3.0m ordnance datum (OD) elevation, as well as a larger outer bar 150–400m from shore of -2.5 to -4.0m OD elevation. These bars are approximately shore-parallel. Seaward of the bars, a 1,200m-wide channel (up to 9m deep) separates the coast from the Sizewell–Dunwich Bank. Whilst primarily sandy, muds are found in a narrow strip just landward of the bank.

23.4.5 The Sizewell–Dunwich Bank is a single sedimentary feature currently located 1.2–1.7km from shore and has an area of 6.3km^2 (above the -8m OD contour). Its higher north and south ends, often referred to as Dunwich Bank and Sizewell Bank respectively, are joined by a lower-elevation saddle. Over the last decade, the northern Dunwich Bank (outside the

study area) has experienced substantial lowering across its northern extent and associated shoreward migration of its seaward flank, while in contrast the southern Sizewell Bank, lying partly within the main development site, has remained stationary, increasing in elevation and featuring a northward growing spur on its seaward flank. Seaward of the Sizewell Bank are outcrops of Coralline Crag: its presence underneath the bank may have influenced its initial formation and its stability. Within the wider area, exposures of the younger Norwich Crag are also observed outcropping near the seabed, interspersed by a series of bedforms.

23.4.6 Surveys have identified a series of distinct Holocene estuarine and terrestrial deposits beneath the modern seabed. Deposits, consisting of peats and intertidal clays and silts, are found to coincide with the BLF and cooling water intake/outfall head. Marine geoarchaeological investigations of the deposits at these locations, discussed in **Appendix 23B** of this volume, have identified a series of Holocene peats and alluvial clays and silts underlain by Norwich Crag. The deposits located by the BLF are a continuation of the alluvial deposits located immediately west underlying the main platform area – see **Chapter 16** of this volume which sets out the heritage significance of these deposits.

ii. Designated heritage assets

Designated heritage assets within the study area

23.4.7 There are no designated heritage assets within the marine historic environment study area. The closest designated site under the Protection of Wrecks Act 1973 is the Dunwich Bank wreck (NHLE 1000073) located 3.2km north of the site.

iii. Non-designated heritage records

23.4.8 There are five HER records within the marine historic environment study area. These include two wreck sites (MSF11344) and (MSF20289) that were identified during construction works for Sizewell B, two ships thought to have been lost in this approximate area (NHLE 913991 and 1243043), and one wreck identified during 2017 geophysical survey of the area (UKHO 87094). Immediately north of the study area a wreck was identified during geophysical survey in 2016 (UKHO 87094). There are 40 recorded losses associated with Sizewell Bank. Along the beach a number of Second World War (WWII) defences are recorded (e.g. MXS19837 and MXS19499).

23.4.9 Non-designated heritage records are illustrated on **Figure 23.2**.

iv. Historic landscape and seascape character

23.4.10 The HLC study for the site shows the coastal frontage predominantly comprising the current industrial landscape (type 11.1), Sizewell power station, and unimproved land (type 8.0) along the coastal marshes. Within the Historic Seascape Character Assessment, these areas are principally classified as coastal infrastructure with some enclosed land onshore and areas for navigation offshore.

23.4.11 The character areas identified within the site are of low historic value, including significantly modified wetlands and substantial areas where historic landscape elements have either been erased or have been obscured by modern planting schemes or hedgerow loss. An assessment of effects on Historic Seascape Character is presented in **Chapter 16** of this volume.

v. Archaeological and historical background

Prehistoric (Neolithic, Bronze Age and Iron Age)

23.4.12 No records of archaeological material dating from the Palaeolithic period have been found within the marine historic environment study area. The near-surface exposures of Coralline and Norwich Crag, pre-dating the earliest known hominid occupation of the British Isles, overlain by Holocene or modern seabed deposits, would suggest that the potential of finding any Palaeolithic archaeology, especially *in situ*, is low.

23.4.13 The Mesolithic was characterised by rapid changes in sea-level and dramatically shifting coastlines. Evidence of submerged palaeolandscapes are present within the site as infilled submerged river channel areas containing organic, freshwater and estuarine deposits.

Romano-British

23.4.14 There are no Romano-British or early-medieval finds recorded within the site.

Early-medieval and medieval

23.4.15 The village of Sizewell, immediately south of the study area, was substantially larger in this period than at present, extending further to the east into land which has been lost through coastal retreat. The Chapel of St Nicholas (now lost to the sea) was dedicated to the patron saint of seafarers and crusaders in 1243 and appears to have been used for burials, baptisms and marriages until the latter part of the 16th century. No reports of further losses to the sea are listed in the manorial records after

1620 and by the latter part of the 17th century a process of accretion appears to have begun at Sizewell.

23.4.16 The importance of fishing to the medieval inhabitants of Sizewell is suggested by the presence of a *'Fishwaye'* in the manorial records from 1483, a road linking the parishes of Sizewell and Aldringham. 23 boat masters are recorded at Sizewell in court rolls dating to 1505, though this was reduced to 16 by 1515. The majority of boats would have been used for herring fishing in coastal waters.

23.4.17 Between 1450 and 1520, Sizewell was commonly referred to as *'Sizewell Hythe'*, a name that has its roots in the Saxon for *'landing place'*. It is likely that vessels would have been dragged onto the foreshore or anchored away from the coast. The continual processes of erosion and accretion evident in the area since the medieval period would make the survival of any ephemeral hard landing place or dock structures improbable. Marine geophysical surveys of this stretch of the coastline have not identified any sunken offshore structure associated with the lost settlements at Sizewell.

Post-medieval

23.4.18 Coastal trading was at its height in the 18th and 19th centuries, and hundreds of vessels would have passed through the waters of the study area every year. The shifting of Sizewell and Dunwich Banks, combined with their high crests, made navigation of these waters hazardous and large numbers of vessels would likely have been lost to the banks. In 1637, a pair of leading lights were built at Orford Ness, later replaced by a pair of brick towers, designed to indicate safe passage between the Sizewell Bank and Aldeburgh Napes to reduce the number of losses in the area.

23.4.19 Forty post-medieval losses are associated with the named location of Sizewell, though the exact positon of these losses is uncertain. No evidence for these losses has been identified by repeated geophysical survey, though some of these wrecks, or fragments of them, could have been incorporated into and dispersed by the Sizewell Bank as it has changed morphologically since the date of the wrecks. Descriptions of eight of the recorded losses suggest they were beached, either on the shoreline or sand banks, and were subsequently broken up for salvage, or are recorded as having become broken during the storm with which their loss is associated. A further two losses, the *Vine* (NRHE 1243043) and *Flora* (NRHE 913991), are given described positions further offshore, as shown on **Figure 23.2**. However the description for the loss of the *Flora*, a Russian barque, is that it ran aground on the outer shoal 400 yards from the beach. Consequently, although many losses are recorded for this area, it is unlikely that many of these would have been preserved within this

dynamic environment, with those grounding nearshore likely to have been subject to salvage by local communities. The heritage significance of these is deemed to be of low to very low significance.

23.4.20 Three wrecks were uncovered during the development of Sizewell B. These consisted of an unnamed 18th century vessel (MSF 20289) located c.120m north-east of the Sizewell B intake structure, remains of a barge discovered in 1982 whilst dredging for the inlet pipe for Sizewell B (MSF 11344), and a 20m long wooden wreck, lying on its port side, discovered in May 1990 (MSF 20288) (refer to **Figure 23.2**). The heritage significance of these is deemed to be of low to very low significance.

Modern

23.4.21 A new wreck was identified 80m north of the main development site offshore zone, during geophysical survey for Sizewell C in 2016, and subsequently investigated by Historic England (NRHE 1956479). The vessel was identified as a 19th or early 20th century wooden merchant sailing ship of at least 300 tonnes. The wreck was deemed to be in poor condition and did not meet the criteria for designation under the Protection of Wrecks Act 1973. The heritage significance of this wreck is deemed to be of low significance.

23.4.22 During the Maritime and Coastguard Agency Civil Hydrography Programme geophysical survey of the area in 2017 (HI1495), a new wreck site (UKHO 87094) was identified just south of one of the underground cooling tunnel alignments. This wreck had only recently been uncovered as it was not visible in previous geophysical surveys of this location in 2012. The wreck measures 25.2m in length, 10.2m in width and 1.2m in height. The wreck is clearly defined and remains mostly in one piece, and likely to be of 19th/20th century date. The heritage significance of this wreck is likely to be of low significance.

23.4.23 There is one modern wreck positioned 380m south of the site; the Ocean Pride (UKHO 10324), a British fishing boat lost in April 1972. Its location is recorded as unreliable and the wreck is classified by the UKHO as *'dead'*. The 2017 Maritime and Coastguard Agency Civil Hydrography Programme survey relocated this record to an anomaly that is moderately defined, probably in two sections, visible on the seabed nearer inshore. This location matches the position of wreck MSF20288 recorded within the HER.

23.4.24 There are no reported air crashes within the main development site, with the closest verified crash site, the remains of a Voodoo jet aircraft lost on the 30th August 1961 (879929), located 1.6km to the north.

23.4.25 Extensive WWII beach scaffolding (MXS19837) was located along the beach at Sizewell. The construction of the Sizewell A and B power stations removed a substantial section of the defences. Further remains are occasionally uncovered, as is the case with beach scaffolding and *'pikes teeth'* in front of Sizewell B uncovered during storms in early 2018. There is a small potential for areas of as yet unknown modern military remains to be uncovered, as discussed in **Chapter 16** of this volume.

23.4.26 Assets dating to this period have a degree of archaeological and historic interest but are likely to be of low heritage significance, and in most instances likely to be poorly preserved.

Deposits of geoarchaeological and palaeoenvironmental interest

23.4.27 As set out in **Chapter 16** of this volume, Sizewell B was constructed on an island of gravel which was formerly adjacent to a river valley or channel, over which the main platform area for Sizewell C will be located. This valley has become infilled over millennia, resulting in the accumulation of significant deposits of soils and peats.

23.4.28 Geoarchaeological survey comprising geophysical and intrusive survey work has determined that these deposits are potentially of high palaeoenvironmental interest as they formed over a prolonged period of time during the Mesolithic and Neolithic periods, as shown on **Appendix 23C** of this volume; **Figure 23.3**. The peats are likely to be primarily of interest for their ability to enhance understanding of past environments rather than past human activity. The estuarine and dynamic nature of the environment would not have been favourable for settlement, with sea-level models suggesting that the area had been inundated by the early Bronze Age. These peats were significantly disturbed during the construction of Sizewell B, with widespread removal of peats from the southern part of the area, where peats survive, and compaction of the northern part, with subsequent disturbance during the heathland creation trials.

23.4.29 This disturbance, taken with the unfavourable conditions for permanent settlement and early inundation of these deposits, means that there is a low potential for extensive archaeological remains, although some material related to exploitation of the estuarine fringes may be present. Assets that are present are likely to be of medium heritage significance as remnants of what were once more extensive.

23.4.30 Marine geophysical surveys and geotechnical site investigations have demonstrated that similar estuarine deposits and peats area are present offshore. These deposits are clustered in two locations:

- peats by the BLF, CDO and northern FRR represent an eastwards continuation of the Holocene peat and estuarine deposits found beneath the main platform area; and
- peats around the proposed northern intake and outfall cooling water tunnel representing a series of previously unknown Early Holocene submerged terrestrial and estuarine deposits.

23.4.31 Palaeoenvironmental assessment, including radiocarbon dating, on a selection of vibrocores collected in 2015, as part of geotechnical investigations for Sizewell C, has demonstrated that the terrestrial landscape furthest from the modern coastline was submerged by c. 6500 BC. Closer to the modern coastline remnants of a complex estuarine environment are preserved that pre-date the transition to marine conditions c. 3000 BC. The vibrocores contain multiple phases of organic and minerogenic sedimentation indicating that these records may be sensitive to past sea level change and hold high potential for the construction of sea level index points for the Early to Middle Holocene period. Potential evidence for Mesolithic activity is alluded to within the pollen and microcharcoal results, suggesting human activity within the coastal wetlands during the Middle Holocene. These marine vibrocore records compliment previous studies undertaken at the main platform area, as discussed in **Chapter 16** of this volume, clearly demonstrating the continuation of the main palaeochannel eastwards into the marine environment. As well as complimenting the onshore sedimentary sequences, these vibrocore sequences have also been found to have better preservation of some ecofacts which may mean these sequences are preferable to study than those derived from onshore for the Early to Middle Holocene.

23.4.32 The potential of these deposits to provide information about past sea level change, including the Early to Middle Holocene submergence of the Suffolk coastline, and past human activity is deemed high.

vi. Previous impacts

23.4.33 Changes to the coastal geomorphology introduced by the construction of Sizewell B are discussed in **Chapter 20** of this volume. During construction of Sizewell B, substantial capital dredging of the nearshore was undertaken, with the largest impacts caused by dredging for intake/outfall culverts and the approach channel to Sizewell B's BLF. Maintenance dredging of the beach was required over 150m of frontage alongside the sheet pile coffer dam associated with the culverts, with a net loss of sediment from the nearshore system reported. This impact means that the

potential for the recovery of *in situ* near-surface archaeological remains associated with these nearshore areas is likely to be low.

vii. Summary of archaeological heritage assets within the site subject to potential direct effects

23.4.34 The areas of highest potential for the survival of archaeological assets within the main development site can be summarised as follows:

- There is some potential for remains associated with military defensive schemes constructed during WWII. However, the location of features associated with these are typically well-known, as discussed in **Chapter 16** of this volume and shown on **Figure 23.2**. Where previously unknown assets are encountered below MHWM, these will have a degree of archaeological and historic interest but are likely to be of low heritage significance due to poor preservation.

- Wreck sites have been identified within the study area through extensive (and repeated) geophysical survey over a five year period. All wreck sites identified are located away from the proposed construction/dredging upon the seabed shown on **Figure 23.2**. Where investigations of these sites have been undertaken, they have been deemed to be of low archaeological significance not meeting the criteria for designation under the Protection of Wrecks Act 1973. There is the potential that wrecks that were beached might be encountered during dredging for the BLF, as found during Sizewell B construction.

- Deposits with geoarchaeological interest have the potential to provide information on past environments. These are of high heritage significance due to the potential that they may provide an important context for understanding how the formation processes of this mobile landscape have influenced the past environment and human activity. The potential for surviving complete sequences of peat has been established by geotechnical investigations with samples recovered suitable for analysis.

viii. Heritage assets subject to potential indirect effects

23.4.35 There are no heritage assets identified as subject to indirect effects within the site.

b) Future baseline

23.4.36 Expert Geomorphological Assessment shows that, without secondary mitigation, shoreline recession (a shifting future baseline) would expose the

Hard Coastal Defence Feature (HCDF) within the operational life of the Sizewell C station. A plausible time window for such exposure of 2053–2087 is identified in **Chapter 20** of this volume.

23.5 Environmental design and mitigation

23.5.1 The marine components of the development, detailed in **Chapters 2** to **4** of this volume and **Figure 23.1**, are:

- Soft Coastal Defence Features.
- Beach landing facility (BLF).
- Offshore cooling water intakes and outfall heads.
- Nearshore fish recovery and return (FRR) outfalls.
- Nearshore combined drainage outfall (CDO).

23.5.2 As detailed in **Chapter 6** of **Volume 1** of the **ES**, a number of primary mitigation measures have been identified through the iterative EIA process and have been incorporated into the design and construction planning of the proposed development. Tertiary mitigation measures are legal requirements or are standard practices that will be implemented as part of the proposed development.

23.5.3 The assessment of likely significant effects of the proposed development assumes that primary and tertiary mitigation measures are in place. For the marine historic environment, these measures are identified below, with a summary provided on how the measures contribute to the mitigation and management of potentially significant environmental effects.

a) Primary mitigation

23.5.4 Primary mitigation is often referred to as 'embedded mitigation' and includes modifications to the location or design to mitigate impacts; these measures become an inherent part of the proposed development.

23.5.5 The BLF will consist of a piled structure with the deck located above the seabed. Localised dredging would also occur to facilitate access to the BLF. The piled foundation design will limit the extent of disturbance of archaeologically significant deposits.

23.5.6 The cooling water intakes and outfall, CDO and FRR will consist of tunnels bored through the solid geology under the seabed, with vertical shafts at

the seaward end extending up to the intake/outfall headwork mounted on the seabed. Localised dredging will take place around each of the headwork sites during construction. The adoption of tunnelling means that effects would be restricted to limited areas of mobile sediments with relatively limited archaeological potential.

23.5.7 Design iterations resulting in the adoption of an integrated freight management strategy, comprising road and rail infrastructure have resulted in the removal of the proposals for a jetty at Sizewell C.

b) Tertiary mitigation

23.5.8 Tertiary mitigation will be required regardless of any EIA assessment, as it is imposed, for example, as a result of legislative requirements and/or standard sectoral practices.

23.5.9 NPS EN-1 requires mitigation of any loss of archaeological interest through development. Consequently, archaeological mitigation may be required in cases where effects are assessed as less than significant. For the purposes of this assessment, all archaeological mitigation is considered as secondary mitigation, and discussed within **section 23.7** of this chapter**.** The effects of any loss of archaeological significance presented in **section 23.6** of this chapter are considered in the absence of mitigation.

23.6 Assessment

a) Introduction

23.6.1 This section presents the findings of the marine historic environment assessment for the construction and operation of the proposed development.

23.6.2 This section identifies any likely significant effects that are predicted to occur and **section 23.7** of this chapter then highlights any secondary mitigation and monitoring measures that are proposed to minimise any adverse effects (if required).

b) Construction

i. Direct effects on heritage assets

Archaeological heritage assets

23.6.3 DBA, geophysical survey and geotechnical site investigations suggest the presence of archaeological assets in the site boundary that are of low to medium heritage significance. These are either known to be present, or

can be reasonably predicted on the basis of the existing evidence, and are assessed as follows.

Previously unrecorded archaeological assets

23.6.4 Identified shipwrecks are located away from the areas identified for development and dredging during the construction of the proposed development. Changes to the local conditions at these sites, away from the beach, are expected to be in line with natural processes with minimal impact upon the coastal geomorphology, as discussed in **Chapter 20** of this volume. Unrecorded archaeological remains, which could include buried shipwrecks, would indicate new discoveries that might be impacted by construction and any dredging. While geophysical surveys have been undertaken to seek to identify assets with archaeological potential, no practical evaluation techniques are sufficient to ensure no such discoveries would be encountered.

23.6.5 Primary construction of the BLF would be through construction of marine piles which will pass through Holocene alluvial deposits that could contain buried archaeological material of low to medium heritage significance. Geotechnical site investigations at this location have not recovered any archaeological material and geoarchaeological studies of this material have not suggested the presence of buried soils that might be occupation surfaces. Construction of the headwork structures for cooling water infrastructure, FRR and CDO would have small construction footprints consisting of localised dredging during construction and heads located over subterranean tunnels.

23.6.6 Construction period change would largely be reversed on the completion of construction activities in the immediate vicinity of these structures and the subsequent removal of temporary structures and surfaces in their immediate vicinity. Some dredging to maintain safe navigation to the BLF would be undertaken but this is likely to be removing sediments that have infilled the existing navigation channel.

23.6.7 If archaeological assets were encountered, these would most likely be of very low to medium heritage significance, with the nature and level of preservation unlikely to be high. This would give rise to a low to medium magnitude of change which would, in the absence of further mitigation, result in a minor to moderate adverse effect, which, applying professional judgement, would be **not significant**.

20th century military activity

23.6.8 It is possible that elements of the BLF would disturb archaeological assets within the beach; these would be restricted to disturbance of partly

dismantled WWII anti-invasion obstacles, which are of low heritage significance. These structures are of a *'terrestrial'* character and are discussed in the context of other shoreline defences in **Chapter 16** of this volume**.**

Deposits of geoarchaeological and palaeoenvironmental interest

23.6.9 Deposits of geoarchaeological and palaeoenvironmental significance would be subject to disturbance associated with the installation of the BLF, CDO, FRR and offshore cooling water infrastructure. However, extensive deposits elsewhere in the site would be left undisturbed *in situ*.

23.6.10 Change to the deposits, which are considered to be of high heritage significance, would be permanent within the area immediately impacted resulting in the total loss of archaeological interest at these locations, but preserved intact within immediately adjacent (non-impacted) areas. The preservation of these lateral continuous deposits away from points of impact (e.g. piles) means the overall impact on these deposits would be a minor adverse effect, which, without further mitigation, would be **not significant**.

ii. Inter-relationship effects

23.6.11 **Chapter 20** of this volume considers coastal geomorphology and hydrodynamics and suggests limited, localised effects only around offshore structures which would be not significant.

23.6.12 Therefore archaeological assets within the site are not sensitive to other impacts identified within this **ES** beside the direct disturbance considered within this chapter and consequently no inter-relationship effects are anticipated.

c) Operation

i. Direct effects on archaeological heritage assets

23.6.13 Any disturbance of archaeological heritage assets within the site would have occurred during the construction phase and no further effects are anticipated during the operation of the proposed development.

23.6.14 Any dredging during the operational phase is anticipated to relate to maintenance of the existing navigation channel approaching the BLF, removing sediment that has infilled the originally dredged channel areas. Any archaeological material encountered during this dredging would not be *in situ*.

ii. Inter-relationship effects

23.6.15 The archaeological assets at the site are not sensitive to other impacts identified within this **ES** beside the direct disturbance considered within this chapter and consequently no inter-relationship effects are anticipated.

23.7 Mitigation and monitoring

a) Introduction

23.7.1 Where possible, mitigation measures have been proposed where a significant effect is predicted to occur. Primary and tertiary mitigation measures which have been accounted for as part of the assessment are summarised **section 23.5** of this chapter.

23.7.2 This section describes the proposed secondary mitigation measures for marine historic environment as well as describes any monitoring required of specific receptors/resources or for the effectiveness of a mitigation measure.

b) Mitigation

23.7.3 It has been established that there is a potential for further assets dating to all periods within the site as set out in **section 23.4** of this chapter which would most likely be of low to medium heritage significance.

23.7.4 Secondary mitigation in this case would comprise the adoption of a finds reporting protocol to permit the identification of any encountered material of archaeological interest within the site to allow it to be appropriately investigated, recorded and disseminated, preserving the archaeological interest of these assets. This would be undertaken under a marine licence condition.

23.7.5 For deposits with high geoarchaeological potential, mitigation would focus on undertaking analysis of stratified sediment samples that have already been collected from this area during geotechnical site investigation. Recommendations for the analysis of these deposits are identified in **Appendix 23C** of this volume. Dissemination of these results would be through the production of a scientific journal publication.

23.7.6 This would ensure that the magnitude of effect on archaeological remains and geoarchaeological deposits from the proposed development would be reduced to low, resulting in a minor adverse effect, which would be **not significant**.

c) Monitoring

23.7.7 Monitoring of the geoarchaeological and palaeoenvironmental analysis would be carried out by Historic England, as required, during the implementation of the scheme.

23.8 Residual effects

23.8.1 **Table 23.4** presents a summary of the marine historic environment assessment during construction, identifying the receptor(s) likely to be impacted, the level of effect, mitigation proposed and the resulting residual effect. During operation no effects have been identified.

Table 23.4: Summary of effects for the construction phase

Receptor	Impact	Primary or Tertiary Mitigation	Assessment of Effects	Additional Mitigation	Residual Effects
Disturbance of archaeological remains.	Disturbance by construction of the BLF, cooling water intakes and outfall, FRR, CDO and localised dredging.	Adoption of construction methodology that causes minimal disturbance comprising piling of the BLF and subterranean tunnels for cooling water intakes / outfall, FRR and CDO. subterranean tunnels for cooling water intakes/ outfall, FRR and CDO.	Minor to moderate adverse (**Not significant** - applying professional judgement).	Finds reporting protocol, as described in **section 23.7**.	Minor adverse (**Not significant**).
Disturbance of deposits of palaeoenviron-mental and geoarchaeolo-gical interest.	Disturbance by construction of the BLF, cooling water intakes and outfall, FRR, CDO and localised dredging.	Adoption of construction methodology that causes minimal disturbance comprising piling of the BLF and subterranean tunnels for cooling water intakes / outfall, FRR and CDO. subterranean tunnels for	Minor adverse (**Not significant**).	Geoarchaeo-logical and palaeoenviron mental analysis and academic dissemination.	Minor adverse (**Not significant**).

		cooling water intakes/ outfall, FRR and CDO.			

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