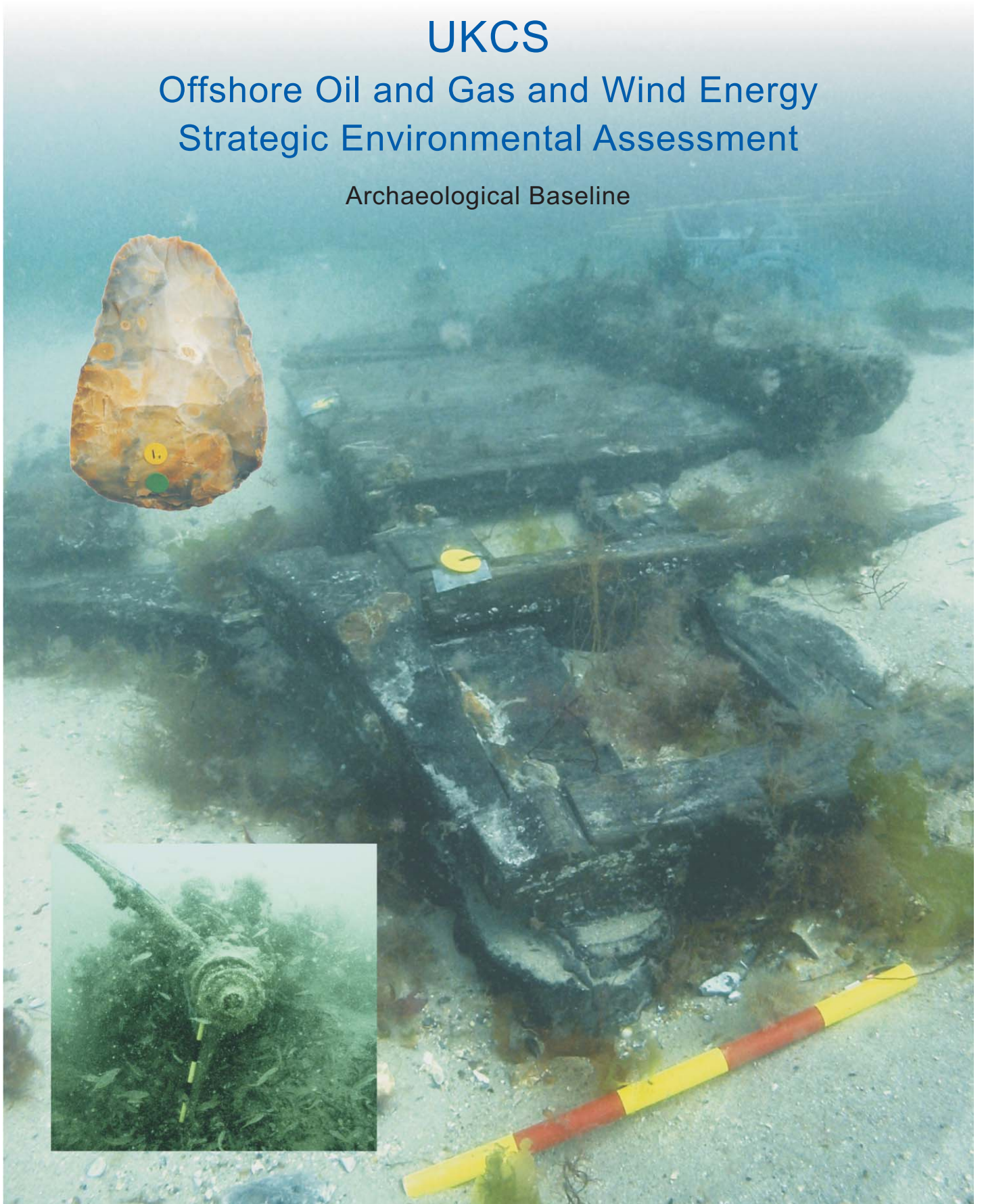




UKCS

Offshore Oil and Gas and Wind Energy Strategic Environmental Assessment

Archaeological Baseline





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**UKCS OFFSHORE OIL AND GAS AND WIND ENERGY STRATEGIC ENVIRONMENTAL
ASSESSMENT**

ARCHAEOLOGICAL BASELINE

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Department of Energy and Climate Change

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Ref: 68860.03

January 2009

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**UKCS OFFSHORE OIL AND GAS AND WIND ENERGY STRATEGIC
ENVIRONMENTAL ASSESSMENT****ARCHAEOLOGICAL BASELINE****Ref: 68860.03**

Title:	UKCS Offshore Oil and Gas and Wind Energy Strategic Environmental Assessment: Archaeological Baseline
Principal Author(s):	Matt Astill, Antony Firth, and John Gribble
Managed by:	John Gribble
Origination date:	March 2008
Date of last revision:	December 2008
Version:	68860.03
Wessex Archaeology QA:	Euan McNeill
Status:	Final report
Summary of changes:	Addition of sections 7 & 8
Associated reports:	68860.01
Client Approval:	12 January 2009

UKCS OFFSHORE OIL AND GAS AND WIND ENERGY STRATEGIC ENVIRONMENTAL ASSESSMENT

ARCHAEOLOGICAL BASELINE

Ref: 68860.03

Summary

Wessex Archaeology was commissioned by the Department of Energy and Climate Change (DECC) (formerly Department for Business, Enterprise & Regulatory Reform (BERR) / Department of Trade and Industry), to undertake an archaeological baseline study in support of Strategic Environmental Assessment (SEA) of the offshore oil and gas and wind energy strategy for the United Kingdom Continental Shelf (UKCS).

This UKCS SEA report is based on studies completed for the eight individual SEA areas around the UK coastline and summarises the potential implications of offshore oil and gas and wind energy developments on marine archaeological sites and deposits.

The potential archaeological resource reviewed is sub-divided into three sections, as follows:

- Prehistoric archaeology;
- Maritime archaeology;
- Aviation archaeology.

**UKCS OFFSHORE OIL AND GAS AND WIND ENERGY STRATEGIC
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Acknowledgements

This Report was commissioned by the Department of Energy and Climate Change (DECC) (formerly Department for Business, Enterprise & Regulatory Reform (BERR) / Department of Trade and Industry).

Matt Astill, John Gribble, and Dr Antony Firth compiled this report, with assistance from Andrea Hamel.

John Gribble managed the project for Wessex Archaeology. Quality Control was provided by Dr Antony Firth and Euan McNeill.

UKCS OFFSHORE OIL AND GAS AND WIND ENERGY STRATEGIC ENVIRONMENTAL ASSESSMENT

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UKCS OFFSHORE OIL AND GAS AND WIND ENERGY STRATEGIC ENVIRONMENTAL ASSESSMENT

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1 PROJECT INTRODUCTION

- 1.1.1 Wessex Archaeology has been commissioned to prepare a technical report on marine archaeology in support of a Strategic Environmental Assessment (SEA) of offshore oil and gas licensing and wind leasing on the United Kingdom Continental Shelf (UKCS). The SEA is being carried out by the Department of Energy and Climate Change (DECC).
- 1.1.2 For the purposes of this technical report, marine archaeology is considered to comprise:
- Submerged Prehistoric Archaeology;
 - Maritime Archaeology;
 - Aviation Archaeology.
- 1.1.3 This report focuses on fully marine, offshore areas. However, it should be noted that coastal areas – including coastal land, inter-tidal areas and inshore waters – often contain numerous and complex archaeological sensitivities. Such sensitivities need to be addressed in the course of assessing oil, gas and wind energy impacts in the coastal zone, notably those relating to pipelines, cables and other infrastructure.
- 1.1.4 The character of the coast is so varied in archaeological terms that it is more appropriate to address it at regional or scheme-specific levels, rather than at a UK-wide level. For further information on coastal archaeology, see for example Fulford *et al* 1997, McErlean *et al* 2002, Cadw 1999 and the *Scottish Coastal Archaeology and the Problem of Erosion* website (see Appendix I). SCAPE is a charity that seeks to research, conserve and promote the archaeology of Scotland's coast, particularly those threatened by coastal erosion. For the purposes of this report, references are made to archaeological resources at the coast and on land only when they have a bearing on archaeology offshore.
- 1.1.5 This report addresses the following areas:
- Available Information;
 - Legal and Policy Framework;
 - Baseline (including the character and importance of the archaeological resources, which is based largely on previous investigations);
 - Sensitivity and Threats.

2 AVAILABLE INFORMATION

2.1.1 There is considerable variation across the UKCS in terms of the information available about the archaeological resource.

2.1.2 There are a number of national and local inventories available which contain information relevant to an assessment of the archaeology of the UKCS. However, they are not consolidated or necessarily compatible at a UK-level, and there are significant problems with data quality and recording biases. Examples of inventories relevant to the UKCS include:

- The National Monuments Records (NMR) of England, Wales, Scotland and Northern Ireland. These are maintained by home country heritage agencies and together contain more than 11.5 millions records related to the historic environment of the UK and its territorial seas, including maritime sites and underwater constructions.
- The United Kingdom Hydrographic Office's (UKHO) Wrecks Database. The UKHO' database contains some 70,000 records of wrecks, mainly centred in UK territorial waters.

2.1.3 In general, however, the data about 'known' marine archaeology held within these inventories is limited and often poor. In addition information about the archaeological 'potential' of the UKCS is extensive and disparate.

2.1.4 Our approach in preparing this report has thus been to draw upon previous SEA documents and Technical Reports, supplemented by secondary sources where available.

2.1.5 The coverage of archaeology within the former Department of Trade and Industries' (DTI) SEA reports is set out the table below:

SEA Area	Prehistoric Archaeology	Maritime Archaeology	Aviation Archaeology
SEA 1	-	-	-
SEA 2/3	August 2002	-	-
SEA 4	May 2003	-	-
SEA 5	March 2004	-	-
SEA 6	March 2005	May 2005	-
SEA 7	March 2006	Nov 2006	incl. in Nov 2006
SEA 8	April 2007	incl. in April 2007	incl. in April 2007

2.1.6 Throughout this report the archaeology of these SEA areas has been related to the UK draft Regional Seas (Defra 2004) (**Figure 1**).

2.1.7 Other sources of information used in the production of the report include:

- *Future Offshore*, BERR's consultation document issued in November 2002, which provided an outline of the Government's plan to lease sites for wind farm development in the North West, Greater Wash, and Thames Estuary strategic areas;
- The Welsh Assembly Government's Marine Renewable Energy Strategic Framework (MRESF) which is aimed at ensuring the sustainable development of the marine renewable energy resource

contained within Welsh seas. In particular, reference was made to the Maritime Archaeology section of the MRESF, compiled by Wessex Archaeology (2008b), which describes the archaeological potential of the maritime environment of Wales, based on evidence for known archaeological sites, and the potential for further remains suggested by historical records and the patterning of known sites;

- The Scottish Government's Marine Renewables Strategic Environmental Assessment published in 2007;
- England's Historic Seascapes, a series of five pilot projects funded by the Aggregates Levy Sustainability Fund (ALSF) through English Heritage between 2004 and 2007, which aimed to extend historic landscape characterisation (HLC) to England's coastal and marine zones;
- The English Heritage / British Marine Aggregate Producers Association (BMAPA) *Protocol for Reporting Finds of Archaeological Interest* and associated Implementation Service, managed by Wessex Archaeology, which has been a source of information on some maritime archaeological finds and sites (Wessex Archaeology 2006b, 2007c, 2008h).

2.2 PREHISTORIC

- 2.2.1 With few exceptions, the known submerged prehistoric archaeology of the UKCS is a closed book. A handful of finds, which will be discussed in more detail later in the report, are the sum total of the concrete expression of more than 700,000 years of potential hominid and human occupation of the UKCS.
- 2.2.2 However, these sites, together with an ever-expanding understanding of the last three glaciations and interglacials, the palaeo-environments that accompanied them, their relative sea level stands, and their associated marine transgressions and regressions, indicate that the potential for prehistoric archaeology within the UKCS is high.
- 2.2.3 Most data on the prehistoric archaeology of the UKCS is limited to secondary sources, such as Ward and Larcombe (2008) and Gaffney *et al* (2007) which have summarised available information on research being done.
- 2.2.4 Very little exists in terms of primary prehistoric data sets. English Heritage maintains a database of coastal sites that are known to contain peat. The *Artefacts from the Sea* project (Wessex Archaeology 2003a), funded by the ALSF and commissioned by English Heritage, aimed to enhance records of prehistoric material recovered from the sea and inter-tidal areas, held by the NMR and selected coastal Sites and Monuments Records (SMR) in England.
- 2.2.5 Other information is available from partial or project specific datasets, such as the catalogue created by Wessex Archaeology (2004b), as part of the *Artefacts from the Sea* project, of the White Collection of prehistoric lithic and faunal remains recovered during the course of fishing activities in the

Solent. The BMAPA Protocol Implementation Service is another source of information about prehistoric finds within the UKCS area.

2.3 MARITIME

- 2.3.1 Prior to the advent of the Lloyds of London list of shipping casualties in 1741, there was no official record of ship losses. However, as an island nation with a long history of maritime activity the potential for discovering wrecks during offshore development is high. The UK has miles of treacherous coastline with many navigational hazards, and often harsh sea and weather conditions. Additionally, there are a considerable number of military maritime casualties, particularly from the two World Wars.
- 2.3.2 Although large numbers of wreck sites have been accurately charted, for example by the UKHO, and in some cases given a protected status, the exact location of most recorded shipping losses is not known, nor is the full extent of the UK's shipwreck and maritime archaeological resource.
- 2.3.3 According to the Receiver of Wreck there are currently approximately 93 protected wreck sites in UK coastal waters. This is a tiny proportion, however, of the actual number of UK wreck sites, and it is impossible to estimate with any accuracy the total numbers that may exist in the UKCS area. Estimates of the true number of maritime casualties around the UK coast vary substantially, and cannot be considered wholly reliable. 'Best guesses' vary between 100,000 and 500,000 wrecks.
- 2.3.4 As will be discussed later in this report, the changes in design and construction, and the development of new technologies incorporated into boat-building was a continual but gradual process over many thousands of years. Our understanding of boat- and ship-building technology is tempered in many cases by the availability of existing archaeological evidence. Indeed, some aspects of the archaeology of boats and ships are currently so poorly represented or understood that they are commonly referred to on a European or even international scale. For example, although a case can be made for the use of boats around the world by people prior to the last (Devensian) glacial maximum about 18,000 years BP, there is yet no evidence from the UK.
- 2.3.5 The archaeological record of wrecks around the UK is at best an uneven representation of the full scope of maritime activity over the centuries, with available data skewed in favour of more modern losses and vessels, simply because records are better and the wrecks themselves are easier to locate than earlier watercraft.

2.4 AVIATION

- 2.4.1 No single definitive list of aircraft losses in UK territorial and near territorial waters appears to exist. However, various sources suggest that since the early 20th century there have been more than 13,000 aircraft losses within the area of the UK and its continental shelf (Ramsey 1989, English Heritage 2002, Holyoak 2002, Ross McNeill, pers. comm.) The majority of these relate to the two World Wars, but there have also been a large number of civil aircraft losses.

- 2.4.2 However, the current state of knowledge of the distribution, importance and appropriate management of aircraft crash sites on the seabed is incomplete, poorly published and inadequate (Wessex Archaeology 2008a).
- 2.4.3 The primary sources for information related to aircraft losses in the UKCS SEA area include:
- The Air Historical Branch (AHB) of the Royal Air Force;
 - The Royal Flying Corps/RAF and Commonwealth records;
 - Royal Naval Air Service and Fleet Air Arm records;
 - World War II air/sea rescue and RNLI records;
 - The Department of Transport's Air Accident Investigation Branch (AAIB);
 - United States military aviation records;
 - Luftwaffe loss records.
- 2.4.4 There is a substantial body of published secondary works on aviation history and losses. Of particular relevance to aviation archaeology is Chorley's nine volume *RAF Bomber Command Losses of the Second World War* (various dates), Franks' three volume *Royal Air Force Fighter Command Losses of the Second World War* (various dates) and McNeill's publication about Coastal Command losses (McNeill 2003).
- 2.4.5 Large numbers of these aircraft were lost within the UKCS SEA area. However, recent finds of aircraft remains during seabed development have demonstrated that there is marked disparity between the number of losses that are recorded and the number of known sites (Wessex Archaeology 2008a). There is thus a reasonable potential for discovering previously unrecorded aircraft sites during seabed development works throughout the area covered by the UKCS SEA.

3 LEGAL AND POLICY FRAMEWORK

3.1 OUTLINE

- 3.1.1 This section presents the legal and policy framework applicable to marine archaeology within the UKCS, encompassing UK territorial waters and the UK Continental Shelf itself.
- 3.1.2 The legal framework applicable to marine archaeology is subject to a variety of jurisdictional divisions. It is generally accepted in international law that states have jurisdiction in respect of heritage within their territorial waters (to 12 nautical miles (nm)). Accordingly, the UK exercises authority in respect of marine archaeology to 12nm on the basis of UK-wide legislation. However, as cultural issues are generally devolved, marine archaeology is administered separately by different authorities in each of the home countries, as follows:
- England – English Heritage (EH);
 - Wales – Cadw;
 - Scotland – Historic Scotland (HS);
 - Northern Ireland – Environment and Heritage Service, Northern Ireland (EHS).
- 3.1.3 Some aspects of the law relating to marine archaeology, such as the Protection of Military Remains Act 1986 and the Merchant Shipping Act 1995, are administered by authorities with UK-wide powers.
- 3.1.4 Beyond 12nm, the situation is more complex. Current international law is unequivocal that wrecks do not form part of the natural resources of the Continental Shelf. Consequently, coastal states are not considered to be entitled to regulate marine archaeology on the Continental Shelf directly. However, some indirect regulation of archaeology on the UK Continental Shelf arises from the environmental controls placed on the exploitation of natural resources and other Continental Shelf activities that coastal states are entitled to regulate. Moreover, there are a number of international conventions and other instruments that are relevant to archaeology on the UKCS.
- 3.1.5 Administration beyond 12nm is not devolved, so that – in principal – marine archaeology on the UKCS is addressed UK-wide. However, in practice the UK-wide authorities with powers relating to archaeology beyond 12nm generally call upon the expertise of the heritage agency responsible for the adjacent territorial waters.
- 3.1.6 The law relating to marine archaeology is likely to undergo fundamental change in the near future, on at least two counts. A draft Heritage Protection Bill has been published that will change the framework for designating archaeological sites in English and Welsh waters; and a draft Marine Bill has been published that is likely to change the way that archaeology is addressed in marine planning and licensing. Law and administration are likely to change in both Scotland and in Northern Ireland to reflect the Heritage Protection Bill and the Marine Bill.

- 3.1.7 Acknowledging these possible changes, this section has been prepared to reflect law and administration as it currently stands, but with a sub-section on the changes that are being proposed in the draft Heritage Protection Bill and draft Marine Bill.

3.2 UK-WIDE

Introduction

- 3.2.1 In the UK, submerged prehistoric sites and shipwrecks are not protected unless specific action has been taken to protect them. There are, however, two different acts under which wrecks that may be of archaeological interest may be designated, namely the Protection of Wrecks Act 1973 (PWA 1973, which has two relevant sections), the Protection of Military Remains Act 1986 (PMRA 1986). Designation of wrecks and submerged prehistoric sites is also possible under a third act, the Ancient Monuments and Archaeological Areas Act 1979 (AMAA 1979), which applies to England, Scotland and Wales, but not Northern Ireland which has its own equivalent legislation (see below).
- 3.2.2 Specific actions are not required to protect aircraft that were lost while in military service. These are automatically protected under the PMRA 1986.
- 3.2.3 For people who find or take possession of wreck, including wreck of archaeological interest, the Merchant Shipping Act (1995) applies.
- 3.2.4 The Protection of Military Remains Act 1986 and the Merchant Shipping Act 1995 are administered UK-wide by the Ministry of Defence (MoD) and the Maritime and Coastguard Agency (MCA) respectively. Section 2 of the Protection of Wrecks Act 1973, which deals with dangerous wrecks, is also administered UK-wide by the MCA. However, Section 1 of the Protection of Wrecks Act 1973, which deals with wrecks of historic or archaeological importance, is administered by the heritage agencies of each of the home countries. The Ancient Monuments and Archaeological Areas Act 1979 is also administered by the heritage agencies of England, Scotland and Wales.

Protection of Wrecks Act 1973: Section 1

- 3.2.5 The following paragraphs set out the general provisions and background of Section 1 of the PWA 1973. Further details relating to its administration in each home country are dealt with subsequently, under the heading for each country.
- 3.2.6 Section 1 of the Protection of Wrecks Act 1973 enables the Secretary of State to protect wreck sites from unauthorised interference if they are of historic, archaeological or artistic importance.
- 3.2.7 Under the Act it is an offence to carry out certain activities in a defined area surrounding the site, unless a licence for those activities has been obtained from the Government.
- 3.2.8 Section 1 of the PWA 1973 is administered by each of the home country heritage agencies, largely independently.
- 3.2.9 The relevant Secretary of State must consult appropriate advisors prior to designation, though it is possible to designate a wreck in an emergency without first seeking advice. Advice is provided by the heritage agencies and

by the Advisory Committee on Historic Wreck Sites (ACHWS). ACHWS has a UK-wide remit.

- 3.2.10 There are currently a total of 60 sites protected under Section 1 of the Act. The sites range in date and character from dispersed cargoes of Bronze Age metalwork to the largely intact remains of the submarine A1, lost in 1911.
- 3.2.11 Generally, sites are designated following an extended consultation process. However, there have been instances (such as the Swash Channel wreck) where an emergency designation order has been obtained where a site has been detected by geophysical investigations in the course of Environmental Impact Assessment (EIA), highlighting the capabilities of the Act for rapid protection of a previously unknown wreck found as a result of marine development.

Protection of Wrecks Act 1973: Section 2

- 3.2.12 Section 2 of the Protection of Wrecks Act 1973 provides protection for wrecks that are designated as dangerous due to their contents and is administered by the Maritime and Coastguard Agency (MCA) through the Receiver of Wreck (ROW).
- 3.2.13 There are currently two wrecks designated as dangerous wrecks under Section 2 of the Act: the wreck of the *Richard Montgomery* off Sheerness; and the wreck of the SS *Castilian*, East Platters, Anglesey.
- 3.2.14 Section 2 of the PWA 1973 is not used to designate sites because of their archaeological interest, but it is possible that a dangerous wreck designated under this section might also be of archaeological or historic interest.

The Protection of Military Remains Act 1986

- 3.2.15 Under the Protection of Military Remains Act (1986), the MoD has powers to protect vessels that were in military service when they were wrecked. The definition of 'military service' has been examined in detail in the course of judicial review and subsequent appeal, such that in some circumstances merchant vessels are eligible for protection.
- 3.2.16 The MoD can designate named vessels as Protected Places even if the position of the wreck is not known. In addition, the MoD can designate Controlled Sites around wrecks whose position is known. In the case of Protected Places, the vessel must have been lost after 4 August 1914, whereas in the case of a wreck protected as Controlled Sites, no more than 200 years must have elapsed since loss (MoD 2001). In neither case is it necessary to demonstrate the presence of human remains.
- 3.2.17 Diving is not prohibited at a Protected Place but it is an offence to tamper with, damage, move or remove sensitive remains. However, diving, salvage and excavation are all prohibited on Controlled Sites. Licences for restricted activities can be sought from the MoD.
- 3.2.18 The provisions of the Protection of Military Remains Act 1986 in respect of Protected Places and Controlled Sites are applicable in international waters, which would include the UK Continental Shelf, though they are enforceable only in respect of British-controlled ships, British citizens, and British companies.

- 3.2.19 The MoD is undergoing a rolling programme of identification and assessment that has resulted in several tranches of wrecks being designated under the PMRA 1986. The most recent tranche came into effect on 1 May 2008. There are now a total of 12 controlled sites and 46 protected places around the world.
- 3.2.20 Records of vessels lost while in military service do not always give an exact location for the loss. Given the extent of military activity on the UKCS, the potential for wrecks eligible for further designation under the PMRA 1986 is high.
- 3.2.21 Under the Protection of Military Remains Act 1986, all aircraft that have crashed in military service automatically constitute a Protected Place. Hence it is an offence to tamper with, damage, move or remove any remains of military aircraft unless authorised by a licence. The provisions of the PMRA 1986 relating to aircraft are administered by the MoD Joint Casualty and Compassionate Centre.
- 3.2.22 Also, it should be noted that it is an offence under the PMRA 1986 to carry out unauthorised excavations for the purpose of discovering whether any place in UK waters contains remains of a vessel which has crashed, sunk or been stranded while in military service.

Ancient Monuments and Archaeological Areas Act 1979

- 3.2.23 The main legislation concerning archaeological remains in the UK is the Ancient Monuments and Archaeological Areas Act 1979. This Act primarily deals with land sites but there is provision to designate sites of vessels in territorial waters as Scheduled Monuments.
- 3.2.24 Monuments are defined by the AMAA 1979 as including buildings, structures, works, caves, excavations, vehicles, vessels, aircraft or other movable structures. Monuments can only be scheduled if they are of national importance. Section 53 extends the AMAA 1979 to monuments situated in, on or under the seabed within UK territorial waters.
- 3.2.25 Once a monument has been scheduled, visiting or diving on the site is not necessarily restricted. It is, however, an offence to demolish, destroy, alter or repair the monument without prior authorisation, in the form of Scheduled Monument Consent.
- 3.2.26 Examples of wreck sites that have been designated as Scheduled Monuments in UK waters include the following (and see Appendix I):
- The Light Cruisers *Brummer*, *Dresden*, *Karlsruhe* and *Koln*, along with the Battleships *Konig*, *Kronprinz Wilhelm* and *Markgraf* of the German High Seas Fleet. All scuttled at Scapa Flow, Orkney, on 21st June, 1919;
 - The Kilspindie Hulks Nos.1-8. Examples of 19th to 20th century 'Fifie' sailing fishing vessels, Kilspindie, Aberlady Bay, Lothian;
 - The *Louisa*, a 19th century seagoing merchant vessel, Grangetown, Cardiff. This vessel was first protected in 2001 and now forms part of the Cardiff land reclamation scheme.

Merchant Shipping Act 1995

- 3.2.27 The Merchant Shipping Act 1995 (MSA 1995) is used to regulate the reporting and disposal of wreck – including wreck of archaeological interest – found or recovered from UK waters, or found or recovered outside UK waters but brought within those waters. Within the context of the MSA 1995, wreck refers to flotsam, jetsam, derelict and lagan found in or on the shores of the sea or any tidal water. It includes ships, aircraft and hovercraft, parts of these, their cargo and equipment.
- 3.2.28 All wreck that is found or taken into possession must be notified to the Receiver of Wreck by the finder. The wreck is then delivered to the Receiver, or, more commonly, held by the finder to the order of the Receiver.
- 3.2.29 The ownership and disposal of wreck is decided according to procedures contained within the MSA 1995. Provision is made for original owners to come forward to claim their property. Ownership of unclaimed wreck from within territorial waters lies with the Crown or in a person to whom rights of wreck have previously been granted by the Crown.
- 3.2.30 The Receiver has a duty to ensure that finders who report their finds as required receive an appropriate salvage payment. In the case of material considered to be of historic or archaeological importance, a suitable museum is asked to buy the material at the current valuation and the finder receives the net proceeds of the sale as a salvage payment. If the right to, or the amount of salvage cannot be agreed, either between owner and finder or between competing salvors, the Receiver will hold the wreck until the matter is settled, either through amicable agreement or by court judgement.

Archaeological Material other than Wreck

- 3.2.31 The Merchant Shipping Act 1995 applies only to archaeological material that is 'wreck', i.e. material that is derived in some way from a ship or aircraft. Material that is not wreck (such as prehistoric material associated with submerged landsurfaces) will generally belong to the owner of the land in which they are found, under common law.
- 3.2.32 The Treasure Act 1996 (England, Wales and Northern Ireland) applies only to land and the foreshore above mean low water. The Act does not apply in Scotland where ownership of non-wreck material is subject to the law of *bona vacantia*. Finders have no ownership rights to any find they make in Scotland and all finds, with the exception of Victorian and 20th century coins, must be reported to the Treasure Trove Unit for assessment.

Marine Consents

- 3.2.33 For offshore renewable projects, consent is generally sought from the DECC through the Electricity Act 1989. Consents are also required from the Marine and Fisheries Agency under the Food and Environment Protection Act 1985 and the Coast Protection Act 1949. Planning permission may also be required from the relevant local planning authority for terrestrial elements of the scheme. Irrespective of the details of the consenting process, Environmental Impact Assessment (EIA) is likely to be required under UK regulations implementing European Directives 85/337/EEC and 97/11/EC.

The EIA Directive requires that the effects of the development on the archaeological heritage have to be identified, assessed and mitigation proposed. It is now common for conditions relating to archaeology, reflecting the results of the EIA, to be attached to consents for offshore renewable schemes.

- 3.2.34 For oil and gas, consent for field development, drilling of wells and construction of pipelines has to be sought under the Petroleum Act 1998, administered by the DECC. The application of the EIA Directive is given effect through the Offshore Petroleum Production and Pipelines (Assessment of Environmental Effects) Regulations 1999, as amended in 2007. As above, the regulations require that effects upon the archaeological heritage are identified, assessed and mitigation proposed. The DECC is currently concluding a consultation process on Guidance Notes on the Offshore Petroleum Production and Pipelines (Assessment of Environmental Effects) Regulations 1999 (as Amended). The consultation draft provides guidance on the types of project for which EIA is required, noting that one trigger for EIA of exploration, appraisal and development wells is:

Presence of known archaeological features; designated under the Protection of Wrecks Act 1973, The Protection of Military Remains Act 1986 or the Ancient Monument and Archaeological Areas Act 1979; or other heritage features potentially subject to damage or physical disturbance by the proposed drilling operations.

- 3.2.35 The need to address the archaeological heritage in oil and gas EIAs is confirmed in Appendix L.
- 3.2.36 In particular, insofar as Continental Shelf activities are subject to Environmental Impact Assessment. Similarly, the effects on the archaeological heritage of Continental Shelf activities have to be assessed by virtue of the Strategic Environmental Assessment Directive (2001/42/EC).

Other UK-wide Plans, Policies and Guidance

- 3.2.37 Of direct relevance to offshore renewables is Cowrie's Historic Environment Guidance for the Offshore Renewables Sector (Cowrie 2007). This guidance is UK-wide and provides detailed guidance on all aspects of dealing with the historic environment in planning and implementing offshore renewable schemes. The guidance is also generally relevant to other forms of marine development, including oil and gas. COWRIE has also published Guidance for Assessment of Cumulative Impacts on the Historic Environment from Offshore Renewable Energy (Oxford Archaeology 2008).
- 3.2.38 The Joint Nautical Archaeology Policy Committee (JNAPC) Code of Practice for Seabed Development (JNAPC 2006) is a UK-wide code developed in conjunction with key industries. The JNAPC Code is voluntary but provides a framework that can be used in the course of development to ensure that activities are conducted in an archaeologically sensitivity manner.
- 3.2.39 In 2002 English Heritage published *"Military Aircraft Crash Sites: Archaeological guidance on their significance and future management*, which aims to provide archaeological and heritage management guidance on military aircraft crash sites.

3.2.40 The guidance states that there should be a presumption that nationally important aircraft crash sites (see below) should be preserved *in situ*. However, for the majority of less important sites and possibly for some nationally important sites, the position adopted is that excavation and recording is the appropriate response, provided that an appropriate fieldwork and recording methodology is adopted and a record of the excavation is lodged with the local SMR and the NMR (English Heritage 2002: 7).

3.3 ENGLAND

3.3.1 The National Heritage Act 2002 extended English Heritage's responsibilities to include archaeological sites out to the limit of territorial waters off England. English Heritage became responsible for the implementation and administration of the PWA 1973 in England, and also for UK-wide aspects of the PWA 1973. EH's aspirations in respect of their new responsibilities were laid out in *Taking to the Water: English Heritage's Initial Policy for the Management of Maritime Archaeology in England* (English Heritage 2002). A Maritime Team based in Portsmouth administers English Heritage's marine responsibilities.

3.3.2 English Heritage (2008a) recently set out the following level principles in relation to cultural heritage:

- The historic environment is a shared resource;
- Everyone should be able to participate in sustaining the historic environment;
- Understanding the significance of places is vital;
- Significant places should be managed to sustain their values;
- Decisions about change must be reasonable, transparent and consistent;
- Documenting and learning from decisions is essential.

3.3.3 Prior to 2002, English Heritage's responsibilities in the marine sphere had been limited to the coast. In this context, English Heritage and the Royal Commission on the Historic Monuments of England (RCHME – subsequently subsumed within English Heritage) published *England's Coastal Heritage: a statement on the management of coastal archaeology in 1996* (EH/RCHME 1996). The statement set out a number of key management principles, which include:

The coastal zone of England includes a finite, irreplaceable, and, in many cases, highly fragile archaeological resource which by virtue of its value, variety, and vulnerability justifies a presumption in favour of the physical preservation in situ of the most important sites, buildings, and remains.

Although archaeological remains situated within inter-tidal and sub-tidal areas may be less visible and accessible than remains on dry land, this does not affect their relative importance and they should be

managed in accordance with the principles which apply to terrestrial archaeological remains.

As historic landscapes can extend seamlessly from dry land, through the inter-tidal zone, and into sub-tidal areas, effective management of the coastal archaeological resource cannot be achieved without due consideration of marine as well as terrestrial archaeological remains.

Where economic development in the coastal zone is likely to impact on important archaeological remains, decisions should be taken with regard to the best available information and the precautionary approach should be adopted wherever possible.

- 3.3.4 The statement also included a number of detailed recommendations, including one specifically addressing oil and gas (EH/RCHME 1996, 14):

Appropriate consultation procedures should be established prior to the approval of consent for development, production and pipeline works and controlled pipeline authorisations which may affect important archaeological remains. Where appropriate, provisions relating to archaeology should be included in conditions and restrictions applied to future rounds of licensing.

- 3.3.5 In addition, a general recommendation on development control and environmental assessment also includes specific reference to oil and gas (EH/RCHME 1996, 13):

Coastal archaeological interests should be ... consistently and comprehensively included in Environmental Assessment procedures for coastal and marine developments (including harbour works, mineral extraction, oil and gas activities, capital dredging projects, and waste water treatment and disposal) and other activities requiring sectoral consent.

- 3.3.6 A further key statement in England's Coastal Heritage invoked Planning policy guidance: archaeology and planning (PPG 16) (Department of the Environment 1990). PPG 16 is central to the regulation of development-led archaeology on land, but it applies to planning law which, as a general rule, extends only to the low water mark. However, England's Coastal Heritage included the following statement:

Although it remains government policy not to extend the Town and Country Planning system to the territorial sea, the principles set out in PPG 16: Archaeology and Planning should be applied to the treatment of sub-tidal archaeological remains in order to secure best practice.

- 3.3.7 The principles of PPG 16 include archaeology being a material consideration in development control, preservation *in situ* of nationally important remains, developer-funded investigation of remains that cannot be preserved *in situ*, and consents being subject to applications being accompanied by sufficient information on archaeological impacts.

3.3.8 English Heritage has also published, in conjunction with the British Marine Aggregate Producers Association (BMAPA), a Guidance Note on assessing, evaluating, mitigating and monitoring the archaeological effects of marine aggregate dredging (BMAPA and English Heritage 2003). While the Guidance Note is concerned with aggregates, many of its details are relevant also to the implications of oil and gas development for maritime archaeology.

3.3.9 English Heritage's general guidance with respect to wind energy is set out in Wind Energy and the Historic Environment (October 2005), which includes a short section on offshore renewables. The document includes the following 'Best Practice Checklist':

The implications for the historic environment of wind energy developments should be reflected in Regional Spatial Strategies, Local Development Frameworks and Supplementary Planning Documents.

The effects of wind energy programmes and projects on the historic environment should be evaluated in all levels of environmental impact assessment.

Consideration of the historic environment should include World Heritage Sites; marine, coastal and terrestrial archaeology; historic buildings and areas; designed landscapes; and the historic character of the wider landscape.

The significance of internationally and nationally designated sites should be safeguarded, and physical damage to historic sites should be avoided.

The impact of wind energy developments on the setting and visual amenity of historic places should also be considered.

Where wind energy developments affect historic sites, national planning policies on the historic environment should be taken into account.

Consideration should always be given to the reversibility of wind energy projects.

3.3.10 English Heritage has been developing and piloting a methodology for Historic Seascape Characterisation, which is intended to 'enable area-based understandings of the historic environment that are designed to promote well-informed decision-making relating to the sustainable management of change and conservation planning affecting the historic environment in the coastal and marine zones'. The character areas have no formal legal or planning status but consideration of them may be expected.

3.3.11 English Heritage has recently circulated a consultation document on views, entitled *Seeing the History in the View: a methodology for assessing heritage significance within views* (2008b). As implied by the title, the consultation draft sets out a methodology that can be used for 'any view that may have heritage significance', with particular reference to development proposals and environmental impact assessment. English Heritage intends to use the methodology in its own decisions relating to developments affecting views, and also to encourage planning authorities to adopt the same approach. The document includes a methodology for assessing

impacts to views in the course of EIA. Although the case studies presented in the document are urban, its potential application to heritage significance within views to and from the coast is apparent.

3.4 NORTHERN IRELAND

- 3.4.1 The Environment and Heritage Service (Department of the Environment, Northern Ireland) (EHSNI) administers the Protection of Wrecks Act 1973 in Northern Ireland's territorial waters.
- 3.4.2 In partnership with the University of Ulster at Colerain, EHSNI has set up a Centre of Maritime Archaeology to carry out surveys of the coastal zone, foreshore and seabed and to train future maritime archaeologists.
- 3.4.3 The Historic Monuments and Archaeological Objects (NI) Order 1995 (HMAO) provides for the protection of all archaeological sites and objects including those on the foreshore and the seabed.
- 3.4.4 Article 38(1) states that a monument situated in, on or under the seabed within the seaward limits of territorial waters adjacent to Northern Ireland may be included in the schedule under Article 3(1). Article 38(5) grants powers conferred by Article 24 to conduct archaeological investigations in territorial waters.
- 3.4.5 Under Article 29(1) any person that has a detecting device in their possession in a protected place without the written consent of the Department shall be guilty of an offence and liable on summary conviction to a fine. Restrictions on searching for archaeological objects are provided under Article 41 of the Order.
- 3.4.6 Reporting of archaeological objects is also a legal requirement. Article 42(1) states that any person who finds an object shall, within 14 days of finding the object, report the circumstances of finding, nature of the object, the owner or occupier of the land on which it was found; and deposit the object with the relevant authority.
- 3.4.7 Northern Ireland also uses planning law to regulate archaeology. Government policy on planning, archaeology and the built heritage is presented in Planning Policy Statement 6 (Department of the Environment 1999). While the Planning Order (NI) 1991 has application only to the low water mark, the principles of Planning Policy Statement 6 can be extended to the seabed (Williams and McErlean 2002).

3.5 SCOTLAND

- 3.5.1 Historic Scotland (HS) carries the responsibilities of Scottish Ministers with regard to archaeological and built heritage matters, which extend offshore to the 12 mile territorial limit. There are three relevant pieces of legislation from which direct responsibilities arise: the PWA 1973, the Ancient Monuments and Archaeological Areas Act 1979 and the Planning (Listed Buildings and Conservation Areas) (Scotland) Act 1997.
- 3.5.2 As noted above, Historic Scotland has used the AMAA 1979 to designate wreck sites of archaeological interest, as well as the PWA 1973.

- 3.5.3 The Planning (Listed Buildings and Conservation Areas) (Scotland) Act 1997 contains the bulk of built heritage conservation planning law for Scotland. It requires Scottish Ministers to compile lists of buildings of archaeological or historic importance and provides for the designation of conservation areas.
- 3.5.4 The scope of the Act ends at the low water mark and it is therefore not possible for buildings or sites that are permanently submerged to be listed. However, it is possible for structures which are sometimes or partly below the sea to be listed (Historic Scotland 1999).
- 3.5.5 The strategic policies of Scottish Ministers to the historic environment are being set out in a new set of documents entitled Scottish Historic Environment Policies (SHEPs). These documents provide immediate context for advice arising from Historic Scotland, but importantly the SHEPs are effectively cross-governmental and can be expected to guide decisions across the range of authorities responsible to Scottish Ministers. Scotland's Historic Environment (SHEP 1 – Historic Scotland 2007) sets out an overall vision and brings together a broad range of existing guidance. The consultation period on a draft SHEP on The Marine Historic Environment (Historic Scotland 2008) has recently closed.
- 3.5.6 National Planning Policy Guidelines (NPPGs) provide statements of Government policy on nationally important land use and other planning matters. NPPG5 Archaeology and Planning sets out policy on how archaeological remains and discoveries should be handled. The guidance is aimed at planning authorities in Scotland, and is also of direct relevance to developers, owners, statutory undertakers, government departments, conservation organisations and others whose actions have a direct physical impact upon the natural or built environment (Scottish Office 1994a).
- 3.5.7 The Planning Advice Note: Archaeology - the Planning Process and Scheduled Monument Procedures (PAN 42) gives more detailed advice on planning procedures and the separate controls over scheduled monuments (Scottish Office 1994b).
- 3.5.8 Although it is primarily concerned with development on land, a recent document on scoping wind farm proposals in Scotland (Historic Scotland 2007) may also be relevant to offshore wind farms:

3.6 WALES

- 3.6.1 Cadw administers the responsibilities of Ministers from the National Assembly of Wales (NAW) with regard to archaeological and built heritage matters, which extend offshore to the 12 mile territorial limit. The relevant pieces of legislation from which direct responsibilities arise are the Protection of Wrecks Act 1973 and the Ancient Monuments and Archaeological Areas Act 1979.
- 3.6.2 One wreck in Wales, the *Louisa*, has been protected under the Ancient Monuments and Archaeological Areas Act 1979. The wreck, which is located on the river Taff, was protected under the AMAA 1979 because impoundment for a land reclamation scheme for Cardiff Bay removed the site from UK waters such that the site could not be designated under the PWA 1973.

3.6.3 General advice on the care of Wales' coastal heritage is set out in *Caring for Coastal Heritage* (Cadw 1999). This document includes a brief guide to best practice for the management of the coastal heritage, which it summarises as (Cadw 1999: 16-18):

- *SEEK information;*
- *EVALUATE its importance;*
- *ASSESS the impact of proposals;*
- *Consider PROTECTION and PRESERVATION;*
- *Or devise MITIGATION measures;*
- *MONITOR the effect of the proposals.*

3.6.4 Considerable effort has been put into the identification and management of historic landscapes in Wales, many of which are coastal and some of which include intertidal areas. The key document is the Guide to Good Practice on Using the Register of Landscapes of Historic Interest in Wales in the Planning and Development Process. Revised (2nd) Edition Including Revisions to the Assessment Process (ASIDOHL 2) (Countryside Council for Wales, Cadw and Welsh Assembly Government 2007). ASIDOHL2 includes assessment of indirect visual impacts as part of its Stage 3, and makes provision for the assessment of the disruption of views. The document also notes that advice on the application of ASDOHL 2 to coastal areas should be obtained from CCW (para. 3.3).

3.7 RELEVANT INTERNATIONAL INSTRUMENTS

3.7.1 A broader context is provided by international law, represented by customary law and the conventions to which the UK is party. The United Nations Convention on the Law of the Sea (UNCLOS) (1982), The European Convention on the Protection of the Archaeological Heritage (Revised) (1992) (the Valletta Convention), the European Landscape Convention (ELC) (2000) and the UNESCO Convention on the Protection of the Underwater Cultural Heritage (CPUCH) 2001 are all relevant in this regard. (Details of websites for these conventions can be found in Appendix I).

3.7.2 UNCLOS 1982 was ratified by the UK in 1997. Article 303 stipulates that 'states have the duty to protect objects of an archaeological and historical nature found at sea and shall co-operate for this purpose'. Article 303 also provides for coastal states to exert a degree of control over the archaeological heritage to 24 nautical miles, though the UK has not introduced any measures to implement this right.

3.7.3 The Valletta Convention was ratified by the UK Government in 2000 and came into force in 2001. The convention binds the UK to implement protective measures for the archaeological heritage within the jurisdiction of each party, including sea areas. Insofar as the UK exerts jurisdiction over the Continental Shelf, then it would appear that the provisions of the Valletta Convention apply to that jurisdiction.

3.7.4 The UNESCO Convention (COPUCH) concluded in 2001, and is a comprehensive attempt to codify the law internationally in respect of the underwater archaeological heritage. The UK abstained in the vote on the final draft of the Convention, however, it has stated that it has adopted the Annex of the Convention – which governs the conduct of archaeological investigations – as best practice for archaeology. In addition, although the UK is not a signatory, the convention will be carried forward in January as it has now been signed or ratified by 20 member states.

3.7.5 The ELC 2000 became binding on the UK from 1 March 2007. Its principal clauses require the Government:

a to recognise landscapes in law as an essential component of people's surroundings, an expression of the diversity of their shared cultural and natural heritage, and a foundation of their identity;

b to establish and implement landscape policies aimed at landscape protection, management and planning through the adoption of ... specific measures ...;

c to establish procedures for the participation of the general public, local and regional authorities, and other parties with an interest in the definition and implementation of the landscape policies mentioned in paragraph b above;

d to integrate landscape into its regional and town planning policies and in its cultural, environmental, agricultural, social and economic policies, as well as in any other policies with possible direct or indirect impact on landscape.

3.7.6 The ELC applies to the entire territory of the UK and includes land, inland water and marine areas. 'Territory' includes UK territorial waters (i.e. to 12nm), but the Convention is not regarded as applying to sea areas regulated by the UK that lie beyond territorial waters (i.e. to the UKCS).

3.7.7 One further international measure is worth noting, namely the International Council on Monuments and Sites (ICOMOS) Charter on the Protection and Management of Underwater Cultural Heritage 1996 (the Sofia Charter). The Charter includes a series of statements regarding best practice, intending 'to ensure that all investigations are explicit in their aims, methodology and anticipated results so that the intention of each project is transparent to all'. The UK is a member of ICOMOS.

3.8 CHANGING FRAMEWORKS

Heritage Protection Bill

3.8.1 The Heritage Protection Bill will apply to territorial waters off England and Wales and replace the AMAA 1979 and the PWA 1973 that currently apply there. The Bill introduces new terminology; designated sites will be referred to as 'registered marine heritage sites'. In order to be considered for designation, a site has to comprise a 'marine asset'. The scope of 'marine asset' includes many different types of archaeological site ('registrable structures') as well as wrecks, and the scope of 'registrable structure' has been widened beyond the definition of 'monument' in the AMAA 1979. Consequently the Bill represents a considerable widening of the potential application of protection.

- 3.8.2 In order for a marine asset to warrant being protected as a registered marine heritage site, it must be of 'special ... interest'. Criteria for what constitutes 'special interest' are to be published. In addition, the marine registration authority can take into account whether it is 'appropriate' for the site to be registered.
- 3.8.3 All applications for registration are subject to consultation, and sites are protected provisionally as soon as practicable after the authority has decided to start the consultation process by seeking representations. When a site is registered, either provisionally or 'in full', it is an offence to carry out various activities without a licence.
- 3.8.4 For marine assets, the marine registration authority is the Secretary of State in England, and Welsh Ministers in Wales. In England, licences will be issued by English Heritage. On land, assets will be registered directly by English Heritage and heritage asset consent will be administered by local authorities. It should be borne in mind that the new regimes for marine and land overlap considerably at the coast, so the situation may be complex.
- 3.8.5 Among the provisions of the Bill there is a facility to seek 'Certificates of No Intention to Register' whereby a developer, for example, may obtain a guarantee to the effect that the asset subject to the guarantee will not be registered for at least five years.

Marine Bill

- 3.8.6 The Marine Bill will fundamentally change the management of the UKCS, introducing a Marine Management Organisation (MMO), a hierarchy of spatial forward plans, a revised system licensing marine development, a new system of marine conservation zones (MCZs), and new fisheries management mechanisms.
- 3.8.7 The Marine Bill does not contain detailed provisions on the historic environment, but it is apparent that archaeology will be taken into consideration in many of the frameworks that are to be established:
- The historic environment seems likely to feature in the priorities of the MMO by virtue of its objective of contributing to the achievement of sustainable development (s. 2(1));
 - In the context of marine licence decisions being obliged to have regard to the need to protect the environment (s. 63), the draft Marine Bill's Explanatory Notes state that 'environment ... should include ... any site of historic or archaeological interest';
 - The primary purpose of MCZs is to conserve marine flora, fauna and habitats, though there is also provision to conserve features of geological or geomorphological interest that may encompass surfaces and deposits of archaeological interest. Also, draft guidance on MCZs notes that 'when designating MCZs, Ministers will be able to take account of socio-economic considerations, including the existence of marine heritage assets' (Defra, May 2008);
 - The part on inshore fisheries and conservation authorities notes that the marine environment includes 'features of archaeological or historic interest ...'.

- 3.8.8 Clearly, both the draft Heritage Protection Bill and the draft Marine Bill may undergo significant amendment in the course of the legislative process, so the provisions outlined above may not become law.

4 SUBMERGED PREHISTORIC ARCHAEOLOGY

4.1 BACKGROUND

- 4.1.1 The prehistoric archaeological record of the UK extends back at least 700,000 years; a span of time characterised by a series of global glacial and interglacial cycles during which dramatic changes occurred in climate, landscape, environmental resources and depositional conditions (Wenban-Smith 2002).
- 4.1.2 The human occupation of the UK during the last 700,000 years has been a precarious business. The climate has swung from balmy conditions reminiscent of southern Europe today to arctic wasteland as massive ice sheets up to a mile thick spread south across much of the UK and UKCS (Stringer 2006).
- 4.1.3 During this time the UK has been abandoned by hominins, modern humans and our ancestors, at least seven times, only to be re-inhabited as climate ameliorated (Stringer 2006). These cycles are thus central to an understanding of the prehistory of the UK for two important reasons. Firstly, they regulated the environment of the UK, and had a profound effect on when human occupation was possible. Secondly, as a result of sea level falls during the glacial periods, large areas of what is now the UKCS would have been exposed as dry land. This facilitated human movement between Europe and the UK, and provided environments richly stocked with natural resources for human exploitation and occupation.
- 4.1.4 With the exception of a relatively small number of sites and finds, the known submerged prehistoric archaeology of the UKCS is a closed book. These finds, which will be discussed below, are the sum total of the concrete expression of more than 700,000 years of potential human occupation of the UKCS. However, these sites, together with an ever-expanding understanding of the last three glaciations and interglacials, the palaeo-environments that accompanied them, their relative sea level stands, and their associated marine transgressions and regressions, indicate that the potential for prehistoric archaeology within the UKCS is high.
- 4.1.5 The Palaeolithic (literally Old Stone Age) covers the span of time from the initial human occupation of UK to the end of the last (Devensian) glaciation. The sheer length of the Palaeolithic period necessitates some form of division according to hominid development. The earlier, or Lower and Middle parts of the Palaeolithic witnessed the gradual evolution of an archaic human lineage from Britain's original colonisers (*Homo heidelbergensis*) through to *Homo neanderthalensis* during the period up to the middle of the last glaciation (c.35,000 BP) (Wenban-Smith 2002). About this time Neanderthals were replaced in Britain and north-west Europe by anatomically modern humans (*Homo sapiens*), corresponding with the period known as the Upper Palaeolithic.
- 4.1.6 For the purposes of this report the discussion of submerged prehistoric archaeology has been divided into three phases:
- Pre-Devensian, c.700,000–48,000 years Before Present (BP), covering the period from the earliest evidence of hominin occupation of the UK and to the onset of the last glaciation maximum, and corresponding to the Lower and Middle Palaeolithic;

- Devensian, c.48,000–12,000 BP, covering the period up to and including the last glacial maximum and corresponding to the Early Upper Palaeolithic which saw the transition from Neanderthals to modern humans;
- Post-Devensian, c.12,000–6,000 BP, comprising the period of re-inhabitation of the British Isles following the last glacial maximum through to the final inundation of the UKCS, and corresponding with the Late Upper Palaeolithic and Mesolithic.

4.1.7 This section attempts to summarise the available background information for the prehistoric archaeology of the UKCS, as detailed in the various regional SEA reports and other sources.

4.2 CHARACTER AND IMPORTANCE OF SUBMERGED PREHISTORIC ARCHAEOLOGY

4.2.1 Archaeological remains from early prehistory are relatively scarce across the UK, and the archaeological investigation of early prehistory is still underdeveloped. There are major gaps in our understanding of much of the hominin occupation of the British Isles and its continental shelf (Stringer 2006, Wessex Archaeology 2008d, 2008f).

4.2.2 Much of the UKCS – the southern North Sea, English Channel, Western Approaches and Irish Sea – represents vast, formerly terrestrial basins that were exposed as dry land at various times during the last 700,000 years. Surrounded by highlands (the countries that now border the UKCS) these basins would have been attractive environments for hominins, and will contain evidence of human activity and occupation in the form of archaeological sites. These sites, and other palaeoenvironmental information now submerged on the UKCS, are critical to our understanding of the development of early humans in north-western Europe and the peopling of the UK. Consequently, submerged prehistoric landsurfaces and deposits found in the UKCS are likely to be of special interest, often well beyond UK.

4.2.3 Understanding the archaeological potential the submerged landsurfaces and deposits of the UKCS is made more complex by the fact that the area was not consistently inhabited. At some stages, the environment may have been so harsh that they retreated to better climes in Continental Europe. At other times, higher sea levels would have covered large portions of the formerly terrestrial areas of the UKCS. And in some cases, the archaeological evidence suggests that the UK was not inhabited even though it was agreeable and accessible (Stringer 2006). There is considerable scope for new discoveries to change fundamentally our understanding of how, and when, the UK and the UKCS was inhabited in early prehistory.

4.2.4 Palaeolithic sites and remains, whether they occur on land or within submerged contexts will have particular importance if:

- Any hominin bone is present in relevant deposits;
- The remains are in an undisturbed, primary context;
- The remains belong to a period or geographic area where evidence of a hominin presence is particularly rare or was previously unknown;

- Organic artefacts are present;
 - Well-preserved indicators of the contemporary environment (floral, faunal, sedimentological etc.) can be directly related to the remains;
 - There is evidence of lifestyle (such as interference with animal remains);
 - One deposit containing Palaeolithic remains has a clear stratigraphic relationship with another;
 - Any artistic representation, no matter how simple, is present;
 - Any structure, such as a hearth, shelter, floor, securing device etc, survives;
 - The site can be related to the exploitation of a resource, such as a raw material;
 - Artefacts are abundant (English Heritage 1998).
- 4.2.5 Prehistoric landscapes and deposits, including those submerged within the UKCS are important because of what they can say about the environment that people lived in at the time they formed, about the people themselves when they lived on and around these surfaces and deposits, and about the circumstances and processes that caused them to become uninhabitable (Wessex Archaeology 2008f).
- 4.2.6 The scope for high levels of preservation within fine-grained deposits means that in some cases, material will survive that gives a detailed and direct insight into the activities of a single individual or a small group, millennia ago. In many cases, however, the study of early prehistory involves looking at far broader aggregations of evidence, to pick up patterning that might hint at processes that affect whole populations, or even the overall development of humanity (Wessex Archaeology 2008f).

Sea Level Changes

- 4.2.7 During each of the glaciations referred to above, global cooling caused the polar ice sheets to grow dramatically. In the UK, the Arctic ice sheet pushed south, covering large areas of land and locking huge quantities of seawater up as ice. This caused dramatic falls in sea level, by as much as 125m at certain times (Chappell and Shackleton 1986).
- 4.2.8 At their maximum extent the ice sheets of Anglian (c.470,000-424,000 BP) and Wolstonian (c. 380,000-130,000 BP) glaciations reached as far south as the present Thames Valley, and ran in an arc across the North Sea. South of the ice, the floor of the southern North Sea, from approximately Southwold to Scheveningen in the Netherlands was exposed as land. In the west, the Irish Sea was largely covered by the ice sheet. During the Devensian glaciation (c. 110,000-12,000 BP) separate ice sheets formed in north-west Europe and on the UK mainland and never joined across the North Sea. Again, vast areas of the UKCS would have been exposed.

- 4.2.9 The archaeological record suggests that hominin populations retreated to the Continent from mainland Britain during the extremes of the glacial cycles, returning when conditions ameliorated. However, there is evidence that hominins did exploit and occupy areas of the UKCS which were exposed during the glaciations as periglacial tundra and inhabited by large mammals such as mammoth and musk ox (Stringer 2006).
- 4.2.10 The glacial cycles were interspersed with a series of interglacials:
- Cromerian Complex - c. 860,000-470,000 BP;
 - Hoxnian - c. 424,000-380,000 BP;
 - Purfleet and Aveley - c. 339,000-303,000 and c. 245,000-186,000 BP (within the Wolstonian);
 - Ipswichian - c. 135,000-110,000 BP.
- 4.2.11 During these warm periods the climate of much of the UK and the UKCS was equivalent to, or warmer than today and conditions would have been favourable to human occupation of large areas of the UK and its continental shelf. Although much of the UKCS would have been inundated at the height of the interglacials, for much of these warm phases large areas of the UKCS would have been exposed and inhabitable.
- 4.2.12 The most recent rise in global sea levels, after c.18,000 BP, finally separated Britain from Continental Europe completely for the first time in 2.5 million years when a chalk ridge between Kent and the Artois region of France was finally breached by the sea (Stringer 2006). By the Neolithic (c.6,000 BP) the sea level was only a few metres lower than its present stand and human movement between the UK, Europe and the wider world was only possible using watercraft. Accordingly, the period from the Neolithic onwards is not considered in this section, but is covered in the Maritime Archaeology section below.

Depositional Contexts

- 4.2.13 The extreme fluctuations in climate associated with the cyclical glacial periods throughout the Quaternary led to the formation of sediments by a variety of depositional and post-depositional processes. It is within these sediments that Palaeolithic archaeological and palaeoenvironmental evidence is preserved.
- 4.2.14 Although it is beyond the scope of this report to detail these sedimentary processes, it is important to highlight the likely depositional contexts in which archaeological material may be found, and to what extent this material may have been naturally disturbed or reworked within a particular type of sediment.
- 4.2.15 The table below summarises the main depositional contexts in which Palaeolithic and Mesolithic archaeological material have been found and provides an estimate of how much disturbance material from these contexts is likely to have suffered.

Deposit Type	Context	Disturbance
Glacigenic	Tills	Major
Fluvio-glacial	Outwash sands/gravels	Major
Fluvial	Gravel	Minor to major
	Sands	Minimal to minor
	Alluvial floodplain	None to minor
Aeolian	Loess	None
	Dunes	None to minor
Lacustrine	Clays, silts	None to minor
	Peats	None to minor
Coastal marine	Storm beach	None to moderate
	Scree, rockfalls	None to moderate
	Intertidal sands/silts	None to moderate
Estuarine	Intertidal sands/silts	None to moderate
	Peats	None to minor
Colluvial	Solifluction gravels	Minor to major
	Slopewash	None to major
Cave deposits	Occupational debris	None to minor
	Scree, rockfalls	None to moderate
	Cave earth	None to minor
Residual deposits	Clay-with-flints	None to major
Buried land-surfaces	Soils	None to minor

Depositional contexts of Palaeolithic/Mesolithic archaeological evidence (after Wenban-Smith 2002)

- 4.2.16 The majority of these depositional contexts can be expected in areas of the UKCS that are now submerged, although the extent to which the process of marine transgression and inundation will have further disturbed, reworked or removed sediments is currently not well understood (Ward *et al* 2006).

Survival of Evidence

- 4.2.17 A key consideration in any assessment of the submerged prehistoric archaeological potential of the UKCS is the degree to which archaeological material can be expected to survive.
- 4.2.18 Survival can be affected by a range of factors and processes. Archaeological materials may be covered by metres of sediments which protect them indefinitely or they may be compromised by erosion – by ice, rivers, surf action, bottom action of storm surge in shallow water or tidal currents – and a range of other natural processes. Increasingly they may also be subject to human disturbance as a result of marine and seabed activities such as trawling, aggregate dredging, trenching for pipelines and drilling for oil or gas.
- 4.2.19 The following factors for the survival of submerged prehistoric archaeological deposits are suggested by Flemming (2003):

- Very low beach gradient and offshore gradient so that wave action is attenuated and is constructional in the surf zone, i.e. sediment is deposited rather than eroded;
- Minimum fetch so that wave amplitude is low, wavelength is short, and wave action on the seabed is minimal;
- Original deposit is embedded in peat or packed lagoonal deposits which provide resistance and cohesion during marine transgression. Drowned forests and peat are good indicator environments;
- Deposits are in a cave or rock shelter. In these contexts roof falls, accumulated debris, concretions, breccia, conglomerate formation, and indurated wind-blown sand aid in securing archaeological material;
- Local topography contains indentations, re-entrants, bays, estuaries, beach-bars, lagoons, nearshore islands, or other localised shelter from dominant wind fetch and currents at the time of transgression of the surf zone;
- Frozen ground or permafrost enclosing archaeological deposit at time of inundation.

4.2.20 Potential archaeological 'hotspots' are discussed in more detail later, but based on the discussion of depositional contexts and taphonomy above, the key environments for the survival of submerged prehistoric archaeology can be described as follows (Flemming 2003, 2004, 2005; Wickham-Jones & Dawson 2006; Maritime Archaeology Ltd 2007):

- Relict estuaries and river valleys;
- The flanks of banks and ridges which have been proven to have peat layers, or which are likely to have peat layers;
- Valleys, depressions, or basins with wetland or marsh deposits;
- Near shore creeks, mudflats, and peat deposits;
- Relict archipelago topographies where sites would have been sheltered by low-lying islands as the sea level rose;
- Niche environments in present coastal zones, wetlands, intertidal mudflats, lochs, and estuaries;
- Caves and rock shelters in re-entrant bays, fossil erosional shorelines, submerged rocky shores protected by other islands, or in archipelagos;
- Deposits of sediments formed within, or washed into rocky gullies and depressions;
- Relict coastal sites comparable by analogy to modern Inuit migratory sites, adjacent to sea ice, giving access to marine mammals as a food resource;
- Areas of permafrost containing archaeological deposits which were then inundated, and protected by other factors listed above.

- 4.2.21 These environments are likely to exist within the palaeo-landscapes now submerged within the area of the UKCS.

4.3 PREVIOUS INVESTIGATIONS

- 4.3.1 Although the extent of our knowledge of the submerged prehistory of the UKCS is still limited, there have been a number of studies, some of them ongoing, and discoveries of sites and materials that have provided new insights into the prehistoric archaeological potential of the UKCS.
- 4.3.2 A particularly important inter-disciplinary, multi-national initiative has been the Ancient Human Occupation of Britain (AHOB) project. Started in 2001 and now in its second phase, AHOB has brought together archaeologists, palaeontologists and earth scientists from across the UK and Europe to investigate when people first arrived in Britain and build a calendar of human presence and absence in Britain during the Pleistocene (1.8 million - 12,000 BP) (Stringer 2006). Project activities include fieldwork to verify new information about old finds, geochronology (dating of sites and material), stable isotope analysis and new studies of the palaeoecology of human occupation sites.
- 4.3.3 The Submerged Landscapes Archaeological Network (SLAN) was established in 2006 with aim of developing and understanding of Ireland's and Newfoundland's submerged archaeological landscapes. The aims of the research consortium are to demonstrate that ancient landscapes are preserved on the seabed of inshore coastal waters, to locate and record such archaeological sites and materials, and to understand how early coastal environments facilitated the expansion and growth of the first human populations of Ireland and Newfoundland (Bell *et al* 2006, see Appendix I for website references).
- 4.3.4 Coles (1998) has attempted to collate the extensive available literature on the ice limits at different times during the past 700,000 years, the possible courses of the river valleys, estuaries, and the positions of palaeo-shorelines. The numerous publications on the details of topography, dating, soil types, pollen, palaeo-climates, pro-glacial lakes, etc., cannot be discussed in this report, and are, as yet, not entirely consistent in detail. A great deal of work still needs to be done to reconstruct the environmental conditions across the UK and its continental shelf at various dates in the last 700,000 years.
- 4.3.5 English Heritage recently funded the development of guides for the selection of sites that are sufficiently important in archaeological terms to warrant special measures or protection if they are implicated in proposed marine aggregate dredging. *Marine Class Descriptions and Principles of Selection in Aggregate Areas* (Wessex Archaeology 2008d) sets out the general descriptions of archaeology in maritime contexts and the principles of selection for such sites, while the related *Selection Guide: Prehistoric Landsurfaces and Deposits, Review Draft* (Wessex Archaeology 2008f) deals specifically with submerged prehistoric sites and materials.
- 4.3.6 Since 2000 the Hampshire and Wight Trust for Maritime Archaeology (HWTMA) has been investigating a submerged Mesolithic living site at Bouldnor Cliff in the Solent, off the north-west coast of the Isle of Wight (see Appendix I for website reference). The site was identified in the late 1980s as a preserved prehistoric forest with associated peat deposits. A routine

survey in 1998 discovered worked and burnt flint on the site, and excavations in 2000 and 2003 identified the source of this lithic material as a deposit immediately below the submerged forest, which is dated to 8565 - 8345 cal BP (Beta-140104), placing the archaeological material within the Mesolithic. Ongoing investigations have produced hearths, more flint artefacts, worked timber and a ranged of environmental data which is contributing our understanding of the palaeo-Solent during the Holocene.

- 4.3.7 A good deal of strategic work related to the submerged prehistory of the UKCS has been conducted since 2001 under the aegis of the Aggregate Levy Sustainability Fund (ALSF). In 2003 Wessex Archaeology was commissioned to undertake a research project entitled *Seabed Prehistory – gauging the effects of marine aggregate dredging*, the principal aim of which was to develop methods and techniques, within the context of aggregate dredging for gathering archaeological data from the seabed (Wessex Archaeology 2008g). This involved developing existing survey methodologies already in use in various marine industries and assessing their effectiveness for archaeological data gathering. The project produced data which has allowed archaeologists to begin to create a picture of the prehistoric landscapes of the project study areas. Geophysical surveys conducted in one study area in particular, the palaeo-Arun river valley, have allowed the production of a 3D model of the topography of the now submerged landscape.
- 4.3.8 Imperial College London did further work in the area of the palaeo-Arun in their ALSF project, *Submerged Palaeo-Arun River: Reconstruction of Prehistoric Landscapes* (Gupta *et al* 2004). The aim of the project was to reconstruct the palaeo-geomorphology of submerged and buried landscapes of the palaeo-Arun using regional high resolution marine surveying, seismic sequence stratigraphy and sedimentological analysis.
- 4.3.9 In 2007, the results of a project entitled *North Sea Palaeolandscapes* were published by the Institute of Archaeology and Antiquity and the Department of Geography, Earth and Environmental Sciences at the University of Birmingham (Gaffney *et al* 2007). Funded by the ALSF, this study used seismic data collected by the oil and gas industry to generate regional models of the Late Quaternary and Holocene seabed for a large area of the southern North Sea; models that can be used as a framework for the further integration of shallow borehole, environmental and shallow (high resolution) geophysical data for the purposes of geological and archaeological interpretation.
- 4.3.10 *A Re-assessment of Archaeological Potential of Continental Shelves* was an ALSF-funded, University of Southampton project which undertook a comprehensive desk-based review of the current state of knowledge and the archaeological potential of continental shelves across the world for both pre-historic and historic periods on a global basis (Westley *et al* 2004 , Dix and Westley 2006). The project aimed to provide new insights in each of four research areas:
- The reconstruction of submerged landscapes;
 - Human-landscape interaction - the nature of the pre-submerged archaeological deposits;

- Modification of archaeological deposits by marine transgression and regression;
- Predictive modelling of submerged archaeological sites.

4.3.11 The last category of previous investigations to be mentioned relate to finds of prehistoric material from submerged contexts.

4.3.12 In 2002 Wessex Archaeology was commissioned through the ALSF to research previously recovered archaeological artefacts from the sea. The purpose of the *Artefacts from the Sea* project was to collate and enhance records of artefacts from the sea and inter-tidal areas, held by the National Monuments Record (NMR) and selected coastal Sites and Monuments Records (SMRs) and Historic Environment Records (HERs) in England, as well as to record artefacts held in museums or private collections for inclusion in these databases. The project focused on two pilot Study Areas: the Solent and coast between the Humber and the Tees. The final database produced by the project contains some 2300 individual finds records (Wessex Archaeology 2003c, 2003d, 2004a, 2004b).

4.3.13 Many of the finds reported through *Artefacts from the Sea* were made by members of the public. Others important finds have been made as a result of seabed development activities and their reporting has been facilitated by initiatives such as the BMAPA Protocol Implementation Service. Examples of such finds include:

- A mammoth tusk was recovered in Aggregate Area 408, east of the Humber (Wessex Archaeology 2006b, Allen *et al* 2008);
- A collection of wood, peat, mineralised bone, antler and a single piece of struck flint was reported from a load dredged in Area 360, off Great Yarmouth (Wessex Archaeology 2006b);
- Most recently, a collection of 28 handaxes, 36 other pieces of worked flint and a variety of paleontological material, including antler and a number of pieces of mammoth molar and tusk, were recovered from Area 240 (Wessex Archaeology 2008h) (**Plate 1**).

4.3.14 The following technical reports, which attempt syntheses of the submerged prehistoric potential of the individual SEA areas, are available:

Area	Report Date	Author
SEA 1		
SEA 2/3	August 2003	Flemming
SEA 4	May 2003	Flemming
SEA 5	March 2004	Flemming
SEA 6	March 2005	Flemming
SEA 7	March 2006	Wickham-Jones and Roberts
SEA 8	April 2007	Maritime Archaeology Limited

4.4 PRE-DEVENSIAN (c. 700,000 – 48,000 BP)

4.4.1 For more than two centuries a growing body of archaeological, geological and palaeoenvironmental evidence has been steadily pushing back the date

of the earliest hominin occupation of Britain. In the last few years stone artefacts discovered at a fossil site near the Suffolk coastal town of Pakefield have again extended the date – to some 700,000 years BP.

- 4.4.2 Exactly who the makers of the Pakefield tools were is still not clear, although they may have been *Homo heidelbergensis*. What is certain is that the Pakefield material represents both the earliest known evidence of the Lower Palaeolithic in the UK, and the oldest evidence for the presence of hominins in Europe north of the Alps (Stringer 2006).
- 4.4.3 The Palaeolithic covers the span from initial early hominin colonisation of the UK to the end of the last (Devensian) glaciation – a period of some 690,000 years. The sheer length of this period and changes apparent in the form of the dominant surviving archaeological artefacts – stone tools - has resulted in the division of the Palaeolithic into a number of sub-categories, believed to be representative of changes in hominin development.
- 4.4.4 The earlier, or Lower and Middle parts of the Palaeolithic witnessed the colonisation of the UK by the archaic *Homo heidelbergensis*, followed by *Homo neanderthalensis* during the period up to the middle of the last glaciation (c.35,000 BP) (Wenban-Smith 2002). About this time Neanderthals were replaced in Britain and north-west Europe by anatomically modern humans (*Homo sapiens*), corresponding with the period known as the Upper Palaeolithic (Stringer 2006).
- 4.4.5 During the time since Pakefield was occupied Britain, including the UKCS, has undergone dramatic changes, occasioned by a series of climatic oscillations. These have radically reworked large areas of the landscape – covering portions of it in massive ice sheets, whilst at the same time exposing other areas that are currently submerged as dry land, potentially suitable for occupation and exploitation. These glacial and interglacial cycles have had a profound effect on the environmental resources available, and have also affected the depositional contexts of archaeological sites and materials (Wenban-Smith 2002, Stringer 2006).
- 4.4.6 At various times during the Lower to Middle Palaeolithic (700,000-48,000 years ago), much of the English Channel, the southern North Sea and other areas of the UKCS were thus dry and inhabitable. Archaeological sites from this period are known from within or on the seabed within the UKCS, and further such sites and material should be expected to be found in the future (Quinn *et al* 2006, Stringer 2006).
- 4.4.7 On either side of each of the three major glaciations were warm interglacial periods during which the climate of the UK would have gradually ameliorated to be considerably milder than today. At the height of the interglacials sea level would have approached today's level, but for periods of tens of thousands of years during the interglacials large areas of the UKCS would have been exposed, subject to climatic conditions better than those of the present, and rich in natural resources would have been attractive for exploitation (Stringer 2006).

Distribution

- 4.4.8 Ancient hominins have left signs of their presence and activities across wide areas of the UK and UKCS during the pre-Devensian period. Much of the north of the UK and UKCS (draft Regional Seas 1 and 7-10 / SEA areas 4-7)

were, however, effectively out of bounds to early humans for much of this period as a result of climatic extremes. The successive ice sheets that covered these areas of the UKCS are also thought to have had an impact on the survival of the evidence of any hominin presence left in the north of the UK during the interglacial periods of milder climate (Flemming 2002).

- 4.4.9 For example, good evidence for a hominin presence in Scotland is lacking prior to the end of the Devensian, some 11,000 years ago. Wickham-Jones and Dawson (2006) suggest that conditions in Scotland were certainly suitable for human settlement during the pre-Devensian, but that the evidence for such a presence on the mainland and the UKCS is likely to have been destroyed or buried beneath glacial deposits. Isolated finds of stone tools that might indicate pre-Devensian occupation by humans of Scotland and its continental shelf are generally considered to be of unreliable provenance and context (Saville 1997).
- 4.4.10 South of the limit of the ice sheets, however there is evidence for successive phases of hominin presence and activity spread widely across the southern UK and southern areas of the UKCS (draft Regional Seas 2-4 and 6 / SEA areas 2, 3, 6 and 8) and the mainland of north-western Europe during the pre-Devensian (Stringer 2006).
- 4.4.11 The routes taken by these early hominins into the UK are not known, but there are two clear possibilities: westwards via the proto-Rhine valley onto the edges of a huge north-facing bay at the southern end of the North Sea, into which the proto-Thames and Bytham rivers discharged, or from the south, via the proto-Somme river valley and across the chalk land bridge referred to earlier into southern Britain (Stringer 2006).
- 4.4.12 The draft Regional Seas 1 and 2 (SEA2 and 3) cover much of the area described above - from the south-western corner and along the eastern seaboard of England into an area of the North Sea midway between Scotland and Denmark and Norway (Flemming 2002). Large areas of these draft Regional Seas formed a wide terrestrial basin that joined the UK to Europe and which is likely to have been both a conduit for early human passage to and from the UK and a focus of occupation.
- 4.4.13 In the SEA2 and 3 reports Flemming (2002) suggests that submerged prehistoric archaeological deposits dating back some 100,000 years can occur anywhere on the floor of the North Sea, with the notable exception of coastal waters around Scotland, and an offshore area of Yorkshire. He also argues that aside from commenting on the clear importance of this material relatively little can be learnt from considering it in isolation. By looking more widely at known sites in the rest of the North Sea and its margins, however, he suggests that it is possible to see what kinds of future discoveries might be made in the submerged, formerly estuarine environments and palaeo-wetlands of the southern North Sea.
- 4.4.14 This area of the UKCS includes the Dogger Bank, from which a steady stream of pre-Devensian animal fossils and hominin artefacts have been recovered as a result of seabed activities for the last 200 years (Coles 1998). These include mammal bones from 500,000 years BP, during the Cromerian warm phase, indicating that the area would have been exposed at this time. Analysis of seabed sedimentology; the geophysical modelling of glacial-eustatic marine transgressions; predictions of the siting of prehistoric

occupation sites and the taphonomy of archaeological deposits present a consistent picture: hominin artefacts, fossils and sites of a similar age (500,000-700,000 years BP) could survive in or on the floor of the North Sea, as well as in the English Channel (Flemming 2002, Stringer 2006). The site at Pakefield referred to above, and a site eroding out of coastal cliffs at Happisburgh in East Anglia on the fringe of the North Sea basin point to the clear potential for the presence of rich archaeological sites offshore on the UKCS from this period.

- 4.4.15 In the south of the UK, the SEA8 report by Maritime Archaeology Ltd (2007) deals with the area covered by draft Regional Seas 3 and 4. Unlike the other draft Regional Sea / SEA areas, the south of the UK and its surrounding continental shelf was not glaciated within the last 700,000 years, with the exception of the southern Irish Sea, South Wales, and the Bristol Channel which were affected by the southern limits of the Anglian ice sheet some 450,000 BP. This means that there is a possibility of archaeological sites and materials dating to the earliest times of occupation in an area stretching from the Celtic Sea, through the English Channel and the Straits of Dover to the southern North Sea.
- 4.4.16 An example of the potential for sites in this area of the UKCS can be found at the site of La Cotte de St Brelade on what is now the island of Jersey (draft Regional Sea 3). There is evidence from c.150,000 BP, during the Wolstonian glaciation, that hominins were living in a cave on what would have been a high point in the exposed periglacial plateau that is now the seabed of the English Channel. The site was occupied Neanderthal groups who seem to have specialised in hunting the mammoth and rhino herds that grazed the tundra (Stringer 2006) and demonstrates that not only were hominins active in this area of the UKCS, but they had developed strategies which enabled them to occupy parts of the UKCS during times of extremely harsh climate.
- 4.4.17 For the most part, archaeological sites from the pre-Devensian are characterised by assemblages dominated by stone artefacts. They are also often reworked deposits, found in the gravels of palaeo-river terraces. However, where conditions allow, archaeological material in primary context, in association with bone, organic material and a wealth of palaeoenvironmental data can survive on sites such those at Happisburgh and Pakefield, dating back nearly three quarters of a million years. And where bone survives there is the potential for the assemblages to include the remains of the early Britons themselves.
- 4.4.18 Skeletal remains from the early pre-Devensian are relatively rare in the UK, but a number of terrestrial sites have produced skeletal remains from this period. Skeletal evidence, probably from *Homo heidelbergensis*, has been excavated at Boxgrove, a rich Lower Palaeolithic site near Chichester which dates to the end of the Cromerian interglacial – c.500,000 BP (Stringer 2006). In 1935 one of the UK's best known examples – parts of a skull – was discovered in a gravel pit near Swanscombe in Kent. Recent research suggests these remains have Neanderthal affinities, and probably date from the start of the Hoxnian interglacial (c.350,000 BP) (Stringer 2006).
- 4.4.19 Another important site is Pontnewydd Cave in the north of Wales where twenty bones from the bodies of at least five individuals, probably Neanderthals, have also been excavated, along with stone tools from layers

dated to about 225,000 BP (Flemming 2002, Stringer 2006). This site is important not only for the material it has produced, but because it indicates a hominin presence quite far north in the UK during the Averley and Purfleet interglacials, in areas covered by the glacial ice sheets both before and after the date of the archaeological deposits. Hominins were thus clearly moving into areas previously covered by ice, which has implications for the archaeological potential of the UKCS in at least draft Regional Seas 6, 7 and 1.

- 4.4.20 The deposits in Pontnewydd Cave are also important because their sheltered context allowed them to survive the subsequent glaciation of the area (Stringer 2006). This has implications for the potential for the survival of archaeological material in offshore contexts within the UKCS.
- 4.4.21 Across the UK there is a wealth of information that tells the story of the pre-Devensian human occupation of Britain from at least 700,000 BP. There is also a growing body of physical evidence and a continually improving understanding of the pre-Devensian climate and geography of the UK and its continental shelf that points to the very high potential of large areas of the UKCS to preserve submerged prehistoric archaeology.
- 4.4.22 Towards the end of the pre-Devensian period and during the Middle Palaeolithic, early hominins disappear from the archaeological record in the UK. It is clear from sites like La Cotte de St Brelade that the climate was cold and the landscape inhospitable, but that hominins were nevertheless able to exploit it and that were present in areas of what is now the UKCS.
- 4.4.23 The question of why, if people were able to move onto the UKCS from Europe, they did not re-colonise the UK as conditions improved during the Ipswichian interglacial, and were absent from Britain for nearly 100,000 years is therefore intriguing. One possible answer is that for the first time since the Pliocene, Britain had become an island (Stringer 2006). Evidence from the English Channel suggests that after 200,000 BP the chalk ridge referred to earlier, which had kept Britain joined to Europe and provided a reliable and constant land bridge throughout the previous interglacials was finally breached by massive glacial lakes to the north in a catastrophic flood. The resultant channel this flood scoured into the landscape of the UKCS we now know as the English Channel, and into it flowed a number of major rivers – the Thames, the Rhine and the Seine – filling this new underwater valley and creating a huge southern river more than 10km wide and 50m deep in places. A formidable barrier to movement (Gupta *et al* 2004, Stringer 2006).
- 4.4.24 By 60,000 BP, however, at about the time of the interglacial optimum, Britain was once again peopled, probably by Neanderthals, who occupied much of midland and southern Britain for the next 30,000 years (Stringer 2006).

4.5 DEVENSIAN (48,000 – 13,000 BP)

- 4.5.1 The Devensian period is critically important in archaeological terms because it coincides with the appearance in Britain of fully modern humans, known as Cro-Magnon people, after a site in France which produced the first physical remains of these people. Until c. 40,000 BP, the human populations that had inhabited the UK and UKCS on and off since 700,000 BP were archaic humans: *Homo heidelbergensis*, and then *Homo neanderthalensis*, now

generally agreed to be a close cousin, but not direct ancestor of anatomically modern humans, *Homo sapiens* (Stringer 2006).

- 4.5.2 The first evidence for something new happening in the archaeological record dates to about 40,000 years ago with the appearance of a new type of stone tools, known as leaf points, tools made from bone and specialised tools like chisels and burins made on long thin stone blades. This new archaeological signature marks the arrival of anatomically modern humans in the UK, and ushers in the Upper Palaeolithic. In addition to the new technology that marks the Upper Palaeolithic, it also marks a watershed in human behaviour, with the appearance of evidence deemed to be markers of essentially modern behaviour – representational art, decorated burial of the dead, body adornment (beads, pendants, etc.) and what appear to be wholly new levels of social complexity (Stringer 2006).
- 4.5.3 The first skeletal evidence to be excavated in the UK comes from this period, from Paviland Cave in south Wales. The remains are those of a 24 year old male, apparently formally buried and stained with red ochre. Near the bones were pierced sea shells and small ivory rods, probably from bracelets. The bones were dated to 25,840 +/- 280 BP (OxA-8025) (Lynch *et al* 2000: 19), although more recent evidence (Jacobi and Higham 2008) suggests that they are actually 4000 years older than this estimate.
- 4.5.4 For roughly 15,000 years the two groups of humans appear to have co-existed in Britain, but with the approach of the glacial maximum (c. 21,000 BP) the Neanderthals left Britain or died out and never returned, becoming extinct throughout the world during this period. The Cro-Magnons were also eventually forced out of the UK by the glaciation, and for a period of about 10,000 years Britain was again deserted by humans (Stringer 2006).
- 4.5.5 At the Devensian glacial maximum much of north-west Europe, including much of the UK and its continental shelf was covered by massive ice sheets. In Britain the ice sheet extended across Scotland and into the uplands of Wales, reaching the latitude of Swansea, Wolverhampton and Lincoln at its peak. The British ice sheet merged with a Scandinavian ice sheet in the north of the UK. The build-up of the polar ice sheets caused a drop in sea level during the Devensian of as much as 125m below the current sea level, exposing large areas of the UKCS south of the ice and creating a huge land bridge between the UK and continental Europe (Wessex Archaeology 2005, Stringer 2006).
- 4.5.6 Areas now covered by the southern Irish Sea and southern Ireland, the far south of Wales and the Bristol Channel, southern England and much of the North Sea basin, the land was thus free of ice, but this was a harsh periglacial landscape of permafrost tundra not suited to long-term or intensive human occupation (Stringer 2006).
- 4.5.7 After c.16,000 BP the ice sheets began to retreat as the world warmed with the onset of the current interglacial, the Flandrian, which is more commonly known by its geological name, the Holocene. The retreat of the ice across the UK set in motion a glacio-isostatic adjustment of the earth's crust as it rebounded from the weight of the ice, a process that continues today (Wickham-Jones and Dawson 2006).

- 4.5.8 As the ice retreated game migrated back onto the UKCS and into the UK, and was followed by human hunters. Sea level was still as much as 75m lower than the present, and as a result areas of the UKCS were still rich and fertile plains bisected by large rivers and teeming with game. As in the past the land bridge with Europe provided to route back into the UK for returning human groups.

Distribution

- 4.5.9 A detailed description of known late Middle and early Upper Palaeolithic sites in draft Regional Seas 1 and 2 (SEA2 and 3) of the UKCS can be found in the respective Strategic Environmental Assessment (Flemming 2002). As already discussed above, the North Sea has been producing animal fossils and hominin artefacts dating to the Palaeolithic for many years.
- 4.5.10 Although the majority of this material is not archaeological it does provide palaeoenvironmental information that has helped to build a picture of southern North Sea during the Devensian. Animal bones provide excellent climatic markers, one example being a partial mammoth tusk recovered during marine aggregate dredging in licence Area 408, approximately 90km east of the Humber estuary (Wessex Archaeology 2006a). This tusk is the most northerly example of a *Mammuthus primigenius* fossil reported through the BMAPA protocol and comes with good positional information and a known geological context. Dated to a mean age of 44,040±330 BP the tusk suggests that during the height of the Devensian the environment of the southern North Sea was able to support large herbivores like woolly mammoth, and where mammoth were present, humans were probably not far behind.
- 4.5.11 Devensian archaeological material from the UKCS is not plentiful, but examples do exist. One such find is a piece of worked flint recovered from within a borehole core (number 60+01/46) obtained as part of a BGS programme from Viking Bank, on the UKCS about 150km north-east of Lerwick. The presence of this stone artefact at a depth of 143m below Chart Datum within a sealed geological context is clear evidence of the presence of humans on the continental shelf during the Upper Palaeolithic.
- 4.5.12 No prehistoric sites are known from submerged contexts in the northern half of draft Regional Sea 1 (SEA areas 2 and 5), nor have any been reported in draft Regional Sea 8 (SEA4). Flemming (2003, 2004) argues however that in draft Regional Sea 1 there is the potential for finds similar to those identified in the North Sea. Within draft Regional Sea 8 he argues that the terrestrial evidence, in the form of coastal structures, makes it inconceivable that similar offshore sites do not exist.
- 4.5.13 Wickham-Jones and Dawson (2006) echo Flemming's observations in their SEA7 report (draft Regional Seas 7, 8, 10 and 11). They state that although there is a considerable record of Palaeolithic settlement further south in the UK, there is, to date, no secure evidence for the Palaeolithic in Scotland. However, the presence of Palaeolithic hunters to the south suggests that Scotland was inhabited in earlier times, at least periodically, and it is possible that the remains of this period have been masked by later geomorphological processes.

- 4.5.14 The last glaciation covered Scotland in its entirety and led to dynamic changes in the landscape which mean that earlier archaeological material is likely to have been scoured away and destroyed, or buried under later deposits.
- 4.5.15 Wickham-Jones and Dawson (2006) and Flemming (2003, 2004) all stress that it is relevant in considering the Upper Palaeolithic in these draft Regional Sea areas to look at ethnographic evidence from hunting cultures along the margins of ice and sea, both today and in the relatively recent past, as a possible model for human activities in Scotland (Blankholm 2004). They argue that proximity of an ice front is not always a deterrent to human settlement and that prehistoric people may have occupied the exposed Scottish continental shelf area during late glacial periods, utilising Inuit-style survival methods and hunting marine mammals. If this proves to be the case, there may be unexpected occurrence of submerged early Upper Palaeolithic prehistoric sites on the northern UKCS. Any sites found in these draft Regional Sea areas would be particularly important as an indication of the true extent of Upper Palaeolithic activity in the UK.
- 4.5.16 The east coast of the UK (draft Regional Sea 6 / SEA7) was covered by the Devensian ice sheet over the glacial maximum. The mainland and adjacent UKCS would thus have been beyond the possibility of Upper Palaeolithic settlement and like further north, the ice sheets are likely to have impacted on the survival of early Upper Palaeolithic sites and materials.
- 4.5.17 Relatively little Palaeolithic archaeological evidence is known from the extensive drowned landscape of draft Regional Seas 3 and 4 (SEA8), although there is good potential for submerged remains. The early Upper Palaeolithic site of Fermanville, south of this area on the Cherbourg Peninsula in France demonstrates the potential for archaeological sites from the early Devensian (c. 45,000 BP) to survive within peat and clay deposits in the English Channel.
- 4.5.18 This area of the UKCS, like in previous interglacials, was part of the Ipswichian land bridge with Europe, and can expect to have been one of the routes into the UK used by early Upper Palaeolithic hunters (Stringer 2006)

4.6 POST-DEVENSIAN (13,000 BP – EARLY NEOLITHIC)

- 4.6.1 The human re-occupation of the UK during the early Holocene was to be short-lived. Within a couple of thousand years (c. 13,000 BP) of returning, dramatic drops in mean annual temperature, by as much as 15°C within the space of ten years, signalled the arrival of a cold snap known as the Younger Dryas (Stringer 2006). For nearly two thousand years the UK may have been deserted by humans once again. And then, as suddenly as it began the Younger Dryas ended. By 11,000 BP humans were once again returning in what was to be the final prehistoric human colonisation of Britain. The UK has been continuously occupied by humans ever since.
- 4.6.2 The new climatic conditions that accompanied the mid-Holocene – both warmer and wetter than today – posed new challenges to a human population used to open steppe or grasslands and dependant on the large grassland species such as reindeer and mammoth. The new British landscape was one of dense forests, inhabited by shy woodland species like as red deer and wild boar and interspersed with numerous freshwater lakes were left by the retreating ice. (Stringer 2006).

- 4.6.3 The technological changes and shifts in human survival strategies adaptation to this new environment required are marked in the archaeological record by a microlithic stone tool kit and the increased use of sophisticated bone and antler tools, which has been named the Mesolithic, or Middle Stone Age. The development of constructed settlements, centred round caves or groups of huts, is also a defining characteristic of the Mesolithic. Food acquisition was still by hunting, fishing, and gathering, not by cultivation. Coastal and riverine resources are known to have been exploited extensively during the Mesolithic, and there are suggestions that watercraft were a feature of Mesolithic life. The best-known Mesolithic site in the UK is probably Star Carr, which is situated near Scarborough in Yorkshire (Stringer 2006), but many other examples exist, including the submerged Mesolithic site at Bouldnor Cliff on the Isle of Wight referred to earlier (Momber 2000, 2001).
- 4.6.4 Towards the end of the Mesolithic, at about 5,000 BP, the UK's land bridge with Europe was severed for the last time as sea level rose. Some areas of the UKCS, such as the Severn Estuary, remained essentially terrestrial for some time yet, but as the Holocene drew on and sea level rose, so by the early Neolithic, some 4,000 BP it reached its current stand (Coles 1998, Stringer 2006). After the late Mesolithic / early Neolithic therefore, no submerged prehistoric archaeology can be expected on the UKCS.

Distribution

- 4.6.5 Artefacts dating from the last 10,000-12,000 years have been found in submerged contexts across the UKCS and beyond, with known sites on the Viking Bank, in Denmark, at Hartlepool, on the Dogger Bank and Brown Ridge, off of Yorkshire, East Anglia, the Isle of Wight, the Channel Islands and Cherbourg in France.
- 4.6.6 Good evidence for human activity/occupation in Scotland (draft Regional Seas 7-10 / SEA areas 1, 4, 5 and 7) is lacking for the period prior to the end of the Devensian, some 12,000 BP. Wickham-Jones and Dawson (2006) and Saville (1997) argue that that environmental conditions in Scotland were certainly suitable for settlement before 12,000 BP, as evidenced by the reindeer assemblages from Creag nan Uamh near Inchnadamph.
- 4.6.7 In their SEA7 report Wickham-Jones and Dawson (2006) state that the earliest recorded settlement in the area comes from the islands and dates to c. 9,000 BP. Wickham-Jones (1994) has suggested that the Late Upper Palaeolithic re-occupation of the northern UKCS during the retreat of the Devensian ice sheet was by a combination of migratory routes. She suggests that people moved up the west coast from England and Ireland, up the east coast from England and mainland Europe, including from the occupied areas such as the Dogger Bank in the central North Sea, and across the North Sea from the east or north-east where they may have been living on the ice fringes or had recently re-occupied continental margins of Norway and Denmark.
- 4.6.8 These migration corridors are likely to have been through the areas that were the first to be free of ice, and are likely to have followed the coastal margins - areas that now form part of the submerged UKCS. The implication is thus that Late Upper Palaeolithic human occupation and other

archaeological sites are likely to have been deposited on what is now the UKCS.

- 4.6.9 Known submerged prehistoric sites in Orkney, Shetland, on the Viking Bank, where a borehole core sample from west of the Bank contained an Upper Palaeolithic scraper of fine, dark grey, patinated flint approximately 21mm long (Flemming 2002), and in Denmark (Flemming 2004) show that prehistoric sites from the last 5,000-10,000 years can survive marine transgression. However, the strong currents, exposure to full North Atlantic storm conditions, the thin seabed sediment cover in many places and the large areas of exposed bedrock, make the exposed areas of the UKCS in draft Regional Seas 8 and 9 (SEA4) statistically poor prospects for the survival of prehistoric deposits *in situ* (Flemming 2003).
- 4.6.10 The Mesolithic, and later the Neolithic, is well represented in Scotland and the northern islands like Shetland and Orkney with many sites providing evidence for Mesolithic settlement along the western seaboard of Scotland. The Mesolithic lifestyle was essentially mobile, as people moved around the landscape to make the most of different resources at different times of the year. Like Palaeolithic sites, Mesolithic remains can be ephemeral and can be hard to locate and identify.
- 4.6.11 There is a high likelihood of surviving prehistoric archaeology (10,000-5,000 BP) in areas of SEA7, most notably to the west of the Outer Hebrides for a distance of some 10 kilometres and to a depth of -20m, around the islands of Islay, Jura, Mull and the Small Isles, and along the coast between southern Scotland and Northern Ireland.
- 4.6.12 Factors which make this possible are a complex interplay of changing sea level and the eustatic rebound of the land once freed from the compression of ice following the Devensian. The net result of these processes is that c. 10,000 BP relative sea level was up to 45m lower than today along much of the coast during the period that corresponds with the early human settlement in the area. In places this means that considerable areas of submerged land exist. An investigation of bathymetric, sedimentary and tidal data for the area suggests that the prehistoric land surface, including archaeological remains, may survive in many places.
- 4.6.13 Submerged Late Upper Palaeolithic, Mesolithic and early Neolithic archaeological remains could thus occur in draft Regional Seas 8 and 9 (SEA4) between the northern mainland coast of Scotland and the Orkney-Shetland Ridge. Coastal sites in the Hebrides, St Kilda, Orkneys, and Shetland demonstrate that human cultures with seafaring and advanced constructional capabilities occupied northern Scotland at least 9,000 years ago (Wickham-Jones 1994).
- 4.6.14 The area of draft Regional Sea 1 (SEA2, 3 and 5) includes the coastline of eastern Scotland and north-eastern England. It also encompasses a large area of the North Sea basin, including most of the Dogger Bank. The potential for post-Devensian submerged prehistoric archaeology in the north of the draft Regional Sea is likely to be lower than for the area covered by the Dogger Bank, the known potential of which has already been amply demonstrated.

- 4.6.15 Although better than most other draft Regional Sea areas, our understanding of the geochronology and palaeoenvironment of the Dogger Bank and the southern North Sea (draft Regional Sea 2 / SEA2) is still largely speculative. What is clear though is that much of this area remained exposed and accessible throughout the Devensian and as climate ameliorated during the Holocene after c. 12,000 BP probably represented a resource rich alluvial plain, attractive to humans (Ward *et al* 2006) until it was finally inundated during the Mesolithic.
- 4.6.16 The evidence for Mesolithic sites in the North Sea is abundant. Flemming cites the work by Larson (1983) on Mesolithic settlement sites which have been identified at Oresund, the narrow strait between Denmark and Sweden, where peat deposits and flint artefacts were recovered. The seabed surrounding the Danish archipelago has also seen discoveries of similar sites.
- 4.6.17 There is thus already a large body of evidence for archaeological sites and animals fossils in the UKCS within this area, and geotechnical data suggests that the types of sediments that are likely to contain archaeological material have survived the post-Devensian marine transgression in draft Regional Seas 1 and 2 (Ward *et al* 2006).
- 4.6.18 The seabed of draft Regional Seas 3 and 4 (SEA8) has been the focus of a number of recent projects to investigate the post-Devensian archaeological of the UKCS in this area (Gupta *et al* 2004, Wessex Archaeology 2008g) and studies of submerged in-filled estuaries in the SEA8 area have revealed deposits that are suitable for the preservation of archaeological material (Maritime Archaeology Ltd. 2007).
- 4.6.19 Flemming (2005) highlights two examples of submerged post-Devensian archaeology in areas adjacent to SEA8. A Palaeolithic worked flint from the Upper Palaeolithic, dating to about 12,000 BP was recently found in a submerged context near Guernsey, between the islets of Crevichon and Jethou (Sebire 2004). Nearby, off the Normandy peninsula an Upper Palaeolithic site has been identified at a depth of 20m.
- 4.6.20 The current coastline of the SEA8 area has produced numerous examples of Mesolithic flint scatters within low-lying valleys. However, perhaps the most important example of a Mesolithic site in the SEA8 area is that of Bouldner Cliff. Lying north-east of Yarmouth on the Isle of Wight, this is a submerged Mesolithic forest (Momber 2000, 2001), and has yielded timbers and peat, as well as numerous worked flints through ongoing diving surveys. Flemming (2002) highlights the geographical similarities between the Bouldner Cliff site with those from Denmark which indicate important patterns in recognising and modelling other potential sites around the UK.
- 4.6.21 The low relief of the floor of the Irish Sea (draft Regional Sea 6 / SEA6), in contrast to the mountainous nature of the much of the surrounding UK mainland suggests that during the post-Devensian the UKCS in SEA6 would have offered a passage for human migration and movement, and would also have been a focus for human use and settlement. Since the highlands were densely forested by this date, the area most suitable for hunting and gathering would have been the exposed coastal plain of the UKCS. Lynch *et al* (2000: 27-28) discuss the Mesolithic diet and changes in hunting patterns in response to change in climate and vegetation. Exploitation of fish and

shellfish was a key activity, with probable hunting of seals in the autumn months when the females come ashore to pup, suggesting that the coastal margin and areas of the UKCS that are now submerged were utilised by humans.

- 4.6.22 The potential thus exists for archaeological sites and material of post-Devensian age to survive on the UKCS in draft Regional Sea 6. Available evidence is very limited. Flemming (2005) notes that Liverpool Bay on the north coast of Wales is well known for deep deposits of flint from the Mesolithic and Neolithic periods which occur on the coastal strip and foreshore and that it is entirely feasible that these deposits extend offshore. He cites Steers (1948) who describes submerged forests which occur on several parts of the Welsh coast, and which are usually deposits of peat, soil, and tree remains.
- 4.6.23 Flemming (2005) also details studies undertaken by the Centre for Maritime Archaeology at the University of Ulster which have identified submerged Mesolithic forested sites at Strangford Lough, County Down and at Portrush, County Antrim. Lamplugh (1903) observed water-worn flints in the storm beaches at the Point of Ayre. Recent research shows that this lithic material is of late Mesolithic type (Davey, 1999). Archaeological material extends back at least as far as 8,000 years BP, and it is in eroding coastal sections that the stratigraphy is most clearly seen. Manley (1989) names three Mesolithic sites on the Isle of Man, at Port St Mary, Cass ny-Hawin, and Glen Wyllan.
- 4.6.24 The earliest date for a probable post-Devensian human presence in Ireland is c. 9,500 BP from a site at Woodpark in County Sligo (Harbison 1988). This suggests human migration across the exposed UKCS in draft Regional Sea 6 from the UK mainland.

4.7 SUBMERGED PREHISTORIC ARCHAEOLOGY: SUMMARY

- 4.7.1 The potential for submerged prehistoric archaeological sites and materials on or in the seabed of the UKCS is indicated by a range of material: palaeo-environmental deposits – fine-grained sediments and peats in particular (**Plate 2**)– that have survived the mid-Holocene marine transgression; a large body of faunal remains recovered by fishermen and other seabed developers from various areas of the UKCS; and by a relatively small number of crucially important finds of human artefacts on the UKCS.
- 4.7.2 Submerged prehistoric archaeology has the potential to be present across wide areas of the current UKCS, although the degree to which such sites or material will survive in any geographical area will be determined by a range of physical factors and processes.
- 4.7.3 Finds of submerged prehistoric sites and materials such as those described above are likely to be not only of national interest and importance but also of international import. They provide evidence not only of the human colonisation of the UK since 700,000BP, but also of the history of a human presence in north-west Europe, particularly in draft Regional Seas 1-4. A recent example of the wider importance of finds of submerged prehistoric archaeology was the discovery of the Lower Palaeolithic handaxes referred to earlier.

- 4.7.4 Our understanding of the extent and distribution of submerged prehistoric archaeology – chronologically and spatially across the UKCS – is constantly being ‘re-written’ by new discoveries and current research. The current state of knowledge of the submerged prehistory of the UKCS is such that almost any new discovery has important ramifications for our understanding.
- 4.7.5 Many new discoveries that are expanding our understanding of the UK’s submerged prehistory are arising directly from seabed development and other marine activities when these activities coincide with the presence of submerged prehistoric material.

5 MARITIME ARCHAEOLOGY

5.1 BACKGROUND

- 5.1.1 As an island nation, the UK has a long maritime history that forms a complex tapestry of maritime activities and patterns of shipping since at least the Mesolithic.
- 5.1.2 In contrast to the limited evidence of prehistoric remains, wreck sites are a common feature around the entirety of the UK coast. However, specific knowledge of the maritime archaeology scattered across the seabed of the UKCS is very low.
- 5.1.3 Maritime archaeological sites are discussed at length within three of the Strategic Environmental Reports: SEA6, SEA7, and SEA8. These reports cover an area incorporating the continental shelf off western Scotland, the Irish Sea, the southwest and south coast of England, and the English Channel. This corresponds with all or portions of draft Regional Sea areas 3, 4, 6, 7, 8, 10 and 11. Although not covered in the other SEA reports, a similar range and density of maritime archaeological sites and material should be assumed to be present in these SEA/draft Regional Sea areas.
- 5.1.4 As stated already, large numbers of wreck sites are known and accurately charted in UK waters. However, the location of most recorded shipping losses is not known, nor is the full extent of the UK's shipwreck and maritime archaeological resource. Although the majority of these sites may lie relatively close to the coast, many will be scattered across the extent of the UKCS.

5.2 CHARACTER AND IMPORTANCE OF MARITIME ARCHAEOLOGY

- 5.2.1 In considering the current known record of UK wreck sites within the broad chronology of shipbuilding and employment, it is possible to draw out a few generalisations about age and special interest, as follows:
- **Before 1500 AD:** So little is known and remains are so rare from this period that all examples are likely to be of special national or even international interest;
 - **1500-1815:** Remains of boats and ship dating to this period are also rare; the majority can be expected to be of special national and possibly international interest;
 - **1815-1914:** There are more examples of boats and ships from this period so greater discrimination is warranted in determining which ones are of special interest. However, this was also a time of massive change in how vessels were built and used and wrecks that make a distinct contribution to understanding this development should be regarded as having special interest;
 - **1914-1945:** The highest volumes of known boats and ships lost in UK waters were casualties of World War I and II. Greater discrimination will be required in determining which wrecks are of special interest. Nonetheless, technological changes, the magnitude of events and the consequences locally and globally of activities in these years will clearly give rise to some boats and ships having special interest;

- **After 1945:** A strong case will need to be made for boats and ships lost in this period to have special archaeological interest.

5.3 PREVIOUS INVESTIGATIONS

- 5.3.1 There are a number of previous investigations that have a bearing on the discussion of the maritime archaeology of the UKCS. Some of these are wide-area, strategic projects whilst others relate to the investigation of the archaeological significance of individual wrecks sites. What they all do is highlight the wealth and importance of the UK's maritime archaeological resource.
- 5.3.2 At a strategic level, funding from the Aggregate Levy Sustainability Fund (ALSF) since 2002 has facilitated a number of ground-breaking projects in England. In 2003 and 2004 Wessex Archaeology's *England's Shipping* created a Geographic Information System (GIS) digital atlas to map historic shipping patterns in England's waters and improve the incorporation of these historical shipping patterns and routes into the assessment of archaeological potential of the seabed (Wessex Archaeology 2003b, 2004d).
- 5.3.3 The results of *England's Shipping* were recently developed further in another ALSF study by Bournemouth University of historical records of navigational hazards around the England's coast as a means of understanding the distribution of, and potential for the survival of underwater cultural heritage (Merrit, Parham and McElvogue 2007). By identifying areas of known, historical navigational hazards and combining the trend data with models of the preservation potential of marine sediments at locations around the coast the project was able to identify areas with a high potential for shipwreck incidents coupled a high potential for the archaeological preservation of those shipwrecks. The project developed a GIS layer which defined these areas as Areas of Maritime Archaeological Potential (AMAPs).
- 5.3.4 The results showed that the areas of greatest hazards were primarily inshore, and that the best chance for archaeological preservation is in those areas where the seabed comprised a high percentage of fine-grained sediments. The primary areas where these trends coincided were found to be estuaries and offshore sandbanks (**Figure 2**).
- 5.3.5 *Wrecks on the Seabed*, a three year ALSF project undertaken by Wessex Archaeology between 2003 and 2006. The project aimed to test methods for dealing with shipwrecks at risk from dredging or other marine commercial activities, and to provide industry, regulators and contractors with guidance on the archaeological assessment, evaluation and recording of wreck sites within seabed development contexts.
- 5.3.6 *On the Importance of Shipwrecks* (Wessex Archaeology 2005c), another ALSF funded project developed a framework and methodology to assess 'importance' of the physical remains of wrecks on the seabed. The research has broad applications, but a priority is for utilisation in the Environmental Assessment process for marine aggregates extraction proposals. Since then this approach has been developed in *Marine Class Descriptions and Principles of Selection in Aggregate Areas* (Wessex Archaeology 2008d) and the related *Selection Guide: Boats and Ships in Archaeological Contexts* (Wessex Archaeology 2008e).

- 5.3.7 Investigations related to specific wrecks and sites are undertaken as part of the implementation of the Protection of Wrecks Act (1973). Although limited in number – there are currently 61 wrecks designated under the Act (**Figure 3**) – these investigations are important in the development of maritime archaeological assessment strategies in the UK. They also contribute to the development of improved understanding of the issues related to site survival, conservation and threats, all of which ultimately feeds into the policies and methodologies applied to maritime archaeological sites within seabed development contexts.
- 5.3.8 Yet other projects have investigated the wider historical and social significance of individual wrecks. For example, an investigation by Wessex Archaeology (2007b, 2008c) of the World War I wreck of the troopship *Mendi* highlighted the potential for relatively modern wrecks to have an archaeological, historical and social value beyond that generally assumed to be applicable to such wrecks.
- 5.3.9 A number of sites have been found and investigated as the result of seabed development such as port dredging. Two examples of such investigations are:
- The Princes Channel wreck, also known as the ‘Gresham Ship’, was found in 2003 by the Port of London Authority during work to deepen one of the approach channels to the Thames. When it became apparent that the wreck was potentially significant Wessex Archaeology was contracted to investigate the site. Sections of the hull were raised, along with artefacts that have allowed the vessel to be identified as a medium-sized armed merchant ship built soon after 1574 associated with Sir Thomas Gresham (Wessex Archaeology 2004e, Firth 2006, Auer and Firth 2007).
 - The Swash Channel wreck, discovered in 2004 during a geophysical survey by Wessex Archaeology in advance of dredging to deepen the approach to Poole Harbour. The site is part of the side of an unknown vessel, with frames, ceiling and outer planking, possible knees and a fragment of decking, together with other miscellaneous features (**Plate 5.3**). Artefacts recovered from the site and dendrochronological work undertaken by Nigel Nayling of Lampeter University suggests a late 16th/early 17th century date for the ship. The site was designated as a protected historic wreck site in 2004. English Heritage now administers the wreck and Bournemouth University are actively investigating the site (see Appendix I for website reference).

5.4 MARITIME ARCHAEOLOGY DEVELOPMENT AND DISTRIBUTION: PRE-1500

Early Prehistoric (Palaeolithic – Mesolithic)

- 5.4.1 No evidence has been found in the UK for Palaeolithic maritime archaeology pre-dating the Devensian glacial maximum. The effects of glaciations, marine transgressions and associated fluvial activity mean the potential for the survival of any archaeology associated with the maritime environment from this period is unlikely. Certainly no finds from this period were identified in the reports for SEA6, 7 or 8 areas, and none have been reported elsewhere in the UKCS area.

- 5.4.2 However, the lack of evidence should not be taken as indicative of a lack of maritime activity during the Palaeolithic around the UK. Examples from elsewhere in the world suggest that early modern humans did undertake maritime activities (Johnstone 1980). Perhaps the best known being the suggestion that the colonization of Australia c.40,000 BP involved island-hopping in or on primitive watercraft (Lourandos 1997).
- 5.4.3 Activities related to the exploitation of the marine environment may also have taken place during the Middle Palaeolithic. Although presently lacking in the UK, there is evidence from around the Mediterranean Basin (Italy, Gibraltar, Morocco and Libya) and from South Africa for human coastal adaptation, in archaeological deposits formed as early as 127,000BP (Klein *et al* 2004).
- 5.4.4 During the Late Upper Palaeolithic re-population of the British Isles by modern humans (c.12,000 BP) it is postulated that simple watercraft, such as hide-covered log or boat rafts, were used for coastal journeying and fishing (McGrail 1987, 1991).
- 5.4.5 The existence of watercraft during the Mesolithic is inferred by the presence of Mesolithic archaeological material on insular land masses such as Ireland, for example. By the Mesolithic Ireland was already an island, albeit with a lower surrounding sea level than today. The land bridge connecting Ireland to the British mainland having been inundated as the sea level rose after the retreat of the Devensian ice sheets (Wessex Archaeology 2006a). Any of the new Mesolithic human inhabitants would thus have had to travel across a stretch of open water to reach the newly created island (Breen and Forsythe 2004: 27-28).
- 5.4.6 The earliest direct evidence for activity involving maritime craft comes from the early Mesolithic site at Starr Carr in Yorkshire, which has produced a fragment of a wooden oar. This implies that the people who occupied the site built boats, probably coracles or simple canoes used to travel or fish. The lacustrine setting of the site suggests that the boats used in the Mesolithic may have been confined to sheltered waterways, although contemporary sites from north-west Europe suggest that dugout logboats were used for coastal journeys.
- 5.4.7 Ethnographic studies have shown that tree bark can be used to cover boats and it has tentatively been suggested that 8,000-year-old rolls of bark, also from Starr Carr, could have been used to create such vessels (Johnstone 1980: 17). No evidence of watercraft has been found at the site, and it has been noted that by recent standards the size of the Starr Carr rolls would have been inadequate for boat-building (McGrail 1987: 34; Breen and Forsythe 2004: 30).

Neolithic and Bronze Age (4,000 – 700 BC)

- 5.4.8 The transition from the Mesolithic to the Neolithic in the UK is marked by a shift from a hunter-gatherer mode of life to an increased reliance on plant and animal domestication, characterised by more permanent human settlements. By now, the UK was again an island and evidence begins to appear to suggest the advent of maritime trade. For example, the discovery of porcellanite stone axes from Ireland on the UK mainland and the Western Isles of Scotland implies transport by sea (Breen and Forsythe 2004: 32).

- 5.4.9 The only physical archaeological evidence in the UK for Neolithic maritime watercraft is logboats. However, it is postulated (McGrail 2004: 172) that the advancement of technologies by Neolithic times may have seen the development of more complex logboats used at sea and, possibly, simple plank boats in inland waters. No evidence for these craft has yet been found, however.
- 5.4.10 The oldest boat discovered in the UK is the St Albans logboat dating to the 4th millennium BC. Found in 1988 next to the River Colne at Old Parkbury in Hertfordshire, it is the charred remains of a boat containing human bones. The remains measure 5m in length and contained the disarticulated skeleton of what is apparently a human child in a chest. The boat and its contents were part of a burial and had been deliberately set on fire (Delgado 1997: 438). It is the first tangible evidence that the people of the Neolithic age possessed the technological ability to construct such craft (McGrail 2004: 172).
- 5.4.11 A number of other Neolithic logboats have also been discovered around UK and it is presumed they were used for fishing and were capable of journeying onto the open sea (Johnstone 1980). This is suggested by faunal evidence from shell middens at Neolithic sites which contained the bones of deep water fish (Ellmers 1996: 17-18). In addition to fishing, logboats may have been used as coastal transport for trading goods such as stone axes or other goods, such as agricultural produce (McGrail 2004: 174).
- 5.4.12 The Bronze Age witnessed clear advances in maritime technology and an increasingly substantial maritime archaeological record from this period allows a far better understanding of maritime culture than in previous eras. McGrail (1990) states that by the Bronze Age '...in theory, almost any type of raft and boat ever known could have been built.'
- 5.4.13 Although dugout logboats were still used, evidence exists that hide boats were also being constructed in the UK and that the development of sewn plank boats was underway. The latter been described as the most advanced form of early water transport and would have been readily adaptable for use for a variety of functions and in a range of environments (McGrail 1991). There have been several examples of these flat-bottomed sewn plank boats found, ranging from the Brigg 'raft' and North Ferriby boats on the Humber, to fragments found at Caldicot and Goldcliff, Gwent (McGrail and Parry 1991) and the substantial remains of a boat at Dover in Kent (Clark 2002).
- 5.4.14 The Dover boat is of particular archaeological significance because of its sea-going capabilities. Although no artefacts were found with the vessel remains, its size (it is estimated to have been able to carry goods up to a weight of three tonnes) suggests that it may well have conducted trade in metals across the English Channel (Wessex Archaeology 2005a). This ocean-going trade in metalwork and ore is supported by the discovery of a number of maritime sites comprising Bronze Age tools, thought to represent cargoes. Examples include bronze tools discovered in Langdon Bay, Kent, Bronze Age weapons discovered off Moor Sand, Devon, and a number of early tin ingots from within the Erme Estuary, Devon (Fenwick and Gale 1998; Muckelroy 1980). Evidence from the distribution of trade items, not only from continental north-west Europe, but also Ireland and the Scottish archipelago, supports the theory of established open-water maritime trade routes in the Bronze Age.

Iron Age and Roman (700 BC – 500 AD)

- 5.4.15 Iron Age logboats have been found at Hasholme in Yorkshire and Poole in Dorset, among others, but plank-built boats are also likely to have been in regular use in the waters around England. Trading ports investigated at Mount Battern in Plymouth and Hengistbury in Dorset, and Roman accounts of the Veneti people based in Brittany, suggest that England's Iron Age populations were using sea-going sailing ships.
- 5.4.16 In contrast to the Bronze Age, however, evidence for early Iron Age seacraft is rare in the United Kingdom. A single plank from Ferriby has been dated to c.775-700 or 530-375 BC, suggesting a continuing plank-boat tradition (Chapman and Chapman 2005: 44). Further, indirect evidence comes from the coins of the native ruler Cunobelin which depict boats (McGrail 1990) and a mid 1st century AD iron anchor has been found at Bulbery in Dorset (McGrail 1998: 254; Delgado 1997: 440).
- 5.4.17 During the later Iron Age a distinct 'tradition' of ship construction was being developed in north-western Europe, known as the 'Romano-Celtic' type. The first example of such a vessel - a substantial seagoing trading ship - to be excavated in the UK was the Blackfriars boat found in London in 1962 (Marsden 1994). Another example, the Barlands Farm boat was found in the Severn estuary (Nayling and McGrail 2004). Although smaller than the Blackfriars boat, the Barlands Farm vessels would still have been capable of coastal and oceanic voyages. Further examples of vessels of this period have been found at New Guy's House in London (Marsden 1994), St. Peter Port, Guernsey (Monaghan and Rule 1993) as well as on the Continent.
- 5.4.18 Undoubtedly, boats and ships originating in the Mediterranean, as well as from other parts of the empire, were used in the Roman period (AD 43 – 410) in UK waters. 'Roman' vessels may also have been built in England, such as the County Hall Ship (Marsden 1994) which is thought to have been built in South East England by a shipwright experienced in Mediterranean techniques.
- 5.4.19 Discoveries of both isolated artefacts, such as a Roman anchor stock of the 2-3rd century BC from off Porth Felen, Gwynedd, in Wales (Cunliffe 2001: 421), and an Iron Age bronze sword from Gaul recovered from Ballyshannon harbour, Co. Donegal in north-eastern Ireland, and concentrations, such as the pottery from Pan Sand in the Thames and a number of other locations, point to the survival of lost cargoes and shipwrecks from the Roman period (Breen and Forsythe 2004: 40; Delgado 1997: 440).

Early Medieval and Medieval (500 AD – 1500)

- 5.4.20 During the 5th century AD Romans withdrew from Britain. Subsequent local development of boats was now influenced by a dramatic change in the form of maritime craft being introduced into Britain. The influx of Anglo-Saxon, and later Norse and Danish Viking settlers brought an expansion of trade routes and the introduction of Scandinavian-style clinker-built vessels.
- 5.4.21 The key examples of Early Medieval vessels from the UK are the vestiges of the Sutton Hoo ship (c. AD 600) from Woodbridge, Suffolk and the Late Saxon Graveney Boat found in North Kent. These, with examples from other countries bordering the North Sea, belong to traditions that would give rise to Viking ships in their various forms. The SEA6 and SEA7 reports detail the

impact of the Viking settlers on the coasts of western England and Scotland and their spread to Ireland and the Isle of Man. Dublin timber, in particular, was of great importance to Viking boat building, as evidenced by its use in the construction of the Skudelev 2 warship excavated at Roskilde in Denmark. Although numerous archaeological and literary sources give a flavour of the very extensive use of watercraft in this period, as yet however, known examples are few.

- 5.4.22 The same is generally true in the later medieval (AD 1066 – 1499). There are plentiful sources from the Bayeux Tapestry onwards of the extent and volume of vessel traffic, but material remains from England are fragmentary, at best.
- 5.4.23 The medieval period saw the expansion of maritime trade routes both around the British Isles and with the European mainland. Powerful trading confederations emerged, such as the Hanseatic League in North Germany and the Baltic. The English Channel was the artery for increasing trade between Britain and Europe and the expanded trade of this period also extended across the Irish Sea and the North Channel. It led to a dramatic increase in shipping around UK waters and, as such, there were greater chances for maritime casualties.
- 5.4.24 During the 13th and 14th centuries the design of the vessels that would have frequented UK waters changed as the fast, shallow draught descendants of Scandinavian vessels were replaced by more capacious, deep-draught vessels carrying fore- and after-castles and hung rudders, rather than steering oars. These changes were linked to the changing nature of maritime activity – wide, international-scale trade – and saw the development of the large merchant vessels like cogs, hulcs (reverse clinker built vessels) and keels needed to accommodate bigger cargos (Kemp 2002). An example of such a vessel is the Newport ship, discovered during construction activities on the banks of the River Usk in 2002, and probably built in the middle of the 15th century (Nayling 2003).
- 5.4.25 Trading vessels and their valuable cargos faced constant risks not only from sea, weather and navigational hazards, but also from war and piracy. Throughout this period developments in shipbuilding technology improved the military function of ships, particularly by the addition of fore- and after-castles to the larger vessels from the 12th century (Breen and Forsythe 2004: 72-75).
- 5.4.26 At this time there was virtually no difference between merchant vessels and warships. In fact, most warships were no more than trading vessels called up for service during times of war. The ships were no more than platforms for carrying men to battle, and maritime warfare was nothing more than land battles fought at sea. By the 15th century, however a revolution was underway in England as it was realised that the English cog wasn't suitable for maritime warfare. For the defence of the seas around the kingdom special, purpose designed and built ships were needed. The development of warships was also linked to the introduction of gunpowder to Europe during the 14th century. Guns found their way onto ships and became established as viable, offensive naval weapons, not just adjuncts of the fighting men being carried by the vessel. These developments precipitated the establishment of a standing navy and interchangeability of merchant vessels and warships became largely a thing of the past (Kemp 2002: 71-72).

- 5.4.27 The introduction of guns also changed the design of ships. Tonnage had to increase to cope with the additional weight, and during the 15th century warship tonnage went up fourfold to 1000 tons. These larger ships required improvements in propulsion and the single mast was replaced by three or four masts plus all the extra rigging this required. This more complicated rig, required larger crews, while the guns below deck needed men trained to use them in naval warfare (Kemp 2002).
- 5.4.28 Merchant vessels were also growing in the 15th century. As Mediterranean trade with the east grew, so did demand, and larger vessels were needed to handle the cargoes. The introduction of the carvel technique of flush planking in shipbuilding became common on larger craft throughout Europe at this time, although the clinker technique continued to be used on smaller vessels. The introduction of the carvel technique, probably from the Mediterranean, meant that shipwrights could build larger vessels – some weighing as much as 1200 tons – which were more economical and structurally sound, like carracks, galleons, balingers and caravels (Breen and Forsythe 2004: 82-84).
- 5.4.29 During the late medieval period the development of reliable navigation techniques and aids was to have as profound an influence on ship development as the introduction of guns. Ship owners could now plan long oceanic voyages and greater distances could be travelled, with ever-expanding trade routes (Kemp 2002). This period saw the advent of European maritime exploration on a global scale as vessels from Europe reached first the New World and then mapped the spice routes to the Far East.
- 5.4.30 The SEA6, SEA7 and SEA8 reports detail area-specific wrecks from the medieval period and it must be assumed that the east coast SEA/draft Regional Sea areas would have a similar maritime archaeological resource from this period as the important medieval ports of the southern North Sea and English Channel – London, Southampton, Hull, Boston, Kings Lynn, etc. – would have seen intense UK/European maritime trade.
- 5.4.31 The potential for coherent shipwreck remains from this period to survive is demonstrated by the Magor Pill wreck, the Newport ship from Wales and the *Grace Dieu*, built in 1418 and lost in 1439, and now designated under the Protection of Wrecks Act 1973.
- 5.4.32 Our knowledge of shipbuilding from the medieval period is still limited, as ship-building techniques were learned by shipwrights, rather than being recorded by writing and drawing. For information about the maritime technology of this period therefore we rely on the physical remains of the vessels and for this reason shipwrecks from this period are generally of high archaeological importance.

5.5 MARITIME ARCHAEOLOGY DEVELOPMENT AND DISTRIBUTION: 1500 – 1815 AD

- 5.5.1 Post-medieval seafaring is better represented in the known archaeological record than earlier periods, but the wrecks that have been investigated are only a tiny fraction of the numbers likely to have been lost, and an even smaller fraction of the overall volume of shipping (Wessex Archaeology 2008e).

- 5.5.2 Although there was continuity in the main forms of vessels into the post-medieval period, there was still technological innovation – not only in building, fitting and arming ships, but also in navigation, sailing rigs, steering, provisioning, storage and so on. Shipbuilding traditions for larger vessels coalesced around hulls made up of a skeleton of frames covered by planks laid edge to edge ('carvel') to provide a smooth outer surface, a form which prevailed throughout this period. Smaller vessels show greater diversity of form and construction, with overlapping planks ('clinker') pointing back to earlier traditions (Wessex Archaeology 2008e).
- 5.5.3 The great innovations in ship design of the post-medieval period were stimulated by the development and growth of a number of truly international mercantile businesses carrying goods from around the world to Europe. The Portuguese voyages of exploration at the end of the 16th century precipitated the explosion of global mercantile trade and expansion during the early 17th century, and led to the formation of large trading associations founded to exploit trade with the countries on the fringe of the Indian Ocean.
- 5.5.4 The new trade in the Far East that the East India Companies developed, for example, brought new impetus to merchant shipbuilding. The profits from the trade were so great that huge numbers of people were attracted to the trade and by the beginning of the 17th century the volume of trade, and hence the number of trading ships in the water increased dramatically. The best known of these companies were the Dutch East India Company (Verenigde Oostindische Compagnie or VOC) (1602-c.1800) and the English East India Company (1600-1858) (Breen and Forsythe 2004: 110), although there were French, Danish and a number of other similar mercantile cartels involved in the trade with the east.
- 5.5.5 Because of the length and hazards of these long, trans-oceanic voyages the size of these Indiamen, as the vessels involved in this trade came to be known, increased rapidly. Vessels in excess of 1000 tons were not uncommon. The design of these ships too reflected their use – round-bellied, with capacious holds to take both stores and cargo.
- 5.5.6 For the next 200 years and in tens of thousands of voyages these ships carried European exports to the far corners of the world, and returned laden with exotic imports, such as spices, silks, porcelain and saltpetre. Seafaring was central to the expansion of European influence around the globe, through exploration, colonisation and commerce. The shipping routes of many countries crossed the waters around England, with English ports themselves playing a major role in the movement of goods and people (often on inequitable terms, such as in the case of slaves) around the world (Wessex Archaeology 2008e).
- 5.5.7 The routes used by the outward-bound and returning trading fleets of the various nations in the seas around the UK are well-known. Much of the movement in the UKCS area was concentrated in the English Channel and southern North Sea (draft Regional Sea areas 2, 3 and 4). At certain times, particularly during periods of hostility with England, the Dutch fleets used a northerly route which took them from Texel, around Scotland, through draft Regional Sea areas 1 and 8.
- 5.5.8 As is to be expected, many Indiamen were lost on the coast of the UK or within the UKCS area. Some of the best known casualties include the

English *Earl of Abergavenny* (1805) in Weymouth Bay, the Dutch *Amsterdam* (1749) at Bulverhythe in East Sussex, *Rooswijk* (1739) on the Goodwin Sands, and *Schiedam* (1684) off Gunwalloe, Cornwall. Although no comprehensive list of English casualties is available, at least 30 Dutch East Indiamen in addition to those discussed above are known to have been lost within the UKCS area (see Appendix I for website references). Roughly a third of which lie off the Scottish coast, in draft Regional Sea 8.

- 5.5.9 Between the 16th and mid-19th centuries the separation of ships built for fighting and ships built for transport became more marked, though many larger merchant ships were also armed. Naval engagements were fought broadside to broadside, with fleets of capital ships meeting each other in lines ahead and astern. Warships mounted up to three decks of guns and there is a rough progression (with key exceptions) from wrought iron, to cast bronze, and then to cast iron for the main armament. A large number of cannon on the seabed is often the most obvious indication of the presence of a wreck (Wessex Archaeology 2008e).
- 5.5.10 Throughout the post-medieval period there are relatively few years that can be described as peaceful in the seas around England, though the combatants vary. Key engagements increasingly happened in theatres beyond UK waters, but the comings, goings and sinkings of vessels from a variety of nations – from misfortune as much as action – still added substantially to the shipwreck record in the UK's waters (Wessex Archaeology 2008e).
- 5.5.11 At the same as global trade was expanding, the Royal Navy grew to become an established force, developing from the small Elizabethan Navy as its role expanded from 'homeland security' to include the policing of the kingdom's interests across the globe. Two of the most important naval wrecks of this period are Henry VIII's 1000 ton *Henry Grace a Dieu*, built in 1512, and the *Mary Rose*, lost in 1545 off of Portsmouth (Rule 1982).
- 5.5.12 Other important naval sites include the wrecks of vessels around the UK used in the Spanish Armada invasion of 1588 (Martin 1975). These early wrecks have been hugely important archaeologically in providing invaluable information about British and European naval technology and societies of this time. Similar finds in future are likely to be equally archaeologically significant.
- 5.5.13 By the end of the 18th century the Royal Navy was the most powerful navy in the world, and was made up a huge variety of ships – from warships, rated according to the number of guns they carried, to auxiliary vessels, including fireships, hulks, ketches, smacks and yachts (Lyon 1993, Colledge and Warlow 2006). There are numerous recorded losses of British naval vessels from this period in UK waters. Some of these sites have been archaeologically investigated, including HMS *Stirling Castle*, HMS *Colossus*, HMS *Invincible*, HMS *Hazardous*, and what are thought to be HMS *Restoration* and HMS *Resolution*.
- 5.5.14 Global shipping movements were augmented by huge volumes of seaborne activity on more regional and local scales, with water transport being more swift and economic not only along the coast but also well inland, though the network of navigable rivers and, later, canals (Wessex Archaeology 2008e). In addition to the types of vessels discussed above, therefore, the UKCS will

contain the remains a very wide and diverse range of boats and ships involved in the rich and varied maritime activities that have taken place in the waters around the UK: everything from small local and regional traders and coasters, to barges, to fishing vessels. Together these sites form a rich, diverse and irreplaceable part of the UK and the world's cultural heritage.

- 5.5.15 Interestingly, the survival of more ancient forms of sea travel is also still documented around the UK into the post-medieval period. For example, the currach remained one of the most enduring vernacular boat types in post-medieval Ireland and logboats were another long-term survivor in other parts of the country (Johnstone 1980). Both of these vessel types are potentially represented in the UK's maritime archaeological record.

5.6 MARITIME ARCHAEOLOGY DEVELOPMENT AND DISTRIBUTION: 1815 – 1914 AD

- 5.6.1 During the late 18th and early 19th centuries, coastal and international trade were dominated by wooden sailing vessels and the zenith of sailing naval vessels had been reached in the 'wooden walls' of the Nelsonian and other navies of the period (Lavery 1991). The industrial revolution however, introduced technological innovation that was to precipitate fundamental changes in maritime technology during the course of the 19th century. By mid-century the advent of the steam engine, iron hulls and the screw propeller had wrought major transformations on ships and shipping (Gould 2000: 238).
- 5.6.2 The use of iron and steel for vessel construction and steam for propulsion were foreshadowed in the 18th century, but it wasn't until after 1820 that these technologies gradually came into widespread use, as the capabilities of iron-hulled vessels, combined with steam propulsion made long distance trade both faster and more economical.
- 5.6.3 Iron was first used in shipbuilding to supplement structural elements, particularly those that were becoming increasingly difficult to source in wood, such as the knees that supported decks. Before long, iron was being used to frame vessels, and soon was replacing wood as the covering of the hull. In warships, iron was also used as armour cladding on wooden hulls, such as in the case of HMS *Warrior* preserved in Portsmouth, then to protect the central battery and later for all-metal, armoured hulls (Lambert 1992, Ville 1993, Wessex Archaeology 2008e).
- 5.6.4 Steam propulsion was at first most common in paddleships, with screw propulsion demonstrating its greater efficiency somewhat later. Initially, steam was supplementary to sail, but as the technology improved and advantages of independent power over the vagaries of the wind became increasingly apparent, so steam gradually supplanted sail. Later still, steam piston engines gradually gave way to turbines, which also developed during this period from being fired by coal, to those fired by oil (Kemp 2002, Wessex Archaeology 2008e). The introduction of iron and steam also drove innovations in ships' machinery, with the development of steam-powered winches and capstans, the introduction of steel rigging, and in all manner of ships' fittings.
- 5.6.5 These new technologies took time to prove themselves, both technically and economically, so there was often a difference of several decades between their earliest use and widespread adoption, especially in commercial shipping. The early years of this period were thus dominated by the well-

established wooden sailing vessels such as schooners, brigs, brigantines and snows (Breen and Forsythe 2004:127-128). Although much of this wooden sailing technology was to be replaced by independent power and iron hulls during the 19th century, the strengths of wooden construction and sail, demonstrated over millennia, were such that both continue well into the 20th century (Greenhill, 1993a).

- 5.6.6 The new technologies were applied to sail, resulting in iron-hulled and rigged versions of the traditional forms like the barques and brig. They also allowed the development of new forms of sailing vessels like windjammers and clippers, the most famous example of which is the *Cutty Sark* (Greenhill 1993b).
- 5.6.7 The 19th century saw a dramatic increase in the volume of shipping traffic in the waters of the UKCS, which resulted in numerous casualties and losses, with collision – because new propulsion meant that ships could move at speed on headings independent of the wind – becoming such a problem that it prompted some of the first international conventions.
- 5.6.8 It is important not to leave vernacular boats types out of the equation when considering this period (and the early 20th century below). These vessels tended to be locally built, often regionally varied in design and regionally specific to conditions and task. They also tended to be long-lived and are often un-recorded and undervalued.
- 5.6.9 During this period there was better centralised recording of losses, so the available record of shipping casualties is both more complete and more accurate. The presence of metal hulls and/or fittings means that wrecks of the 19th century are often more evident on the seabed than their predecessors. The ‘known’ archaeological resource across the extent of the UKCS for this period is thus greater than for earlier periods. However, it must be borne in mind that the same factors that mean a better record also skew the results. Knowledge is related to a particular segment of past maritime activity, favouring bigger ships at the expense of the many smaller vessels that are also likely to have been lost during the same period.

5.7 MARITIME ARCHAEOLOGY DEVELOPMENT AND DISTRIBUTION: 1914 – PRESENT

- 5.7.1 The maritime archaeological record of the period from 1914 to the present is dominated by World Wars I and II. Whereas seaborne conflict was largely exported from the waters of the UKCS for much of the 19th century, the two major conflicts of the 20th century saw its return at altogether different levels of magnitude (Wessex Archaeology 2008e).
- 5.7.2 Although some actions during both World Wars were directed at warships, these engagements account for only a fraction of the maritime casualties directly related to the wars. Warships, submarines and U-boats were all certainly lost, but by far the greatest losses during both World Wars were amongst merchant vessels, some carrying cargos, others acting as troopships – and thousands of military and other aircraft (see below).
- 5.7.3 The new technologies of the submarine, torpedo, mine and aircraft are mostly responsible for the huge toll in shipping losses, as is the outright intention by all sides during both wars to destroy shipping (and anyone on board), a deviation from earlier centuries, where the emphasis during maritime conflict was on blockade or capture (Wessex Archaeology 2008e).

- 5.7.4 The list of both losses and known wrecks in the waters of the UKCS goes off the scale for the ten years 1914-18 and 1939-45 (Wessex Archaeology 2008e). The majority of these were cargo vessels, but many were also many losses of personnel transports - troopships or hospital ships. These casualties were usually accompanied by massive loss of life. An example is the wreck of the *Mendi* which was sunk south of the Isle of Wight after a collision on 21 February 1917, with the loss of 649 lives, the majority of whom were black South African labourers en route to the Western Front (**Plate 4**) (Wessex Archaeology 2007b).
- 5.7.5 Amongst these World War I and II casualties special archaeological interest is likely to be more widely dispersed than during earlier periods. However, the loss of life and the personal tragedies that accompanied many of these World War losses were in many cases so cataclysmic or numerous that these wreck sites will often warrant respect, even is not archaeologically significant.
- 5.7.6 Relatively few capital ships were lost during both World Wars within the UKCS area, and in many instances these vessels are already protected; either in terms of the PWA such as in the case of the German fleet in Scapa Flow, or in terms of the PMRA, such as in the case of vessels such as HMS *Royal Oak* (torpedoed in Scapa Flow in October 1939), or HMS *Acheron* (sunk after hitting a mine off the Isle of Wight in 1940). The majority of military casualties in the UKCS during the World Wars would have been relatively small craft - E-boats, U-boats and submarines, MTBs, etc.
- 5.7.7 Other casualties relate to small boats actions, such as the Dunkirk evacuation in 1940, or operations like D-Day during which numerous landing craft and amphibious DUKWs (duck boats) were lost (Wessex Archaeology 2005b). In addition, *materielle* related to the war such as anti-submarine defences or constructions like the Mulberry Harbours created for the D-Day landings are known to exist in the waters of the UKCS (McDonald 1999).
- 5.7.8 Boats and ships continued to enter the archaeological record during the inter-war period and after 1945. Although ships and boats are far less numerous, and far less prone to disaster, the overall volume of trade by sea continues to be very high. Losses of big ships make headlines, not least due to the threat of pollution; losses amongst smaller vessels – including fishing vessels – however, gain less notice. Amongst these vessels, some might be of sufficient special interest to warrant additional mitigation measures (Wessex Archaeology 2008e).

5.8 MARITIME ARCHAEOLOGY: SUMMARY

- 5.8.1 The UKSC contains a very substantial maritime archaeological record with a long time depth, made up of boats and ships from prehistoric times to the present.
- 5.8.2 As an island the UK has seen high levels of shipping activity operating at different scales: local; regional; national and global.
- 5.8.3 This maritime activity has been accompanied by high levels of loss, attributable to a range of factors; some coastal or natural, others related to human error or conflict.

- 5.8.4 The survival of archaeological evidence of this maritime activity is very variable, but can be very good, even for early remains. A combination of better record-keeping, more robust construction materials and a shorter time on the seabed means that 'known' maritime archaeology is skewed in favour of more recent wrecks. However, there is demonstrated potential for very ancient wrecks or materials to survive in archaeological contexts within the UKCS, and these sites are likely to be of substantial significance.
- 5.8.5 Marine development areas often include wreck sites, the presence of only some of which are known from available records prior to high resolution geophysics. Older shipwrecks tend to be less visible to geophysics, but more important. Several recent examples where highly significant wrecks have been discovered in the course of marine development.
- 5.8.6 Frameworks for gauging maritime receptor importance are still underdeveloped, especially in respect of vessels from 19th and 20th centuries.

6 AVIATION ARCHAEOLOGY

6.1 BACKGROUND

- 6.1.1 Since the advent of powered human flight in the early 20th century, records indicate that thousands of military and civilian aircraft have been lost in UK territorial waters and in the wider area covered by the UKCS SEA. Although the main concentration of losses falls in the 1939-45 period, aircraft losses at sea span entire period of aviation history, from the early 20th century to post-WWII losses.
- 6.1.2 Although the records of aircraft losses at sea are extensive (**Figure 4**), they are seldom tied to locations. Aircraft remains on the seabed are also often ephemeral and not easily distinguishable in standard geophysical surveys. As a result, sites have historically been infrequently found and identified.
- 6.1.3 Aviation archaeology was not well represented in the DTI SEAs, but has become an increasing concern in recent years, partly because of national policy, such as English Heritage's guidance note *Military Aircraft Crash Sites* (English Heritage 2002) which recognises the importance of 20th century wartime heritage and makes the case for recognising the importance of aircraft crash sites, specifically with regards to existing and planned development proposals which may have an impact on such sites. The discovery too of increasing numbers of aircraft wrecks in development-led contexts has raised the profile of this resource in the last few years.
- 6.1.4 All military aircraft crash sites are automatically protected under PMRA 1986, and a licence is needed for any disturbance or works.

6.2 CHARACTER AND IMPORTANCE OF AVIATION ARCHAEOLOGY

- 6.2.1 Although the extent of our knowledge of aviation archaeology is currently limited it is possible to broadly characterise the resource and draw out a few generalisations on importance and special interest. Aviation archaeology falls into three broad chronological divisions:
- **Pre-1939** – The period of intense and rapid development of a new technology, from the inception of powered flight to the outbreak of WWII. The fragility of airframes and the relative paucity of flights over water mean that any aircraft remains from this period surviving in a maritime context are likely to be of interest. At least 119 different aircraft models were used by the military in the UK during this period, examples of only 24 survive today anywhere in the world. The scarcity of extant aircraft from this period therefore also raises the importance of any discovered in archaeological contexts.
 - **1939 – 1945** – By the outbreak of WWII advances in technology had greatly extended the reliability and range of aircraft. Long range flights were increasingly possible and during the war large areas of the UKCS were overflowed by aircraft of various nations. This period also saw the highest number of aircraft and associated human casualties in the history of aviation and as such has special significance.
 - **Post-1945** – A period characterised by the rapid development of jet propulsion technology and its use in both military and civil aviation applications. Of particular importance within the context of the UKSC

during this period are the losses of military aircraft as a result of training accidents.

6.3 PREVIOUS INVESTIGATIONS

- 6.3.1 In addition to the information available from primary and secondary sources about the aviation archaeology of the UKCS a number of previous investigations and studies, both strategic and development-led, provide direct evidence of the potential of aviation archaeology across the UKCS area.
- 6.3.2 In 2000 English Heritage, in consultation with the MoD and as part of the Monuments Protection Programme (MPP) carried out a survey of crash sites in England (English Heritage 2000a). The study revealed that WWII aircraft losses tended to cluster along the southern and eastern margins of England with some 1,000 losses recorded off the coast of Suffolk, for example. The study suggested that similar concentrations of aircraft losses are likely elsewhere off the UK coast, the result of factors such as enemy action and the presence of airfields. By the same token, there will be areas around the UK coast with very few aircraft losses.
- 6.3.3 During the last decade a number of aircraft wrecks have been found as a result of both development-led activities and archaeological survey. During diving investigations undertaken in advance of the construction of an outfall at Sandown, Isle of Wight in 1997, Wessex Archaeology identified a wreck found in the course of a hydrographic survey in 1989 as being a C-47 Dakota (Wessex Archaeology 1997). The site consisted of a central wing section with two engines, lower fuselage and associated fixtures and fittings, including oxygen cylinders, elements of the undercarriage, and propellers.
- 6.3.4 A more recent inshore find of an aircraft wreck was that of a WWII B-17 bomber investigated by Wessex Archaeology during the ALSF-funded *Wrecks on the Seabed* project (Wessex Archaeology 2004c).
- 6.3.5 In 2006 a second aircraft wreck was identified by the same project, this time a B-24 Liberator bomber lying in more than 50m of water off the Hampshire coast (**Plate 5**). This site, which was recorded by UKHO records as being a small, intact, possibly wooden shipwreck, highlighted the problem of distinguishing aircraft wrecks from shipwrecks. Geophysical survey, including multibeam swath bathymetry survey, was undertaken by Wessex Archaeology in advance of a Remotely Operated Vehicle (ROV) investigation, but also failed to identify the site as an aircraft. The presence of well-preserved textile items, including an American flying jacket on the wreck also illustrated the potential for excellent survival of organic artefacts on buried aircraft crash sites (Wessex Archaeology 2007a).
- 6.3.6 Marine aggregate dredging has resulted in the discovery of a number of aircraft wrecks, which have been reported the BMAPA Protocol Implementation Service. In the year ending 2006 over 25 finds were reported, from three sites (Wessex Archaeology 2006b). In the following year 312 finds were reported, largely from one of three further sites (Wessex Archaeology 2007c).
- 6.3.7 An example of such a find comes from Area 430, a licensed marine aggregate extraction area approximately 27km off Southwold in Suffolk. The

Area was the subject of an archaeological assessment by Wessex Archaeology in May 2006. No aircraft crash sites were recorded in Area 430 by either the NMR or UKHO and no aircraft related anomalies were identified in the geophysical data for the Area. In 2006 and 2007 a series of finds of aircraft wreckage were made during dredging activities, and these were reported through the BMAPA Implementation Service. These included material from either a P-51 Mustang or a B-25 Mitchell bomber, material from a German Ju 88 and human remains, possibly German (**Plate 6**) (Wessex Archaeology 2007c).

- 6.3.8 The Area 430 case demonstrates both the potential for the discovery of previously unknown aircraft remains within seabed development contexts, and limitations of existing knowledge about the aviation archaeology of the UK. In addition, aircraft remains continue to be discovered around the coast, and in October and November 2008, further remains were discovered in Areas 447 and 474 (**Plate 6**).
- 6.3.9 In response to the finds described above and the apparent discrepancies between the known and potential resource of aircraft crash sites, Wessex Archaeology was funded by English Heritage through the ALSF to undertake a scoping study entitled *Aircraft Crash Sites at Sea* (Wessex Archaeology 2008a). The study aimed to identify gaps in data and understanding relating to aircraft crash sites at sea.

6.4 AVIATION ARCHAEOLOGY DEVELOPMENT AND DISTRIBUTION: PRE-1939

- 6.4.1 Fixed wing aviation began in the early 1900s in the UK. The first fixed wing flight across the English Channel was by Frenchman, Louis Bleriot, in 1909.
- 6.4.2 World War I had a marked impact on the development of aviation. The military potential of aircraft had been understood in the pre-war years and was quickly translated into reality after the outbreak of hostilities. The Royal Flying Corps (RFC) and the Royal Naval Air Service (RNAS) were founded in 1912 and 1914 respectively, to be followed by the establishment of the Royal Air Force (RAF) in April 1918 (Brown *et al.* 1995:31, English Heritage 2000a; Lake and Francis 1998:13).
- 6.4.3 The aircraft of this period were extremely fragile – constructed of canvas covered wooden frames – and their limited engine power kept their effective payload down. Fairly rudimentary aviation engineering also meant that most aircraft of the time were structurally fragile by later standards, and not infrequently broke up in flight.
- 6.4.4 By the end of the war aircraft were in regular use over the battlefields of the Western Front and this spurred technological advances and aircraft production to meet the rising demand for planes. Fixed wing aircraft were for the first time mass-produced in large numbers. Also significant during the wars years was the development of more powerful engines which allowed aircraft to reach speeds up to 130 mph, more than twice the speed of pre-war aircraft. This increased power made bigger aircraft possible.
- 6.4.5 Throughout WWI German Zeppelin airships and, from 1917, Gotha bombers posed a real threat to UK cities, carrying out a number of air raids on coastal towns and London. A total of 28 fixed wing aircraft and 15 airships were lost by the German Imperial Air Service and Navy during raids on the UK

mainland during WWI. Whether any were lost at sea is not known (Wessex Archaeology 2008a: 18).

- 6.4.6 During the same period 34 aircrew from British Home Defence Squadrons were lost, suggesting a similar scale of aircraft losses (Holyoak 2002: 659). It is not known whether sea losses occurred, but Wessex Archaeology (2008a) suggests that was likely. In addition, research by the Midlands Aircraft Recovery Group has indicated that significant numbers of aircraft were lost in the UK during WWI through training accidents (Holyoak 2002: 659).
- 6.4.7 Aviation had a profound impact on the conduct of warfare during WWI, and by 1918 it had become apparent that increasing effort would have to be put into defending Britain's airspace (Brown *et al.* 1995:31). After the collapse of the Geneva disarmament talks in 1933, the British government engaged in a massive programme of rearmament and more than 100 permanent airbases were built throughout Britain during the inter-war years (English Heritage 2000; Lake and Francis 1998:13).
- 6.4.8 The 1920s and 1930s were a time of rapid progress in the field of aviation. Aircraft evolved from low-powered wood and cloth biplanes to high-powered monoplanes made of aluminum. In 1927 Charles Lindbergh completed the first transatlantic flight, and a year later Charles Kingsford Smith flew across the Pacific.
- 6.4.9 The birth of commercial civil aviation was not far behind with the construction of aircraft designed specifically to carry passengers and cargo. One of the most successful designs of this period was the Douglas DC-3, which became the first airliner that was profitable carrying passengers exclusively. Services from the UK to various European and worldwide destinations were established during the inter-war years and by the end of the 1930s many towns and cities had built airports and there were numerous qualified pilots available.
- 6.4.10 The AAIB records 20 civil aircraft losses at sea around the UK between 1920 and 1939. These numbers should be treated with caution as this is not regarded as being a comprehensive record, particularly for the inter-war period. The AAIB also holds no records for civil aviation losses prior to 1920, although Wessex Archaeology (2008a) is aware of other sources which suggest such losses did occur.
- 6.4.11 Despite the rapid development of aviation during the pre-1939 period, prior to WWII both civil and to some extent military flights over the sea were uncommon, aside from regular scheduled services and maritime patrols (Wessex Archaeology 2008a:17). Aircraft crash sites at sea from this period are thus likely to be relatively rare. The lightweight construction of the earlier airframes means also that their survival in the marine environment is likely to be low unless buried within seabed sediments.

6.5 AVIATION ARCHAEOLOGY DEVELOPMENT AND DISTRIBUTION: 1939 – 1945

- 6.5.1 WWII was markedly different from the previous war. Wooden airframe construction had been replaced with metal during the inter-war years and aeroplane technology had developed to a sufficient degree to make flying over the sea a less risky business.

- 6.5.2 WWII saw all countries involved in the war dramatically stepping up the pace of development and production of aircraft and aircraft weapon systems. The war saw the birth of the long range bomber and the development of increasingly fast and effective fighters, which were critical to the success of the heavy bombers, allowing much lower losses than would have been the case without fighter protection against enemy fighters.
- 6.5.3 The first functional jet-propelled aircraft made its appearance in 1939, the German Heinkel He 178 turbojet prototype. The first operational jet fighter was the Messerschmitt Me 262. It was the fastest conventional aircraft of the war, but production on a large scale only started in 1944, too late for a decisive impact on the outcome of the war. Jet aircraft had limited impact during WWII due to their small numbers and only came into their own after the war (Jarrett 2000).
- 6.5.4 Air power became increasingly important at a strategic and operational level during WWII. Attacks on enemy territory by both the Allied forces and the German Luftwaffe were facilitated by the mass-production of aircraft, and in Britain nearly 600 airfields were built between 1939 and 1945 (English Heritage 2000a).
- 6.5.5 The English Channel and the North Sea formed a frontier between the Allies and Axis Europe and became a significant focus for high volumes of aviation activity as first the German bombing raids into the UK, and later the Allied raids into Europe crossed these bodies of water. Offensive and defensive fighter activity in support of these raids also took place off the east and south coasts of the UK in particular (Wessex Archaeology 2008a:16).
- 6.5.6 These activities led to huge losses on both sides and it has been estimated that an average of 5 aircraft crashed somewhere in the British Isles every day between 1939 and 1945 (Bédoyère 2001:8).
- 6.5.7 One of the most complete sources of information for the aircraft casualties is provided by aviation researcher Ross McNeill. McNeill has recorded 11,090 RAF aircraft losses in the North Atlantic, North Sea, English Channel, Irish Sea and Biscay areas between 1939 and 1990. The majority of these occurred during WWII and demonstrates the potential for WWII aircraft crash sites within the UKCS SEA area (Wessex Archaeology 2008a).
- 6.5.8 Dr Guenter Leonhardt of Luftfahrt-Museum in Laatzen-Hannover, Germany estimates that around 1,000 Luftwaffe planes were lost off Britain during WWII, with about 800 of these associated with the Battle of Britain between July and September 1940 (Dr Guenter Leonhardt, pers. comm.) (Wessex Archaeology 2008a:18).
- 6.5.9 The English Heritage / MoD survey referred to earlier noted that WWII losses tended to be clustered along the southern and eastern margins of England. For example about 1,000 losses were noted for Suffolk, compared with only 500 for Warwickshire (English Heritage 2002: 5). These areas would have formed the entry and exit points for offensive operations over Continental Europe, the North Sea and the English Channel. The majority of air combats appear to have occurred over these areas and the majority of airfields were based there. Some 1000 losses are estimated to have occurred over and off Sussex and Suffolk respectively (Burgess and Saunders 1990: 95, McLachlan 1989: 195)

- 6.5.10 As part of the ALSF funded *Aircraft Crash Sites at Sea* scoping study Wessex Archaeology (2008a) analysed data from the NMR, the UKHO and a sample of Sites and Monuments Record / Historic Environment Record databases, the latter focussing on the south and east coasts of England from Dorset to Suffolk. This is because operational air activity was particularly concentrated there during WWII and also because of the number of aggregate extraction licences in this area.
- 6.5.11 This information was compared with the available information concerning the number of reported sea losses of aircraft to establish the approximate relationship between known sites and known losses. Together these sources contain 2,578 recorded losses of aircraft at sea within the UK territorial waters around the southern counties of England. Of these, known sites (i.e. where some physical evidence of the aircraft has been located at some point) are limited to 580 listed by the SMR/HERs for the area between Dorset and Suffolk, and 28 aircraft wreck sites recorded by UKHO (Wessex Archaeology 2008a).
- 6.5.12 This example illustrates the great disparity between the number of aircraft losses at sea that are recorded and the number of known maritime aircraft crash sites within an area of the UKCS, and is likely to be indicative of the situation in other areas of the UKCS for this period.
- 6.5.13 Commercial aircraft losses recorded by the AAIB amount to only two during this period. This figure seems unlikely and is probably a factor of the acknowledged incompleteness of the AAIB records, rather than a true reflection of the number of commercial aircraft casualties during WWII (Wessex Archaeology 2008a).

6.6 AVIATION ARCHAEOLOGY DEVELOPMENT AND DISTRIBUTION: 1945 – PRESENT

- 6.6.1 Between the end of WWII and the early 1990s, military aviation development and activity was dominated by Cold War imperatives. The rivalry this sparked brought out the best in military aircraft research, design, and development, much of which development was also applied to commercial sector aircraft.
- 6.6.2 The technological breakthrough of the post-1945 period was the refinement of the jet engine and its application to both military and commercial aircraft. Jet aircraft are faster than propeller-powered aircraft and are able to attain much greater altitudes where they achieve maximum efficiency over long distances (Jarrett 2000).
- 6.6.3 Whereas military aviation had dominated much of the two earlier periods of aircraft development, after WWII commercial aviation grew rapidly, initially using ex-military aircraft to transport people and cargo. This growth was accelerated by the availability of large numbers of heavy and super-heavy bomber airframes like the American B-29 and British Lancaster that could be converted into commercial aircraft. Aircraft like the Douglas DC-3, one of the most successful aircraft ever designed, facilitated longer and more reliable commercial flights (Jarrett 2000). The first purpose-built commercial jet airliner was the de Havilland Comet, which first flew in 1949 and entered service for the British Overseas Airways Corporation (BOAC) in 1952, between London and Johannesburg. Since then huge numbers of commercial jets have crisscrossed the UKCS but with very few major losses.

- 6.6.4 The AAIB lists 120 civil aircraft losses at sea around the UK between 1946 and 1994. Most are light aircraft and in recent years, helicopters, the latter reflecting their intensive use in servicing the North Sea oil and gas industry.
- 6.6.5 Military aviation within the area of the UKCS during the post-1945 period largely reflects Cold War activities. In addition to the RAF, a large number of American planes have been based in the UK since WWII and there has been a high volume of aviation activity across the waters of the UKCS (Wessex Archaeology 2008a:16).
- 6.6.6 Unlike during the WWII period, however, military aircraft casualties after 1945 are not associated with combat operations, but are the result of training accidents. There is not comprehensive list of military aircraft losses at sea available for this period, but a number of crash sites have been identified by Wessex Archaeology during the course of environmental assessments in advance of offshore development activities, or during activities such as aggregate dredging. For example:
- The crash site of a RAF F3 Tornado, lost off Spurn Point with the loss of one life in 1995, was identified during the archaeological assessment for the Humber Gateway Offshore Wind Farm (Wessex Archaeology 2005b);
 - The partially salvaged remains of a crashed 1976 RAF Phantom were identified within the export cable route corridor for the Lynn and Inner Dowsing Offshore Wind Farms (Wessex Archaeology 2002);
 - In 2005 two pieces of aircraft wreckage were spotted on board the Hanson Aggregates Marine dredger 'Arco Dart' within sand and gravel dredged off the coast of Worthing, Sussex. The RAF museum at Duxford was able to match a serial number on one of the two parts to a rear wing spar from the Supermarine Attacker WP275 which crashed into the sea on the 6th July 1956 after taking off from Royal Naval Air Station Ford, in Sussex (Wessex Archaeology, 2006b).

6.7 AVIATION ARCHAEOLOGY: SUMMARY

- 6.7.1 Aircraft crash sites have significance for remembrance, commemoration, their cultural value as historic artefacts as well as the information they contain about the aircraft itself and its circumstances of loss (English Heritage 2002: 2).
- 6.7.2 Since the publication of English Heritage's guidance note in 2002, and also as a result of increasing finds of aircraft crash sites in offshore, often development-led contexts, these sites have become an increasing concern for both the heritage and offshore development sectors.
- 6.7.3 Extensive documentary records exist of aircraft losses at sea. However, the majority of these recorded losses are not tied to accurate positions and only very few aircraft wrecks have been physically located on the seabed.
- 6.7.4 Although the overwhelming concentration of losses is in period between 1939 and 1945, aircraft losses at sea span entire period of aviation history, from the early 20th century to very recent, post-WWII losses.

- 6.7.5 The often ephemeral nature of aircraft remains means that they are not easily distinguishable in standard geophysical surveys. The likelihood that aircraft remains could be present within just about any area of the UCCS must therefore always be borne in mind during the assessment of any area ahead of seabed development.
- 6.7.6 The sensitivities associated with military aircraft crash sites, all of which are less than a century old, are reflected in the blanket, automatic protection that applies to such sites under Protection of Military Remains Act (1986). No disturbance of a military aircraft wreck is allowed without a licence from the MoD.

7 SENSITIVITY AND THREATS

7.1 SENSITIVITY OF SITES TO OIL, GAS AND WIND FARM ACTIVITIES

- 7.1.1 The marine archaeology on the UKCS is highly sensitive to change, and it is an irreplaceable, non-renewable resource. Alterations to the archaeological resource, and to its environment, must be carefully considered.
- 7.1.2 Wrecks, aircraft and submerged prehistoric archaeology are sensitive to development activities on the seabed and below the seabed, depending on their location.
- 7.1.3 The impacts on the marine archaeological resource on the UKCS, associated with the construction of offshore wind farms, oil and gas wells, cable routes and pipelines, can be classed as direct, indirect, secondary, cumulative and synergistic.
- 7.1.4 The principal sensitivity of marine archaeological sites and materials is through direct impacts. Direct impacts are related to the construction, operation and decommissioning of developments, and they impact the archaeology within the footprint of the schemes, including cable or pipeline routes. These impacts include direct damage to sites, features, artefacts and deposits, as well as the disturbance or destruction of relationships between sites, structures, features, deposits, artefacts and their wider surroundings.
- 7.1.5 Direct impacts associated with oil, gas, and wind farm activities could include:
- Preconstruction dredging;
 - Foundations for wind turbines;
 - Drilling oil and gas wells;
 - Jack up vessel legs and other vessel moorings;
 - Ploughing, jetting and cutting for the burial of cables or pipes;
 - Cable or pipeline landfall and trenching;
 - Excavation during decommissioning.
- 7.1.6 Archaeological sites, materials and prehistoric landscapes, both on or under the seabed may also be sensitive to indirect impacts. Indirect impacts are those that reach beyond the footprint of the development, and could potentially impact archaeological sites or deposits some distance away. These impacts include changes to sediment transport, erosion patterns, and currents. Indirect impacts can be positive or negative. The impact is negative where wrecks, aircraft crash sites or submerged prehistoric deposits are exposed due to erosion, however, increased sedimentation could be positive if burial of an archaeological site or feature results in increased protection.
- 7.1.7 Secondary impacts arise from activities that are not part of the development as such, but that occur as part of the development process. Secondary impacts to archaeological sites and material might include anchoring / spudding in by construction vessels. Secondary impacts can extend the zone of archaeological concern.

- 7.1.8 Multiple impacts within a development project and / or in combination with past, present and future developments over a larger area are labelled cumulative impacts. These can result from incremental changes to the archaeological resource. Cumulative impacts would include recurrent direct impacts from the development of a number of offshore wind schemes or oil and gas wells in an area, gradually diminishing the archaeological resource. Cumulative impacts also include changes to the perception of the archaeological resource due to impact on the setting of historic monuments (COWRIE 2008). This is particularly important if the offshore wind farms or oil and gas wells are visible from shore.
- 7.1.9 The combined results of different types of impact, or interaction of impacts, either within a proposed development project or in combination with others, are described as synergistic impacts (COWRIE 2008). Synergistic impacts affect different aspects of the environment, for example one impact that affects both the marine archaeological resource and habitats and species.
- 7.1.10 While the marine archaeology is sensitive to impact, the effects of oil, gas and wind farm activities can be minimised through archaeological survey and appropriate mitigation measures.

7.2 CURRENT AND FUTURE THREATS TO THE ARCHAEOLOGICAL HERITAGE OF THE UK CONTINENTAL SHELF

- 7.2.1 It is difficult to assess the current and future threats to the marine archaeological heritage of the UKCS, as only limited data is currently available beyond supposition and anecdote.
- 7.2.2 Considerable attention has been focussed on threats from commercial salvage and to attrition from recreation diving. However, such impacts are highly localised to individual sites.
- 7.2.3 It is not clear to what extent aircraft and shipwreck parts have been recovered from the seabed by recreational divers. The Receiver of Wreck has been centrally collating recovery reports since the 1980s, and although the number of recoveries is likely to be considerably greater than the total number of reports, the system provides an opportunity to identify diver impact in some locations.
- 7.2.4 In some cases, shipwrecks and aircraft crash sites are protected by divers. One example is a well preserved C-47 off the Isle of Wight that is being dived and surveyed by a local recreational diving centre (Wessex Archaeology 2008a). The involvement of recreational divers can bring benefits to such sites.
- 7.2.5 In principle, there are threats from benthic fishing methods since they disturb the sea bed. As fishing gear is towed over the seabed, it can lead to damage to exposed marine archaeology. There is also the potential for nets to drag smaller pieces of wreckage or loose artefacts across the seabed, thus dispersing the site and removing it from its original context. However, the threats from benthic fishing methods have not been quantified, and therefore cannot be examined in detail at this time.
- 7.2.6 Although it is not possible to ascertain information about the overall impact of fishing on marine archaeology, it is possible to gain information about the location of individual aircraft crash sites where net snags have occurred, as

the MoD pays compensation for damage sustained to fishing gear that is caused by military aircraft wreckage. It is likely that large fishing nets could cause considerable damage to the site of an aircraft wreck, particularly aircraft of earlier dates that are more fragile.

- 7.2.7 Threats can arise from other seabed uses, such as aggregate extraction activities. While dredging for aggregates can impact marine archaeology on and below the seabed, the impacts are relatively localised and within specific dredging areas. In addition, archaeological surveys conducted prior to licensing and the implementation of appropriate mitigation measures, can minimise impact.
- 7.2.8 Other current and future threats to the archaeological heritage of the UKCS are posed by climate change. Some impact from climate change is apparent in relation to changing site conditions and degradation. For example, as the seas are warming, wood boring organisms that were previously limited to warmer southern waters are now common off the coast.

8 CONCLUSIONS AND RECOMMENDATIONS

8.1 CONCLUSIONS

- 8.1.1 This technical report was commissioned by the Department of Energy and Climate Change for the Strategic Environmental Assessment of offshore oil and gas licensing and wind leasing on the United Kingdom Continental Shelf. The report has assessed the marine archaeological heritage, comprising submerged prehistoric archaeology, maritime archaeology and aviation archaeology.
- 8.1.2 The marine archaeology on the UKCS is covered by a corpus of legislation, plans and policies, which is subject to jurisdictional divisions. Marine archaeological protection within territorial waters will be summarised first, followed by protection beyond territorial waters.
- 8.1.3 Within territorial waters, much of the legislation, policy and guidance is UK wide, and although in some cases it is administered by authorities with UK-wide powers, as a cultural resource, it's administration is generally devolved, and is therefore administered by the individual authorities in England, Wales, Scotland and Northern Ireland. In addition, Scotland, Wales and Northern Ireland have their own plans and policies that protect archaeology.
- 8.1.4 The legal and policy framework regarding the protection of marine archaeological heritage is currently undergoing a period of review. There will likely be considerable change to the legislation and planning process over the next five years, as the draft Heritage Protection Bill and Marine Bill are brought into practice.
- 8.1.5 The draft Heritage Protection Bill is intended to unify the terrestrial and marine heritage protection systems, however, as it was not covered in the recent Queen's Speech, it is not expected to come into effect in 2010 as proposed, and a new date has not yet been determined.
- 8.1.6 The Marine Bill will fundamentally change the management of the UKCS, through a number of initiatives. In many of the frameworks that are being developed, the impacts of marine development on the archaeological resource will be taken into consideration.
- 8.1.7 Beyond territorial waters, international laws and guidance apply. Current international law states that wrecks do not form part of the natural resources of the Continental Shelf, however wrecks are regulated indirectly through controls placed on activities regarding natural resources. In addition, there are a number of international conventions and other instruments that are relevant to archaeology on the UKCS. Although the UK is not a signatory of the UNESCO CPUCH, the convention will be carried forward in January as it has now been signed or ratified by 20 member states.
- 8.1.8 This report focused on fully marine, offshore areas, but coastal areas are mentioned with regards to potential impacts, such as pipelines, cables and other infrastructure.
- 8.1.9 Rather than gathering primary information, the analysis of the marine archaeological resource for this project was based on collating existing strategic and regional syntheses and relevant secondary sources.

- 8.1.10 There is only limited data available regarding the marine archaeological resource on the UKCS. However, through the analysis of available data some conclusions can be made regarding submerged prehistoric archaeology, maritime archaeology and aviation archaeology.
- 8.1.11 There is potential for the survival of submerged prehistoric archaeological heritage, including sites, finds, palaeolandscapes and palaeoenvironmental evidence, across wide areas of the current UKCS.
- 8.1.12 As a result of new discoveries and current research, our knowledge and understanding of submerged prehistoric archaeology is changing rapidly. Many of the new discoveries are being made as a result of seabed development and other marine activities. Future developments on the UKCS have the potential to contribute to this knowledge base, through archaeological assessment and analysis of geophysical and geotechnical data, and other survey work.
- 8.1.13 Any further discoveries have the potential to be of national or international importance, as they reflect not only on the hominin colonisation of the UK since 700,000 BP, but also on the history of hominin presence in north-west Europe.
- 8.1.14 The maritime archaeological record in the UKCS is substantial, and there is the potential for to encounter previously undiscovered wrecks of ships and boats. The record of known wrecks is skewed in favour of more recent wrecks, but there is potential for wrecks from at least the Mesolithic onwards. The study of shipwrecks can illustrate human interaction with the sea over time, technological changes to watercraft, and trade and migration patterns.
- 8.1.15 As archaeological receptors, wrecks of ships and boats are of variable importance, and at the present time frameworks for gauging the importance of maritime archaeological receptors are relatively underdeveloped. In general wrecks from the Mesolithic to the medieval period would be of special interest, as so few are known in the archaeological record. Remains of boats and ships from the post-medieval period are also relatively rare, and would be of special interest. For modern wrecks, importance could be determined based on rarity of type or design, and / or on historical interest, particularly in association with the two World Wars. Ships that were in military service when they wrecked can be recommended for protection under the Protection of Military Remains Act (1986).
- 8.1.16 Aircraft discovered on the UKCS are of particular concern, as aircraft lost while in military service are automatically protected under the Protection of Military Remains Act (1986).
- 8.1.17 The location and distribution of aircraft crash sites, rather than losses, are not well known. However, aircraft crash sites are increasingly being discovered offshore, often in development-led contexts. These aircraft crash sites span the entire period of aviation history, from the early 20th century to the present day, although there is an elevated number of aircraft losses at sea dating to WWII.
- 8.1.18 Overall, the marine archaeological heritage is a finite, non-renewable resource that is sensitive to change. Impacts on the known and previously

undiscovered archaeological material from oil, gas and wind farm activities include direct, indirect, secondary, cumulative and synergistic impacts. The significance of impact can be determined by the scale of the impact and the importance of the archaeology being impacted. These impacts have been studied in detail in other reports, and are fairly clear and relatively easy to identify, whereas current and future threats to the archaeological resource are less readily apparent.

8.2 RECOMMENDATIONS

- 8.2.1 The principle recommendations for the marine archaeological resource in the UKCS are the collation of existing data sets and the enhancement of national records.
- 8.2.2 Data could be collated from various sources – and could include access to JNCC survey data, a review of previous SEA data, and an audit of suitable survey data from public survey programmes.
- 8.2.3 Once collated, the data could be analysed to identify gaps, and could be used to test the UKHO and NMR records. Having tested the records, the information should contribute to the records, and future work should be designed to enhance national records.
- 8.2.4 UK-wide co-ordination of future work would provide additional support, eliminating duplication and ensuring more even, thorough coverage.

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APPENDIX I: WEBSITE LINKS

1 PROJECT INTRODUCTION

<http://www.scapetrust.org/index.html> - *Scottish Coastal Archaeology and the Problem of Erosion*

2 AVAILABLE INFORMATION

<http://www.english-heritage.org.uk/server/show/nav.1530> - National Monuments Record - England

<http://www.rcahmw.gov.uk/> - National Monuments Record – Wales

<http://www.rcahms.gov.uk/> - National Monuments Record – Scotland

http://www.ni-environment.gov.uk/built/mbr_intro.htm - National Monuments Record – Northern Ireland

<http://www.berr.gov.uk/files/file22791.pdf> - *Future Offshore*, BERR's consultation document issued in November 2002.

<http://www.seaenergyscotland.co.uk/> - The Scottish Government's Marine Renewables Strategic Environmental Assessment published in 2007.

<http://www.english-heritage.org.uk/server/show/nav.8684> - England's Historic Seascapes.

<http://www.wessexarch.co.uk/projects/marine/bmapa/index.html> - The English Heritage / British Marine Aggregate Producers Association (BMAPA) *Protocol for Reporting Finds of Archaeological Interest*

3 LEGAL AND POLICY FRAMEWORK

<http://www.mcga.gov.uk/c4mca/mcga07-home/emergencyresponse/mcga-receiverofwreck/mcga-protectedwrecks.htm> - Receiver of Wreck

<http://www.english-heritage.org.uk/server/show/nav.8385> – Protection of Wrecks Act (1973) – Section 1.

http://www.mcga.gov.uk/c4mca/mcga07-home/emergencyresponse/mcga-receiverofwreck/mcga-protectedwrecks/mcga-protectedwrecks-wrecksact1973_3.htm – Protection of Wrecks Act (1973) - Section 2.

http://www.opsi.gov.uk/si/si2008/uksi_20080950_en_1 - Protection of Military Remains Act (1986).

<http://www.mcga.gov.uk/c4mca/mcga07-home/emergencyresponse/mcga-receiverofwreck/mcga-protectedwrecks/mcga-protectedwrecks-ancient.htm> - Wrecks designated as Scheduled Ancient Monuments.

<http://www.treasuretrovescotland.co.uk/> – Treasure Trove Unit.

<http://www.cornwall.gov.uk/index.cfm?articleid=39985>) – English Heritage – Historic Seascape Characterisation project.

<http://www.english-heritage.org.uk/server/show/nav.18776> - *Seeing the History in the View: a methodology for assessing heritage significance within views* (2008b).

<http://www.un.org/Depts/los/index.htm> - The United Nations Convention on the Law of the Sea 1982.

<http://conventions.coe.int/Treaty/en/Treaties/Html/143.htm> - the Valletta Convention.

<http://conventions.coe.int/Treaty/en/Treaties/Html/176.htm> - the European Landscape Convention 2000.

<http://unesdoc.unesco.org/images/0012/001260/126065e.pdf> - the UNESCO Convention on the Protection of the Underwater Cultural Heritage 2001.

4 SUBMERGED PREHISTORIC ARCHAEOLOGY

(http://www.nhm.ac.uk/hosted_sites/ahob/AHOB1/index_2.html) - Ancient Human Occupation of Britain (AHOB) project.

http://www.iaa.bham.ac.uk/research/fieldwork_research_themes/projects/North_Sea_Palaeolandscapes/ - *North Sea Palaeolandscapes* – Institute of Archaeology and Antiquity and the Department of Geography, Earth, and Environmental Sciences at the University of Birmingham.

<http://www.science.ulster.ac.uk/cma/slan/introduction.htm> - The Submerged Landscapes Archaeological Network (SLAN).

<http://www.hwtma.org.uk/projects/bouldnor/index.htm> - Hampshire and Wight Trust for Maritime Archaeology (HWTMA) - Bouldnor Cliff.

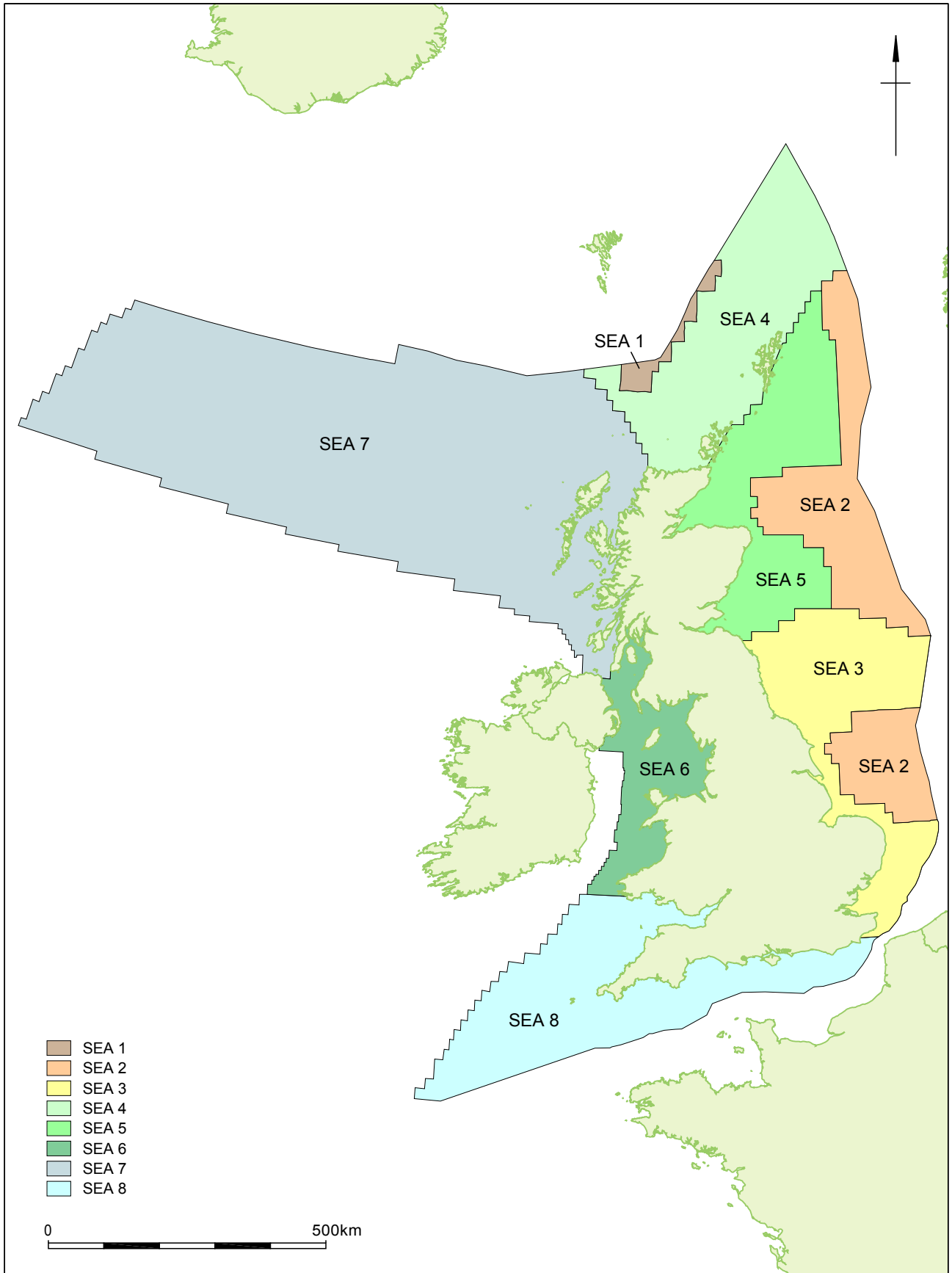
5 MARITIME ARCHAEOLOGY

http://www.bournemouth.ac.uk/caah/marineandcoastalarchaeology/swash_channel_wreck.html - Bournemouth University, Swash Channel Wreck

www.hertsheritage.org.uk/transport/pkboat.htm - St Albans logboat – oldest boat discovered in the UK.

<http://www.dover.gov.uk/museum/boat/trade.asp> - Dover boat

<http://www.vocshipwrecks.nl/> - Dutch East Indiamen



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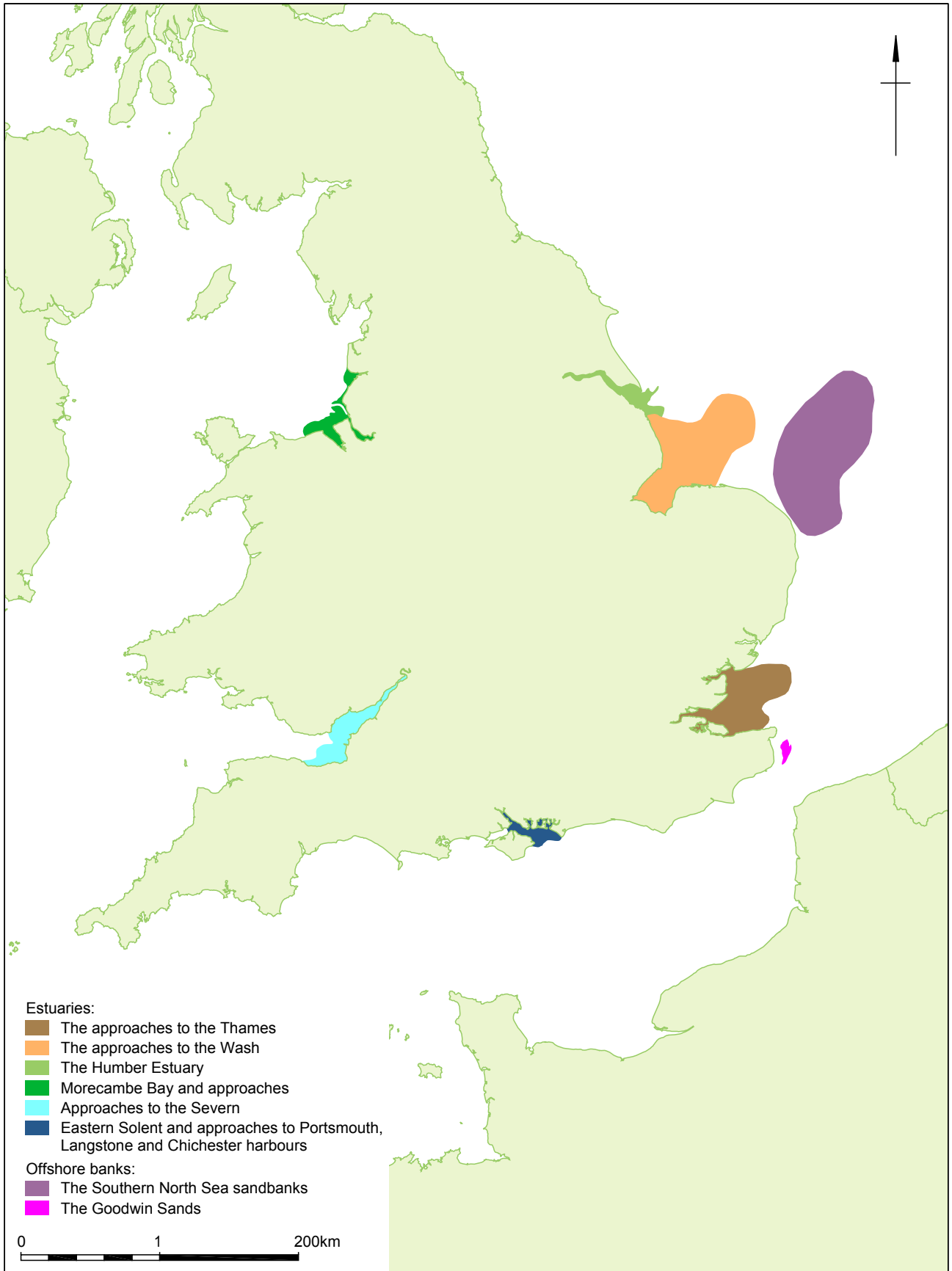
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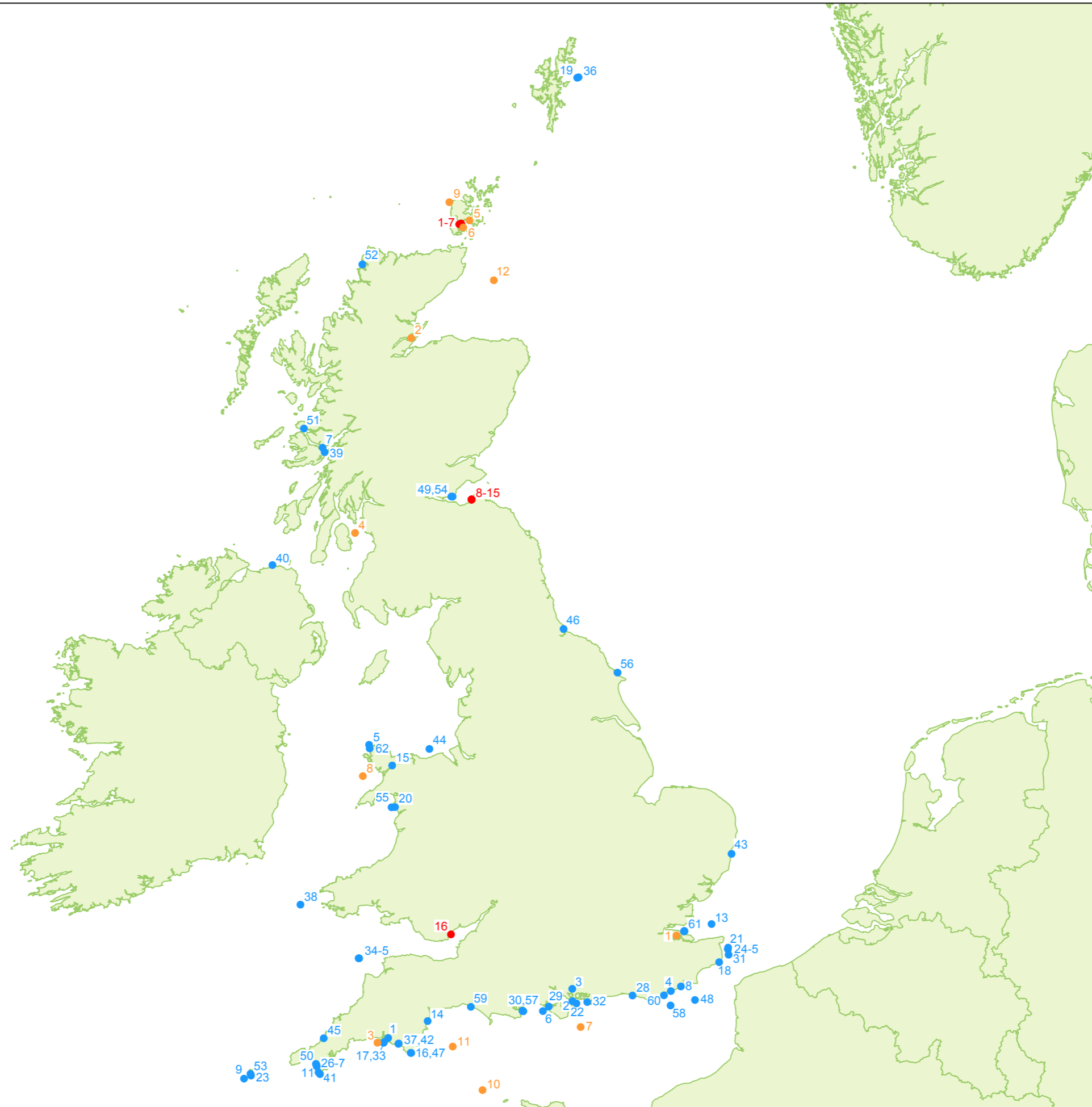
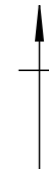
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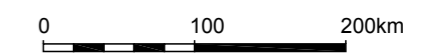
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- Designated Controlled Sites
- Maritime Scheduled Monuments
- Protection of Wrecks Act Sites

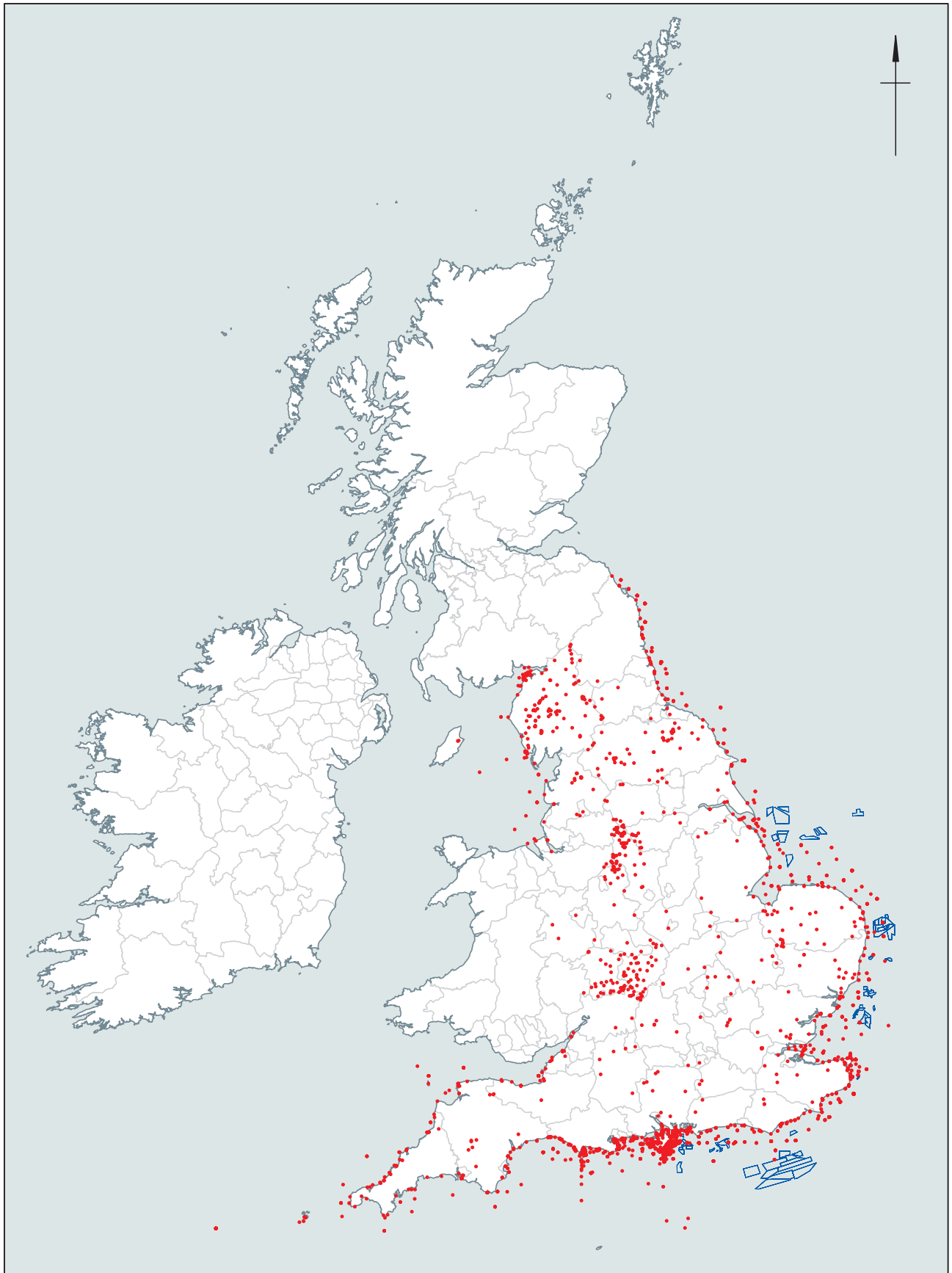



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Location of protected wrecks

Figure 3



	Digital Map Data © (2004) XYZ Digital Map Company This material is for client report only © Wessex Archaeology. No unauthorised reproduction.			
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Known aircraft crash sites (NMR/SMR/HER data)

Figure 4



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Plate 1: Selection of handaxes recovered from the North Sea and reported through the BMAPA/EH Protocol. These illustrate human activity in now submerged areas.



a: Vc1, palaeo-channel infill core



b: VC17



c: VC17, flood couplets



d: VC3, angled peat



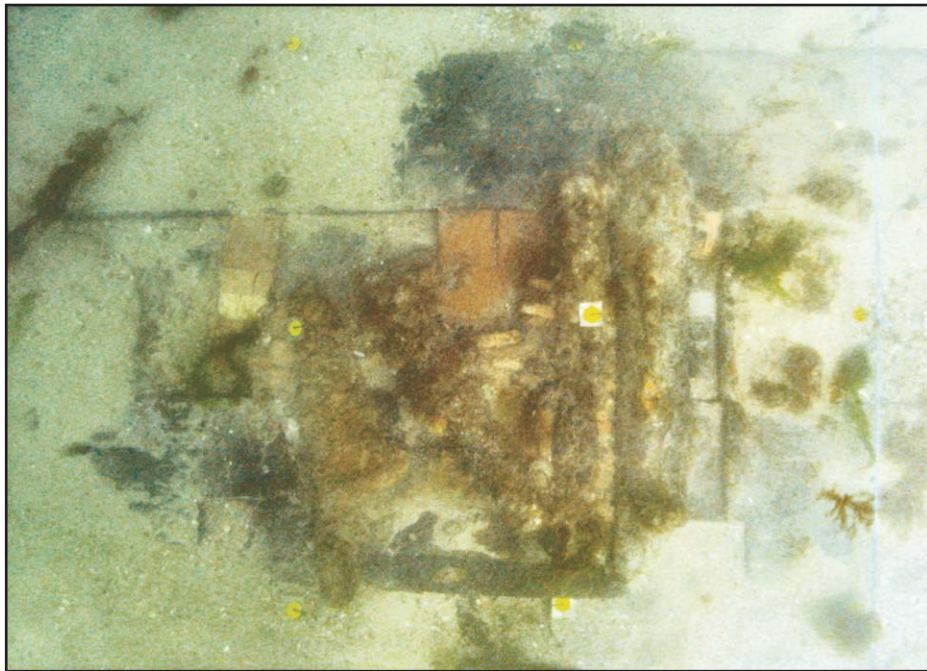
e: Vc3, wider palaeo-valley edge core



f: VC3, peat



a: South-west edge of Area 1 showing the upward curve of the structure



b: Trench 2 (plan view)

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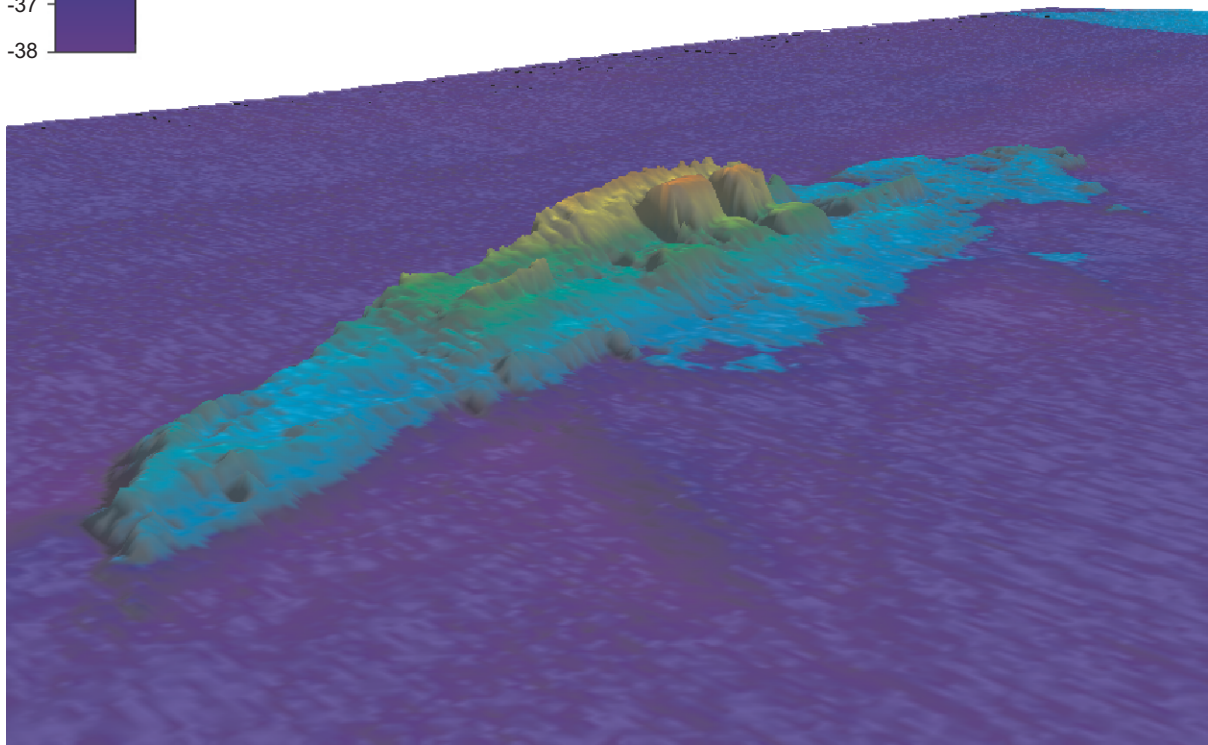
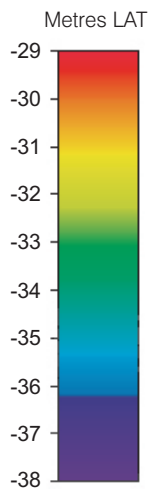
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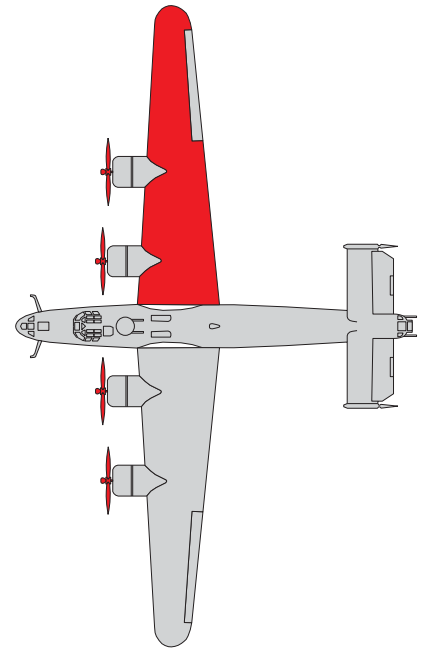
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Plate 4: Wreck of the Mendi. Modern shipwrecks can illustrate complex issues, this World War I troopship highlighted the potential for relatively modern wrecks to have an archaeological, historical and social value beyond that generally assumed.



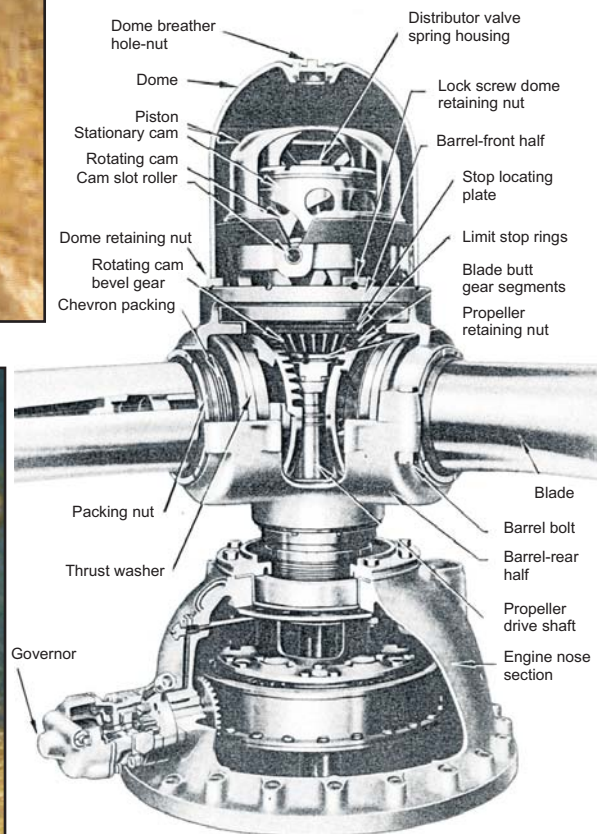
a: Leading edge on wing 1, front view.



b: Leading edge on wing 1 top view.



c: Propeller on engine 1.



d: Illustration of propeller reproduced from Consolidated B-24 Liberator technical manual.

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Plate 6: Aircraft remains, and human remains associated with aircraft finds, reported through the BMAPA/EH Protocol.