# Historic Environment Guidance for the Offshore Renewable Energy Sector

Wessex Archaeology

Prepared by Wessex Archaeology Ltd for COWRIE
January 2007

COWRIE

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# Executive Summary

Wessex Archaeology Ltd was commissioned by COWRIE Ltd. to produce a generic guidance note on the survey, appraisal and monitoring of the historic environment during the development of offshore renewable energy projects in the United Kingdom. The guidance is applicable to the marine environment, which comprises the UK Territorial Seas and Renewable Energy Zone (the area adjacent to the territorial waters within which renewable energy schemes can be installed). It also applies to the coastal environment adjacent to any development, encompassing the inter-tidal area, coastal margin and those areas further inland likely to be affected by offshore renewable energy developments.

The guidance note incorporates the results of a desk-based review of existing guidance and other sources of information relating to the survey, assessment and monitoring of the historic environment during offshore development. It builds upon similar guidance developed for the marine aggregates industry (BMAPA/English Heritage, April 2003).

The guidance note is intended to promote the development of best practice in relation to the marine historic environment for the offshore renewable energy sector. It is also intended to promote an understanding of the conservation issues arising from the impacts of offshore renewable energy projects on the historic environment, and in this way develop capacity amongst developers, consultants and contractors.

The guidance note is aimed at all:

- the offshore renewable energy sector;
- environmental consultants involved in offshore renewable energy development;
- archaeological consultants and contractors involved in offshore renewable energy development;
- regulatory authorities and bodies;
- national and local curators; and
- the wider public.

Wessex Archaeology Ltd has attempted to structure the document in a manner which provides a logical narrative, and which reflects the stages at which archaeological considerations have to be addressed.

References to other sources of information are included in the text where applicable, and an extensive list of further reading and key documents is included at the end of the document.

## The importance of the historic environment

The United Kingdom has been inhabited at various times during the last 700,000 years by modern humans and their predecessors. The evidence of this inhabitation forms a rich and diverse national asset that is often described as the historic environment.

The attractive natural resources to be found along waterways and around the coast meant that much past human activity was centred on these areas of the landscape through seafaring and other maritime activities, or by living at and using the coast. In addition, lower sea levels relating to glacial periods resulted in the exposure of areas of the seabed, creating habitats that were exploited by humans. Potentially rich deposits of prehistoric archaeological and palaeoenvironmental material can therefore be expected on and beneath the seabed and coastal margins of the UK.

The importance and potential of the UK's marine historic environment, as part of the wider historic environment, is clearly understood, as is the need to protect it. However, the content, area by area, of marine historic environment of the UK is often largely unknown and as yet poorly documented, and the need for primary survey and research is widely accepted.

## Fundamental principles applicable to archaeological sites and remains

The artefacts, sites and deposits that make up the marine and coastal historic environment are fragile and non-renewable, and to ensure their conservation a number of general principles are applicable to these sites and materials. These are:

- The use of the precautionary principle, the aim of which is to prevent damage to sites and material by proactively putting in place protective measures, rather than having to attempt to repair damage after it has occurred.
- The assumption that archaeological sites should be subject to as little disturbance as

possible, and should preferably, be preserved *in situ*.
- The requirement, where preservation *in situ* is not practicable or reasonable, for disturbance to be offset by appropriate and satisfactory provisions to mitigate the effects of disturbance.
- The requirement to create and deposit an accessible archive of the results of all archaeological investigations to ensure the 'preservation by record' of this non-renewable resource.

## Range and types of site

In terms of the range of site types that are likely to be affected by offshore renewable energy developments, shipwrecks enjoy perhaps the highest public profile. Watercrafts have probably been used in UK waters since the Mesolithic period and records exist for more than 30,000 maritime casualties in UK waters.

Other evidence of millennia of human coastal and maritime activity includes fish traps, salt-making sites, the remains of inundated or eroded settlements, reclamation and flood defence works, military infrastructure, wharves and hards, shipbuilding sites, and navigational features.

Prehistoric material can be found re-deposited in sands, gravels and other sediments laid down by former rivers as well as *in situ* on former land surfaces and within fine-grained and peaty deposits.

## Impacts and effects upon the historic environment

The impacts of offshore renewable energy schemes on the historic environment arise from the construction of foundations for turbines and other infrastructure, and from laying power and control cables. Primary impacts include cable ploughing, piling and excavation, whilst construction vessels may have secondary impacts when jacking-up or anchoring.

Similar impacts can be expected closer to shore and within the inter-tidal zone where the sites and materials comprising the historic environment are likely to be particularly dense and complicated. On coastal land, activities associated with cable laying and with the construction of shore-side infrastructure are likely to be the principal causes of impact.

The clearest effects of offshore renewable energy developments are those that are direct, where the primary footprint of a development impact coincides wholly or partly with the footprint of an archaeological site or deposit. Indirect effects may arise where the direct impact has effects beyond its primary footprint, implicating archaeological sites or deposits that lie some distance away. Cumulative effects are individually minor but collectively significant incremental changes or effects that result from a scheme in combination with other developments and activities in the same area and are likely to manifest themselves in the medium or long-term.

The non-renewable character of the historic environment is such that physical impacts and their effects are usually permanent and negative, especially in respect of physical remains in their original context. Positive effects may be identified if a scheme can consolidate or safeguard sites that would otherwise have been disturbed. Excavation, recording, conservation of artefacts and structures, and the deposition of a publicly-accessible archive may also be seen as positive outcomes, but they have to be gauged against the underlying principle that preservation *in situ* is preferable. Analysis, publication and other forms of dissemination to scholarly and more general audiences can be seen as positive effects because they create new knowledge and awareness that can help to offset physical destruction. The effects of a scheme upon the historic environment must be considered in the environmental impact assessment and planning of the scheme, and measures put in place to mitigate adverse effects.

## Landscapes, seascapes and 'setting'

It is increasingly recognised that the entire form of our present environment, even features whose main processes are entirely natural, has been structured by human actions and perceptions. The concepts of 'setting', 'landscape' and 'seascape' are becoming increasingly important considerations in addressing the effects of schemes on the

terrestrial and marine historic environments, and their application is being developed as part of the assessment process throughout the UK.

## Archaeology and the development process

The historic environment is best dealt with through a process which is most effective when it is woven through the other strands of any scheme or development. The process-based character of development-led archaeology has become recognised in the following series of well-established stages:

- archaeological appraisal;
- desk-based assessment;
- archaeological field evaluation;
- mitigation;
- monitoring;
- post-fieldwork assessment;
- analysis;
- publication and dissemination;
- archive preparation and deposition.

The relation between the stages of the archaeological process and the stages of development can vary according to the development and the scope of each archaeological stage.

It has become clear to archaeologists and developers alike that consideration of the historic environment should start early in the development process and be maintained throughout. The early advice of national and local curators will be important in establishing the content and timing of these stages.

Adherence by developers to archaeological processes will help to identify, quantify and avoid risks to the scheme arising from the historic environment.

## Sources of archaeological advice and information

There is a wide variety of sources of archaeological advice and information available to offshore renewable energy developers.

The regulatory authorities that decide whether consent is to be granted are advised, in respect of the historic environment, by national archaeological curators and by archaeological curators in local authorities.

The curators are a key source of advice for developers in respect of the marine elements of each scheme and it is strongly advised that developers consult the relevant curators as early in any project as possible, preferably not later than the scoping phase, and maintain regular communication with the curator thereafter. Within the EIA process, curatorial authorities will also provide developers with scoping advice where requested, and will engage in subsequent discussions about the conduct of EIA, the results of investigations, and the appropriateness of possible mitigation measures.

Archaeological curators will not carry out any of the archaeological studies or investigations that contribute to EIA. The developer will be responsible for carrying out such studies, usually by commissioning an archaeological contractor or consultant. Developers should ensure that the archaeological consultants/ contractors they use have skills and knowledge appropriate to advising on offshore renewable energy schemes.

A range of primary and secondary sources of information about the historic environment is available from sources such as the National Monuments Record, local authority Historic Environment Records, the UK Hydrographic Office, the Receiver of Wreck, and national and local museums.

Developers themselves hold important primary data about the historic environment in the form of the geophysical and geotechnical data they acquire as part of the engineering and EIA process.

Other sources of information are available and developers should be guided in this regard by the archaeological consultant/contractor.

## EIA

Environmental Impact Assessment (EIA) requires consideration of the historic environment. Consequently, decisions regarding consent, and any conditions that are to be attached to such consent, can be expected to take account of any likely significant effects on

the historic environment identified by EIA, including the mitigation that is proposed.

The detail of the regulatory route being taken in respect of an offshore renewable energy scheme will be important in identifying the relevant archaeological curators. It is especially important to note that a combination of both national and local curators is likely to become involved, each with their own remits. Moreover, multiple national and local curators might be involved because schemes traverse territorial boundaries, because of regional arrangements, and because of thematic specialisms (e.g. built historic environment, terrestrial archaeology, maritime archaeology).

The detail of the consent processes is also likely to be important in correlating relevant guidance and policies in respect of the historic environment, and in identifying possible stakeholders and consultees. An understanding of the specific remits of archaeological curators may also help in structuring historic environment elements of the Environmental Statement, so that aspects of the baseline, assessment of effects and proposed mitigation reflect their particular involvement.

The refinement of, or changes to scheme details will affect their archaeological assessment as much as any other study, so it is essential that developers keep their archaeological consultants/contractors appraised of changes in a timely fashion.

Early integration of archaeologists within the development team will help to identify the added value that can be achieved in respect of the historic environment through reference to other studies being carried out as part of the EIA process.

There are a number of options for incorporating the historic environment within the Environmental Statement, and this should be viewed as an important consideration in designing the EIA. The conduct of EIA will probably be speedier if, at the outset, the developer, the consultants preparing the ES and any specialist archaeological consultants have a clear understanding of the structure that the ES is to take.

Several commentaries have noted that it is essential that the methodology used in various elements of the EIA process is made explicit, including the use of terminology. Clear expositions of the methodologies that are adopted for gauging the magnitude of impacts on the historic environment, importance of archaeological receptors, significance of effects and so on are likely to be a key factor in achieving an adequate EIA.

## Scoping

Developers of offshore renewable energy schemes should anticipate that the historic environment is likely to be identified as a key issue by the scoping exercise, although the detail will depend on the nature of the project, its location and its environment.

Although archaeological appraisal by the curators is likely to be prompted by the scoping report, there is nothing to stop developers from contacting curators pre-scoping for informal advice.

Whether an archaeological contractor/consultant is employed at the scoping stage or subsequently, the developer and their environmental and engineering team should establish at an early stage the expected scope of communication between their archaeological contractor/consultant and the archaeological curators.

The scoping phase also represents an opportunity for developers to integrate their archaeological contractor/consultant within their overall environmental and engineering team.

## Baseline studies

The coarse nature of much of the information relating to the marine historic environment often makes it appropriate to define relatively broad Study Areas for the baseline study.

Where available, reference should be made to Strategic Environmental Assessments, marine Historic Landscape Characterisation or other regional overviews, rather than seeking to write the entire history of a sea area.

The baseline study should identify all the known elements of the historic environment that may be impacted by the scheme, the most obvious of which are likely to be the sites that are subject to statutory or planning designation, or other forms of quasi-legal registration, including Protected Wrecks, Scheduled Monuments, Listed Buildings, Conservation Areas and so on. There are also likely to be a considerable number of other wrecks, monuments and findspots whose locations are known more or less precisely.

Beyond this 'known' archaeological heritage, the marine and coastal historic environment is characterised by a far wider 'potential' heritage. This is taken to mean features and sites that are likely to be present, but which have not yet been found, and which will be as susceptible to significant effects as the 'known' heritage. Potential sites will encompass the full range of periods and site types, from wrecks to coastal structures to submerged prehistoric sites. Geophysical and geotechnical surveys can play a large part in reducing potential by establishing the actual presence or absence of sites within an area, and by refining the extent of further 'potential'.

## Importance

Baseline studies will have to ascribe importance to both the 'known' and 'potential' archaeological heritage as a basis for the subsequent assessment of significant effects. Even where elements of the historic environment are 'known' it can be difficult to ascribe importance, partly because the character of a 'known' feature will often be obscured because it is buried, and partly because the archaeological importance of any feature is rooted in the intellectual enquiries of the discipline. For many archaeological sites, their importance will depend on what is brought to them by investigation.

There are a number of schemas available for ascribing importance to archaeological sites, and baseline studies should be transparent and consistent in bringing these to bear. It should be noted that references to different forms of designation as a proxy for importance, as is common in respect of species and habitats, will not suffice in an archaeological context.

## Survey design

Geophysical and geotechnical data gathered for offshore renewable energy schemes as part of the design process or to inform EIA topics such as seabed ecology are very important to assessing the effects of offshore renewable energy schemes on the historic environment.

To enable these surveys to provide data that supports historic environment analysis, it is important that archaeological objectives are an integrated component of planning geophysical and geotechnical surveys from the outset. Early consultation between the developer and archaeological curators, preferably including the developer's archaeological consultant/ contractor and geophysical or geotechnical contractor, is therefore essential.

Ideally, geophysical and geotechnical surveys should be informed by prior desk-based studies, which should have identified known features and key deposits that can then be targeted. Equally, the overall historic environment baseline should incorporate the results of geophysical and geotechnical surveys, so the subsequent assessment is based as firmly as possible on data relating to the site, rather than on broader generalisations from existing records and secondary sources.

Surveys should be carried out to a single datum and co-ordinate system. All survey data, including navigation, should be acquired digitally in industry-standard formats. Care should be taken to maintain the orientation and attitude of sensors on line. Trackplots should be corrected for layback and made available in digital (GIS) form.

## Geophysical and geotechnical data

Sidescan sonar survey should be carried out at frequency, range and gain settings capable of resolving all objects that have a relief of more than 0.5m above the seabed throughout the survey area.

For archaeological purposes, true sidescan is preferable to multibeam pseudo-sidescan. Sidescan sonar data should be made available in the form of raw, un-mosaiced files in a suitable proprietary format.

Magnetometer survey should be carried out using a caesium gas or equivalent system capable of resolving anomalies of 5 nanoTeslas and above.

Multibeam survey should be carried out using a system capable of achieving an effective cell/ bin size better than 1m. Use of a beam-forming system is preferred.

Sub-bottom (shallow seismic) survey is likely to be the most productive tool in seeking to understand the prehistory of the seabed, as it can show the deposits, cuts and surfaces of the previous architecture of the land, and of the sequences through which it changed. Survey line and cross-line spacings and orientations should be sufficient to resolve the extents and characteristics of the principal Quaternary deposits.

Ideally, shallow seismic survey should be supported by borehole or vibrocore surveys, to confirm the sediments that have given rise to the acoustic reflections seen using geophysics. Archaeological interest in boreholes and vibrocores will be confined to Quaternary deposits, especially fine-grained material indicative of low energy deposition, and peaty horizons indicative of vegetated land surfaces.

Sediment horizons that have been identified as being of archaeological interest on the basis of geophysical data and/or geotechnical engineering logs should be targeted by the archaeological assessment of borehole and core samples, or by the recovery of further borehole or vibrocores.

## Assessing effects

The coincidence of development activities and the known and potential archaeological heritage can be established by mapping the footprint of the scheme onto the results of the baseline study. The assessment of the significance of the resultant effects will usually be carried out by correlating impacts upon receptors with the importance of the receptor.

Classifications of importance, impact and the significance of effect, combined within a matrix offer a transparent methodology, and may also enable cross-correlation with effects arising from other environmental topics. However, many such schemes have been designed for dealing primarily with other environmental topics and their application to the historic environment may be inappropriate. More qualitative, textual descriptions of effects may be more sympathetic to the characteristics of the historic environment and to the current state of knowledge and understanding, and will result in an assessment that is more adequate overall.

Where effects are assessed, it should be made clear whether the assessment is without mitigation, or whether it assumes the implementation of the mitigation proposed in the Environmental Statement (ES).

EIA should identify beneficial effects as well as adverse effects. For the historic environment, beneficial effects such as improved access or the contribution to new knowledge that arises from investigation are likely to depend on the implementation of mitigation measures. As above, beneficial effects that have been designed-in to the scheme can be highlighted, but beneficial effects that are subject to unconfirmed measures should be dealt with more cautiously.

Gaps in data or methodology should be highlighted where uncertainty remains about known or potential sites, about importance, about impacts, or about effects.

## Mitigation

Mitigation can take place at various stages during the project life and for each scheme will be based primarily on the measures proposed in the EIA. Some mitigation may be implemented pre-submission or pre-consent. There may be a requirement to implement mitigation measures, such as exclusion zones around archaeological sites and features, during the project design stage. Other measures may be required during

the construction, operation and decommissioning of a scheme.

Mitigation measures applicable to archaeological sites generally take three forms:

- prevention or avoidance;
- reduction;
- remedying or offsetting.

Government policy and international best practice favour the preservation *in situ* of nationally important archaeological remains. Preservation *in situ* also has a practical advantage to offshore renewable energy developments in that it reduces the risk to the developer of having to support site excavation and removal, and the subsequent stages of investigation (e.g. post-fieldwork assessment and publications).

The avoidance of known sites can be achieved through the implementation of archaeological exclusion zones, which preclude development-related activities within their extents, around either discrete sites or more extensive areas identified in the EIA.

Although the details of mitigation measures will differ from scheme to scheme, two general measures are likely to be encountered among consent conditions. These are the production of:

- a Written Scheme of Investigation (WSI);
- a Protocol for Unexpected Discoveries.

The WSI is a document which sets out when, how and why archaeological mitigation measures recommended in the ES are to be implemented for any given scheme. It is an overall framework for archaeological mitigation and/or monitoring during the construction, operation and decommissioning of the scheme.

Unexpected archaeological material or sites may be encountered during works associated with construction, operation or decommissioning. The Protocol for Unexpected Discoveries is a formal mechanism for intercepting and reporting such accidental discoveries and aims to reduce any adverse effects of the development upon the marine historic environment by enabling the rapid, convenient and effective reporting of discoveries or recovered material by scheme staff.

## Monitoring

The provision made by a developer for implementing mitigation measures will need to include measures to ensure that the implementation is effective.

A programme of monitoring is likely to be included in the WSI, and may include periodic reporting on adherence to exclusion zones and the results of watching briefs. Measures should also be put in place to establish whether indirect, secondary and cumulative impacts occur, and are mitigated, as predicted.

For monitoring to have any value in mitigating significant effects it will have to be accompanied by a scheme of adaptive management. Mechanisms must be put in place to allow the results of monitoring programmes to inform subsequent development activities throughout the construction, operation and decommissioning of the scheme.

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John Gribble and Dr Antony Firth of Wessex Archaeology Ltd compiled this document and Karen Nichols prepared the illustrations. The project was managed for Wessex Archaeology Ltd by John Gribble.

# 1 Introduction

## 1.1 Background

**1.1.1** In recent decades the exploitation of the marine environment of the United Kingdom (UK), particularly seabed resources, has grown rapidly with the development of the offshore hydrocarbon and aggregate extraction industries. Most recently, as part of the Government's commitment to meeting renewable energy targets, the development of offshore renewable energy schemes has added a new dimension to the use of the seabed of the UK.

**1.1.2** Seabed developments of any sort have the potential to have significant effects on the archaeological sites and materials that make up the historic environment. The coast and seabed of the UK are particularly rich in archaeological sites and materials, which need to be considered during the course of any seabed development.

**1.1.3** As part of its work to raise awareness and understanding of the potential environmental impacts of the UK offshore renewable energy programme COWRIE has commissioned this Historic Environment Guidance. The aim of the document is to provide archaeological advice and guidance to current and prospective offshore renewable energy sector developers, thereby promoting best practice and the protection of the marine historic environment.

**1.1.4** It is also worth noting that a valuable contribution to the understanding of the marine and coastal historic environment is made by offshore renewable energy developers as a result of seabed surveys and other data generated during the course of development.

**1.1.5** This guidance document has been prepared on behalf of COWRIE and should be read in conjunction with the other sources of information to which it refers. The advice presented here reflects current knowledge and understanding, both of which are undergoing rapid change in relation to the marine historic environment. Also subject to change is the legislative situation, due to reviews of both heritage protection, and the framework of marine management.

## 1.2 The importance of the marine historic environment

**1.2.1** For more than 700,000 years the United Kingdom has been inhabited at various times by modern humans and their predecessors. The evidence of this inhabitation is a rich and diverse national asset that is often described as the historic environment, which includes:

- Direct physical traces of human activity, including human remains and artefacts, activity sites, structures and buildings, the remains of ships and aircraft, and their setting.


**THE MARINE BILL AND THE HISTORIC ENVIRONMENT**

The Government is committed to drafting a Marine Bill to provide a new legislative framework for the seas that will balance conservation, energy and environment needs. The key elements of a Marine Bill are expected to include a system of Marine Spatial Planning, a reformed system for licensing marine activities, improvements to marine nature conservation (including Marine Protected Areas), and the possible formation of a Marine Management Organisation. All of these elements are likely to include new or revised provision for the marine historic environment. The Marine Bill will have the principles of sustainable development at its core, and contribute to the Government's strategic goals for the marine environment, which include increasing 'understanding of the marine environment, its natural processes and our cultural marine heritage and the impact that human activities have upon them' (Defra, 2006).

**HERITAGE REVIEW**

The Government is currently conducting a review of marine heritage protection, which is likely to propose changes to the law in respect of matters such as statutory site protection and the reporting of discoveries. A White Paper that includes a chapter on UK marine heritage is expected in Spring 2007.

- Former land surfaces, deposits and features from which evidence of previous human environments can be interpreted.
- Landscapes and seascapes whose form and meaning have been shaped by human activity.

**1.2.2** Archaeological material from before the last ice age (known as the Devensian Glacial Maximum) occurs in many parts of the UK and can reveal details of human evolution and social development. Stone tools, butchered animal bone, and associated deposits can be found which date to the following periods:

- Lower Palaeolithic (>700,000 to 245,000 Before Present (BP))
- Middle Palaeolithic (245,000 to 50,000 BP)
- Early Upper Palaeolithic (50,000 to 18,000 BP).

**1.2.3** After the retreat of the Devensian ice sheet, which started about 18,000 years ago, the UK was re-inhabited by Late Upper Palaeolithic (12,500 to 10,000 BC), Mesolithic (10,000 to 4,000 BC) and later prehistoric peoples. Since then, there has been a constant human use of the land and the sea, through to the present day.

**1.2.4** As huge quantities of water were taken up in ice sheets by a succession of glaciations during the last 700,000 years, large areas of what is now seabed were exposed as dry land. This provided inhabitable land surfaces that were exploited and utilised by humans. During interglacial periods, and particularly after the end of the last ice age, these landscapes and the archaeological evidence they contained were inundated as the sea level rose. Lying on and beneath the seabed of the UK, therefore, are potentially rich deposits of prehistoric archaeological and palaeoenvironmental material.

**1.2.5** The attractive natural resources found along waterways and the coast meant that much early human activity was centred on these areas of the landscape. As early as 7,500 BC, simple watercraft were being used in and around the UK. The rise in sea level saw the terrestrial link with mainland Europe severed approximately 8,000 BC and since then maritime transport has played a central role in the history and development of the UK. Millennia of seafaring has resulted in vast numbers of shipwrecks in UK waters, the study

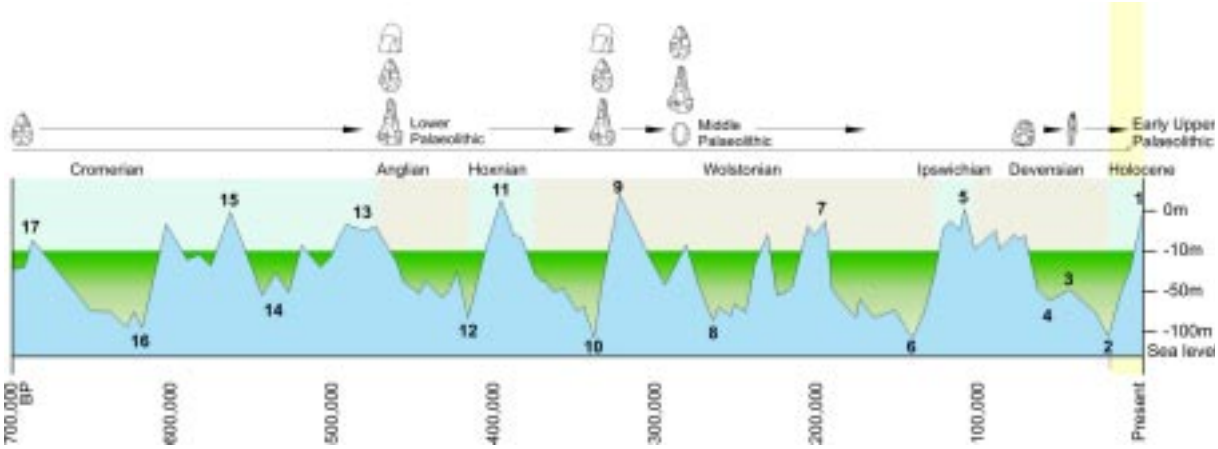



**Figure 1. Lower, Middle and Early Upper Palaeolithic timelines**

For hundreds of thousands of years, much of the seabed around the UK would have formed inhabitable land that would only have been inundated at the peaks of interglacial warm stages. Throughout this time, the principal evidence of human activity is flint hand axes and flakes, which have usually been re-deposited within former river sediments. Recent discoveries are, however, pointing to the continued survival of *in situ* activity sites at the present coast and offshore, complete with butchered bone and a range of palaeo-environmental evidence.

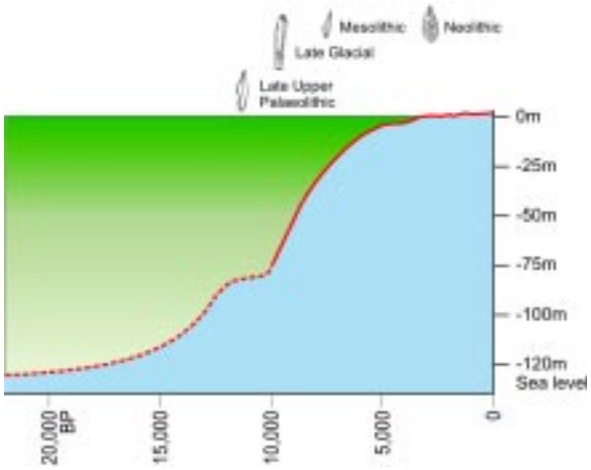



**Figure 2. Late Upper Palaeolithic, Late Glacial Mesolithic and Neolithic timelines**

After the last (Devensian) glacial maximum, the climate warmed and sea-levels rose swiftly. Sea-level was still about 50m lower than today when the UK started to be re-occupied, meaning that the key cultural developments of our predecessors would have taken place on land that is now submerged (curve from Streif, 2004).

of which can provide fascinating insights into trade, communication, combat, technology, industry, economics, and many other aspects of life and society from the Mesolithic to modern times. In the 20th century, the wrecks of more than a thousand aircraft have added to the marine historic environment.

**1.2.6** It is true to say that the marine historic environment of the UK is still largely unknown and as yet poorly documented, and the need for fundamental survey and research is widely accepted. However, the importance and potential of the marine historic environment, as part of the wider historic environment is clearly understood, as is the need to protect it as part of the UK's rich cultural and archaeological heritage.

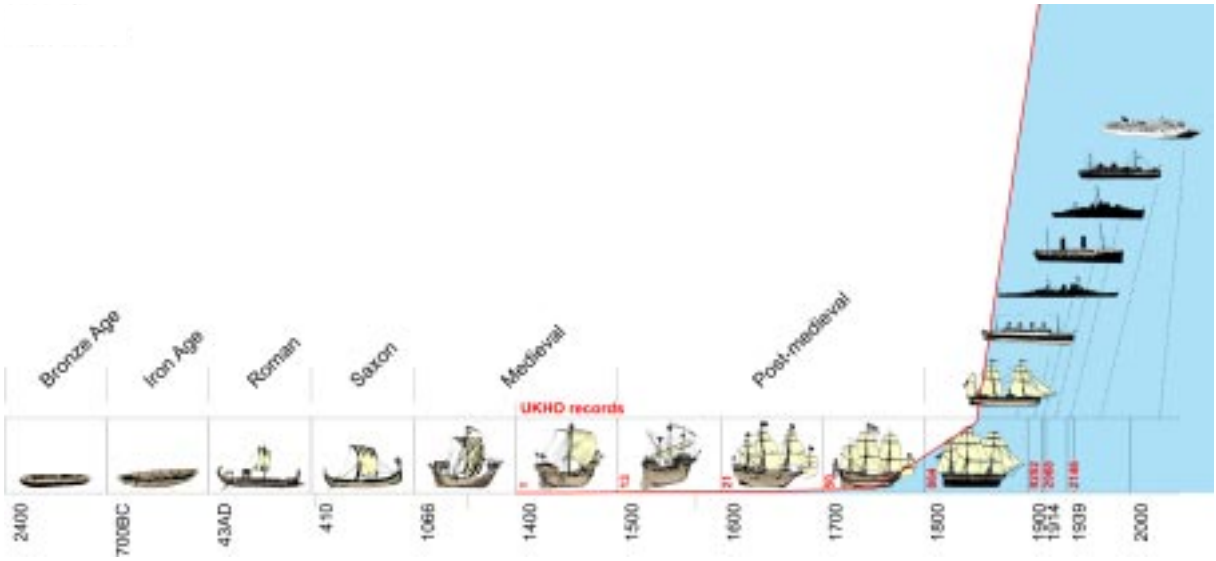



**Figure 3. Maritime timeline**

Although there are very numerous records of ships sunk in the 19th and 20th centuries, the remains of boats and ships dating back to at least the Bronze Age have been found around the coast of the UK.

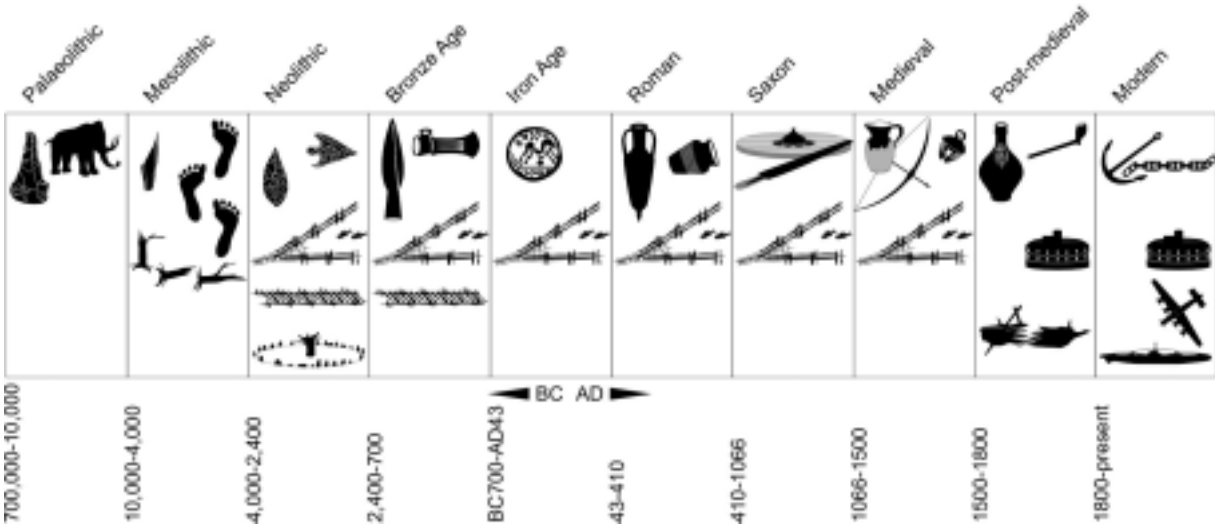



**Figure 4. Coastal timeline**

A very wide range of artefacts and sites are to be found at the coast, often in very close proximity to each other. Animal bone, flint and metal tools, pottery might be just stray losses, or they might point to the presence of denser activity. The waterlogged conditions often found at the coast can lead to the survival of ancient timber structures such as fish traps, trackways and 'Seahenge'. Palaeo-environmental evidence can survive also, including submerged forests, peaty former landsurfaces, and even human footprints. In more recent times, coastal sites include hulked and wrecked ships, military installations and crashed aircraft.

**INSTITUTE OF FIELD ARCHAEOLOGISTS – ARCHAEOLOGICAL PRINCIPLES**

The Institute of Field Archaeologists (IFA) is the professional organisation representing archaeologists and others involved in protecting and understanding the historic environment in the UK. In view of the fact that the archaeological heritage of the UK is a 'finite, vulnerable and diminishing resource' the IFA has adopted a Code of Conduct which sets out professional and ethical standards expected of members.

The fundamental principles of the Code applicable to archaeological involvement in offshore renewable energy development are as follows:

- The archaeologist shall adhere to the highest standards of ethical and responsible behaviour in the conduct of archaeological affairs.
- The archaeologist has a responsibility for the conservation of the archaeological heritage.
- The archaeologist shall conduct his/her work in such a way that reliable information about the past may be acquired, and shall ensure that the results be properly recorded.
- The archaeologist has responsibility for making available the results of archaeological work with reasonable dispatch.

Further information regarding the IFA, and the full text of the Code of Conduct is available at: http://www.archaeologists.net/modules/icontent/

## 1.3 Archaeological principles

1.3.1 The artefacts, sites and deposits that make up the marine and coastal historic environment are fragile and non-renewable. For the whole of prehistory, archaeological material is the only record of human activity on and around these islands. Even in periods for which we have documents, maps and photographs, there is no substitute for the actual physical remains of human action.

1.3.2 Care and attention in the management and protection of the historic environment is essential. This generation is answerable not only to the present, but will also be held to account by future generations for how it manages and protects this heritage. To ensure the conservation of the marine and coastal historic environment a number of general principles are applied by archaeologists whether they are acting as curator, consultant or contractor.

1.3.3 The archaeological principles that animate current UK practice have developed over many years, arising partly from the historical development of archaeology itself, and partly from developments in the environmental and conservation sciences of which archaeology is part. These principles enjoy wide currency, and find particular expression in several international legal frameworks applicable to archaeology generally, and marine archaeology in particular. The guidance provided in this document seeks to give practical effect to these principles in developing offshore renewable energy schemes.

### The precautionary principle

1.3.4 The precautionary principle is one of the key principles shared by the historic environment and other environmental concerns. The principle is highlighted by the UK Government as a mechanism for achieving sustainable development in its strategy document, *Securing the Future* (2005).

**UNITED NATIONS CONVENTION ON THE LAW OF THE SEA (1982)**

Article 303 of the United Nations Convention on the Law of the Sea refers to archaeological and historical objects found at sea and places a duty on signatory States to protect this material.

The full text of UNCLOS is available at:

http://www.un.org/Depts/los/convention_agreements/texts/unclos/UNCLOS-TOC.htm

**UNESCO CONVENTION ON THE PROTECTION OF THE UNDERWATER CULTURAL HERITAGE (2001)**

The UNESCO Convention on the Protection of the Underwater Cultural Heritage created an international legal framework to regulate underwater cultural heritage in domestic and international waters. The Convention also provides that States Party shall use the best practicable means to prevent or mitigate any adverse effects that might arise from activities under its jurisdiction incidentally affecting underwater cultural heritage. 'Activities incidentally affecting underwater cultural heritage' means activities which are not directed at underwater cultural heritage but may physically disturb or otherwise damage underwater cultural heritage nonetheless.

The Annex to the Convention reflects the ICOMOS Charter (see below), setting out rules and standards for conducting marine archaeological investigations.

The Convention has not been signed by the UK, but the UK has signalled its support for many of the principles set out in the Convention, including the rules set out in the Annex.

The full text of the Convention is available at: http://www.unesco.org/culture/laws/underwater/html_eng/conven2.shtml

**THE ICOMOS CHARTER (1996)**

The ICOMOS Charter on the Protection and Management of Underwater Cultural Heritage aims to encourage the protection and management of underwater cultural heritage in inland and inshore waters, in shallow seas and in the deep oceans and is a response to the peculiar attributes and circumstances of underwater cultural heritage.

The Charter attempts to provide decision-makers, such as curators, and archaeologists with criteria for assessing and managing marine archaeological projects, and is important as a statement of international best practice with regard to the investigation of underwater cultural heritage.

The full text of the Charter is available at: http://www.international.icomos.org/under_e.htm

**1.3.5** In relation to the historic environment, the application of this principle by the offshore renewable energy sector will result in development activities being planned and implemented on the basis of the careful evaluation of available evidence regarding the historic environment, whilst acknowledging areas of uncertainty and being responsive to increased knowledge about the historic environment. The precautionary principle should be applied when, on the basis of the evidence available at the time of decision-making:

- there is good reason to believe that the historic environment may be subject to harmful effects; and
- the level of scientific uncertainty about the consequences or likelihood of these effects is such that risk cannot be assessed with sufficient confidence to inform decision-making.

**1.3.6** The aim of the application of the precautionary principle is the prevention of damage to the environment by proactively putting in place protective measures, rather than having to attempt to repair damage (which may be irreversible) after it has occurred.

## *In Situ* preservation

**1.3.7** As a general rule, archaeological sites should be subject to as little disturbance as possible, and should ideally be preserved. Government policy (Securing the Future (2005) and PPG 16) sets out a presumption in favour of the preservation *in situ* of nationally important archaeological remains. The same principle is central to a number of international archaeological conventions such as the Valletta Convention (see text box). Avoidance of sites and material should therefore be the preferred means of mitigation in offshore development contexts.

**1.3.8** Where preservation *in situ* is not practicable it is an accepted principle of national and international policy that disturbance of archaeological sites or material should be offset by appropriate and satisfactory provision to mitigate the effects of disturbance. This practice, sometimes referred to as 'preservation by record' often comprises excavation, recording, recovery of artefacts, structures and or samples, and analysis. Such work also entails archiving and publication (see below).

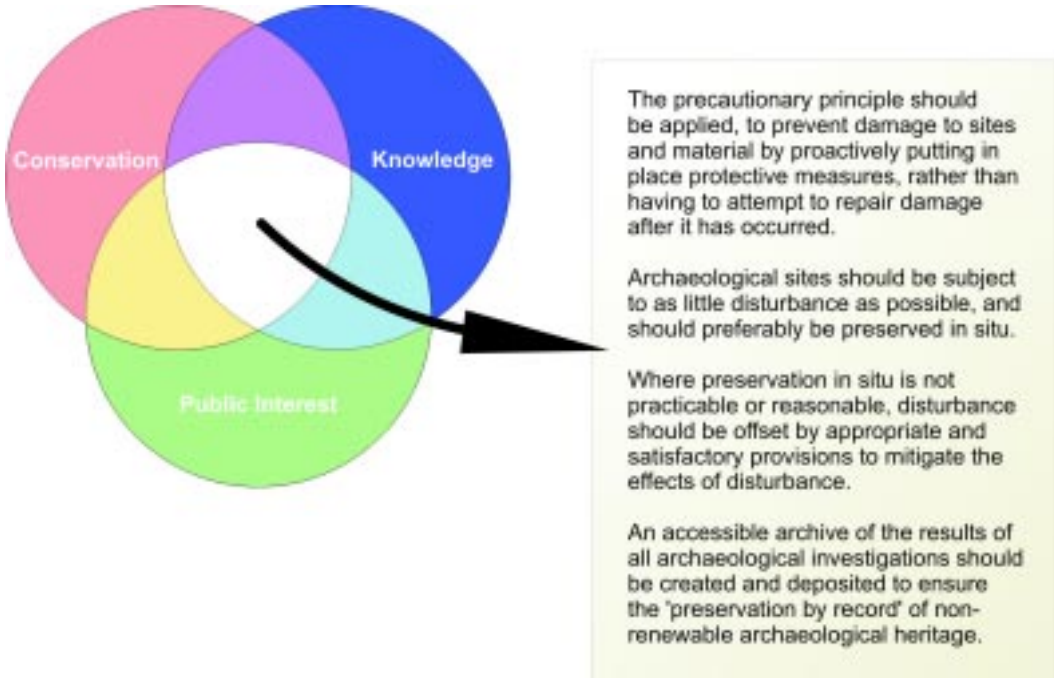



**Figure 5. Key principles**

Archaeology combines the pursuit of knowledge with the conservation of physical evidence, all within a public arena. This has given rise to a series of key principles that inform archaeology in the development process.

## ‘Polluter pays’ and developer-funding

**1.3.9** The ‘Polluter pays’ principle is the premise that whoever causes pollution or environmental damage should be responsible for making good the damage. In archaeology, the principle takes effect through developer-funding, whereby archaeological investigations that are instigated by schemes proposed by a developer are funded by that developer. Developer-funding encompasses all aspects of investigation and its consequences, including analysis, conservation, archiving and publication.

## Archives and publication

**1.3.10** As archaeological sites and materials are non-renewable and all intrusive archaeological investigations are essentially destructive, ‘preservation by record’ is only effective if the resulting record is returned to the public arena by dissemination. The responsibility to disseminate archaeological results arises directly from involvement in the investigative process.

**1.3.11** Archives are generally understood to comprise the entire archaeological record resulting from investigation. This includes the material archive of finds and objects, and all associated documents and survey data, whether written, drawn or photographic, in hard copies or in electronic format.

**1.3.12** Dissemination is understood to include the deposition of an archive of the results of the assessment, evaluation, mitigation and/or monitoring works, prepared according to current professional standards and deposited with a registered museum. It is only through such practice that the destructive effects of development, and of investigations prompted by development, can be considered to have been mitigated.

**1.3.13** In addition, there is a responsibility to ensure that where the results of any work are considered to be substantial contributions to archaeological knowledge, theory, method or technique that these are disseminated through publication. Publication ensures that information and results are made available to a wide audience, both professionally and among the general public.

**THE VALLETTA CONVENTION (1992)**

The European Convention on the Protection of the Archaeological Heritage was signed at Valletta in 1992. It was ratified by the UK Government in 2000 and came into force in 2001.

The Convention contains provisions, amongst others for the identification, protection and integrated conservation of archaeological heritage, whether situated on land or under water, and promotes high standards for all archaeological work.

The Convention makes the conservation and enhancement of the archaeological heritage one of the goals for planning policies for signatories, and sets guidelines for the funding of archaeological work and the dissemination of the results of this work.

The provisions of the Convention reflect current practice in the UK with regard to the protection and recording of archaeology during development. In particular, Articles 5 and 6 contain provisions applicable to the funding of development-led archaeology – the concept of ‘user pays’ – whilst Articles 7 and 8 deal with the collection and dissemination of information generated by archaeological work.

The full text of the convention is available at:

http://www.coe.int/t/e/cultural_co-operation/heritage/archaeology/2Convention.asp

**1.3.14** It is important that developers recognise from the outset that they will be responsible for creating and depositing an archive of the results of archaeological investigations that stem from their development, and that they will also have to provide for publication of significant discoveries or investigations. Even where no damage has been incurred, there is likely to be an extensive archive arising from the archaeological assessment of development proposals, including geophysical and geotechnical data and the results of desk-based studies. Arrangements for the deposition of the archive – including material, digital and hard copy elements – should be made with an appropriate repository at an early stage.

## Public interest

**1.3.15** The historic environment is the cultural patrimony of the people of the UK. As such, seabed developers have a responsibility to ensure that their activities do not unduly damage or compromise this national asset. The public interest is also protected by transparency in the development process and engagement with the public during the consent process, and subsequently by adding archaeological results to national and local records.

# 2 Possible Effects of Offshore Renewable Energy Development on the Marine and Coastal Historic Environments

## 2.1 Overview

**2.1.1** The clearest effects of offshore renewable energy developments are those that are direct, where the primary footprint of a development impact coincides wholly or partly with the footprint of an archaeological site or deposit. The direct impacts related to the construction, operation and decommissioning of offshore renewable energy schemes can therefore include:

- Direct damage to structures, features, deposits and artefacts.
- The disturbance or destruction of relationships between structures, features, deposits and artefacts, and their wider surroundings.

**2.1.2** Indirect effects may arise where the direct impact has effects beyond its primary footprint, implicating archaeological sites or deposits that lie some distance away. In the marine and coastal environment, water quality, currents and sediment transport may transmit the effects of a development to elements of the historic environment lying a considerable distance from the immediate footprint of the scheme. Seabed scour around foundations or cables, changes to local current patterns, or changes to sediment movement may have impacts beyond the immediate area of the construction activities. While these effects are harder to predict than direct impacts, it should be possible to identify them during the Environmental Impact Assessment through the integration of the archaeological assessment with other studies such as coastal processes, for example.

**2.1.3** Effects can also arise from secondary impacts, that is to say, from activities that occur as part of the development process but might not be considered to be part of the development as such. Examples might include anchorages for construction vessels, or access roads and compounds for the installation of onshore cables.

**2.1.4** The direct, indirect, primary and secondary effects of development on the historic environment are usually negative, especially in respect of physical remains in their original context. Positive effects may be identified if a scheme can consolidate or safeguard sites that would otherwise have been disturbed. Excavation, recording, conservation of artefacts and structures, and the deposition of a publicly-accessible archive may be seen as positive outcomes, but they have to be gauged against the underlying principle that preservation *in situ* is preferable. Analysis, publication and other forms of dissemination to scholarly and more general audiences can also be seen as positive effects because they create new knowledge and awareness that can help to offset physical destruction.

**2.1.5** The non-renewable character of the historic environment is such that physical impacts are usually permanent. The positive effects of investigation and recording will be temporary unless proper provision is made for archive deposition and publication.

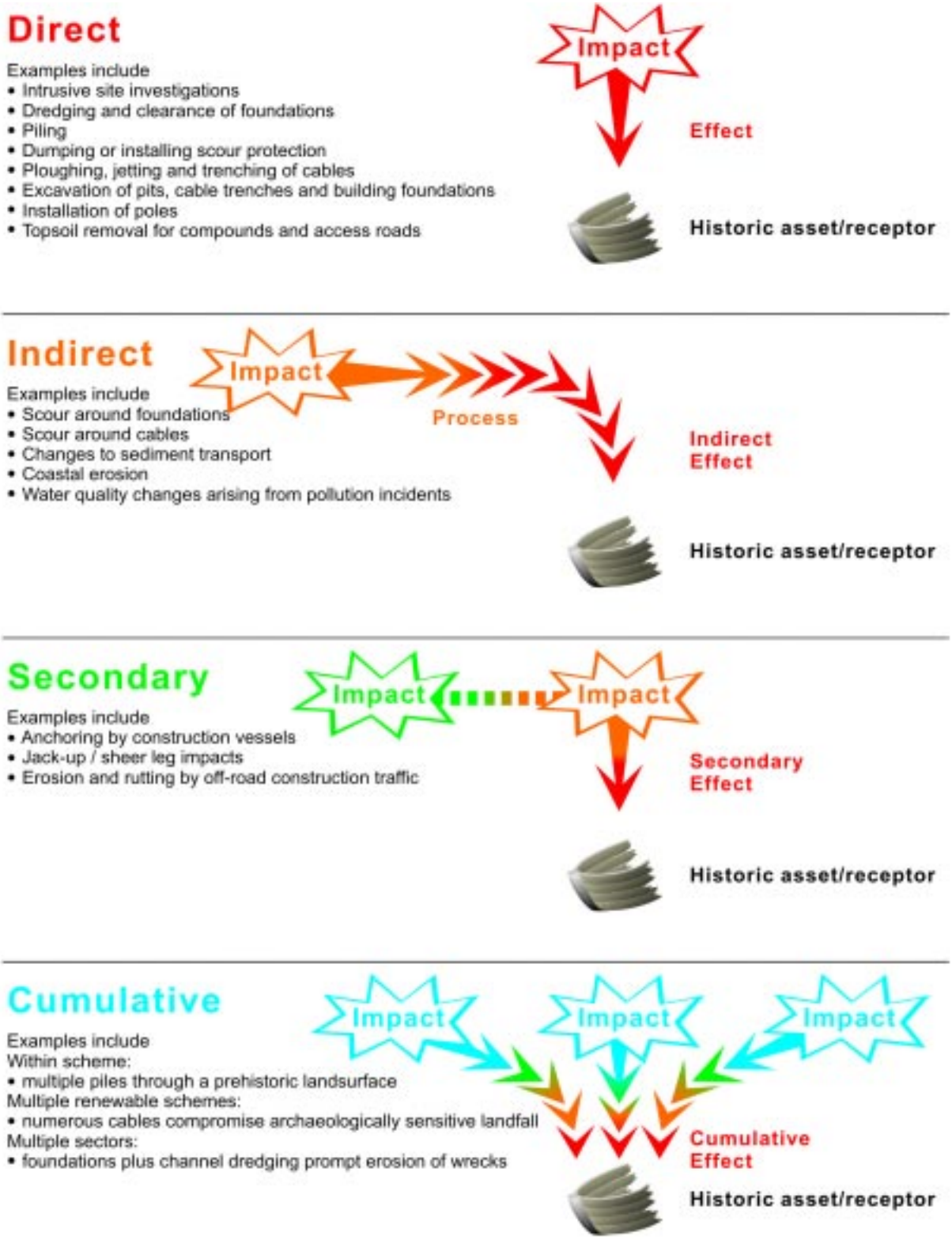



**Figure 6. Effects**

Different types of effect can arise from impacts attributable to offshore renewable schemes, which can be categorised in terms of the pathways that are taken.

**2.1.6** Physical impacts on the historic environment are often of short duration. Effects arise immediately and catastrophically from construction if no provision has been made for mitigation. Where construction has impacted only a part of an archaeological site or feature (by piling, for example), medium or long term effects may occur in respect of the material that had hitherto survived the immediate impact of construction. Where effects of medium and long duration are anticipated, proper provision must be made for monitoring their onset and outcomes.

## 2.2 Types of site

**2.2.1** The potential effects of offshore renewable energy developments on the historic environment are outlined below in terms of:

- archaeological site types and themes; and
- the physical environment they affect.

### Wrecks and wreckage

**2.2.2** In terms of the range of site types that are likely to be affected by offshore renewable energy developments, shipwrecks enjoy perhaps the highest public profile. As noted above, watercraft of various sorts have probably been used in UK waters since the Mesolithic period. Records exist for more than 30,000 maritime casualties in UK waters, but it is estimated that as many as 500,000 wrecks, including aircraft may in fact lie on the coast and seabed of the UK. More ephemerally, distributions of artefacts lost or thrown overboard can indicate anchorages, shipping routes or battle sites.

### Coastal heritage

**2.2.3** Often less widely known or publicised than wrecks, other evidence of millennia of human coastal and maritime activity are to be found on the seabed, inter-tidal zone, foreshore and coastal margins. This evidence includes fish traps, salt-making sites, the remains of inundated or eroded settlements, reclamation and flood defence works, military infrastructure, wharves and hards, shipbuilding sites, and navigational features.

### Prehistoric deposits and artefacts

**2.2.4** Prehistoric material dating from the Palaeolithic periods can be found re-deposited in sands, gravels and other sediments laid down by former rivers. It is increasingly recognised that early prehistoric material can also be found *in situ* in offshore areas, notwithstanding the massive processes that have accompanied glaciation and sea-level change. Prehistoric material from all periods up to Iron Age and Roman times can be found nearer to the shore, in inter-tidal areas, and beneath areas of coastal land reclaimed in Medieval and later periods.

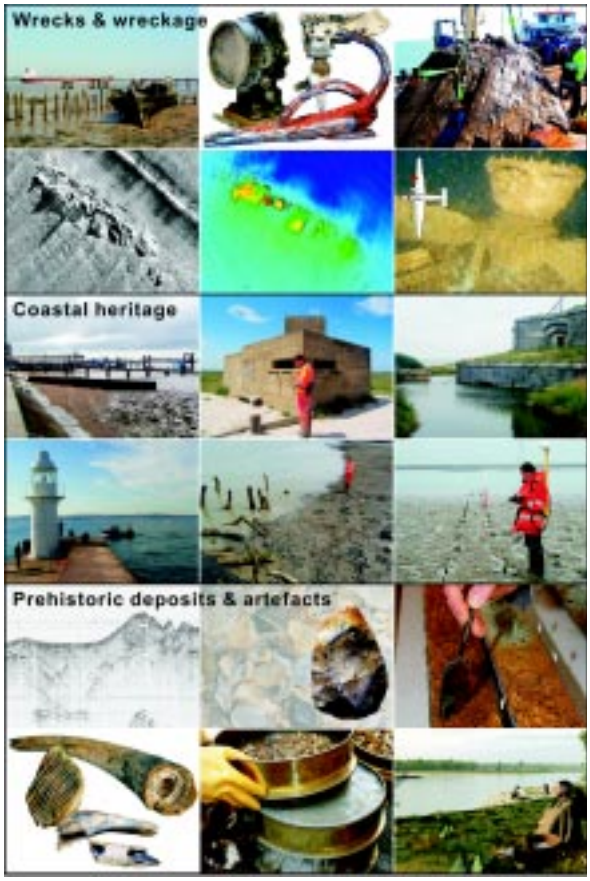



**Figure 7. Types of site**

The range of features of the historic environment that can be affected by offshore renewable schemes is very diverse.

## 2.3 Environments

2.3.1 The sites and materials described above occur in a range of marine (sub-tidal and inter-tidal) and terrestrial environments, which are subject to different types of impact in the course of offshore renewable energy development.

2.3.2 In offshore areas, scheme impacts arise from the construction of foundations for turbines and other infrastructure, and from laying power and control cables. Cable ploughing, piling and excavation are among the primary impacts, while construction vessels may have secondary impacts when jacking-up or anchoring.

2.3.3 Closer to shore and within the inter-tidal zone, scheme impacts are likely to arise from cable laying and from the activities of cable laying vessels. It should be recognised that the historic environment of the coastal margin is likely to be particularly dense and complicated: the coast forms a natural hazard to shipping; it will also have supported specific coastal activities; and the build up of prehistoric layers may have considerable time-depth.

2.3.4 On coastal land, activities associated with cable laying and with the construction of shore-side infrastructure – together with associated compounds and access roads – are likely to be the principal causes of impact. The potential for shipwrecks might be thought to be less than at sea, but many of the most significant ship finds have been found within reclaimed coastal land. The potential for prehistoric material in deposits sealed by reclamation is also high, and there will be potential for traces to survive of many forms of coastal activity – industrial, agricultural and military – from the Roman period, through Medieval and Post-medieval times, to the present day. As well as buried remains, the historic environment of coastal land may include upstanding structures such as ancient sea defences, buildings and historic landscape features.

## 2.4 Landscapes, seascapes and 'setting'

2.4.1 Traditionally, frameworks for managing the historic environment have focused on individual sites and monuments. Archaeologists' concerns have always been broader than this and several concepts, including those of 'landscape' and 'setting' have been used to enable a consideration of the archaeological heritage to go beyond the focus on individual sites. These attempts by archaeologists to engage with monuments within their surroundings has coincided with a wider recognition of the contribution that the physical remains of old things can make to what is valued in an environment. It is now increasingly recognised that the entire form of our present environment, even features whose main processes are entirely natural, has been structured by human actions and perceptions.

2.4.2 'Setting' starts with a monument or group of associated monuments, and draws attention to the importance of their geographical context to understanding and appreciating those particular monuments. 'Landscape' takes an opposite tack, being concerned with the overall geography of a place and the role of historical activity in its formation and survival, of which individual monuments and features are a physical – though often unrecognised – manifestation.

**2.4.3** Although 'setting' may be driven strongly by visual considerations, it can also encompass topography and historic land use. 'Setting' may be used as a way of addressing the intentions of the people who built or were otherwise responsible for the original siting of the monument, or it may be used to address the people whose appreciation of a monument in the present day might be degraded by a change to that setting. Similarly, it can be important to distinguish between the interpretations of landscapes that were meaningful to people in the past, and the contribution that historic features make to landscapes perceived in the present.

**2.4.4** In terms of offshore renewable energy schemes, 'setting' and 'landscape' may be key considerations in addressing the effects of the scheme on land. These effects may arise from scheme elements that are actually on land – overhead cables, sub-stations and other aspects of terrestrial infrastructure – but also from scheme elements which are at sea but can be perceived from land, such as offshore renewable energy turbines. Hence the setting of features of the historic environment situated on the coast – cliff top forts, historic quaysides, designed landscapes that look out to sea – may be affected by development offshore, as may be the overall character of a historic coastal landscape. The effects of offshore elements of a scheme on the historic environment on land may be barely perceptible, but such an assessment should be a conclusion, not a premise.

**2.4.5** The concepts of 'setting' and 'landscape' become harder to apply to the historic environment in fully marine areas – i.e. sites and features that are wholly sub-tidal. Although neither concept is reducible to visual perception, their appreciation is driven to large degree by the physical form and influence of monuments. Moreover, the causal relationship between marine features and their surroundings is sometimes less direct than on land. Prehistoric features – whether they are artefact-rich sites, or deposits whose interest is palaeo-environmental – need not signify the presence of an entire landscape; the prehistoric deposits that are found at many offshore locations are often fragmentary and comprise elements of many successive land surfaces. Although often of high importance in their own right, the degree to which any particular fragment constitutes a 'submerged landscape' will be debatable. Equally, the causality that links a wreck to its surroundings may have to be examined and established, rather than assumed. In landscape terms, there could be a marked difference between, for example, the wreck of a collier lying on the route that its fellow colliers traded over decades or centuries, and the wreck of a 'blow in' whose relationship with its surroundings is as accidental as the tragedy of its loss.

**2.4.6** The relationships between marine sites and their surroundings are starting to be addressed in a way that can help inform their management in the context of offshore renewable energy schemes, but these are still early days. The concept of 'seascape' has considerable currency, but its use is directed at visual considerations and predominantly with the way that the sea is viewed from land.

**2.4.7** Seascape characterisation was developed seminally in Wales by Countryside Council for Wales (2001), to add additional information to existing land-based landscape assessments. It centres on the perceived character of coastal landscapes, and maps areas to relate specific areas of sea to specific areas of coastal landscape, in effect to create coastal zone spatial planning units based on scenery. The concept takes into account both land to sea and sea to land perspectives. In Wales Seascape Characterisation should be complete at a regional scale by the end of 2007, and the concepts are being applied to spatial planning for offshore renewable energy developments. In Scotland similar work for Scottish Natural Heritage (Scott *et al.* 2005) has been used in spatial planning for offshore renewable energy schemes.

**2.4.8** Recent DTI guidance (2005) explains the concepts and applications of seascape to the planning, siting and design of offshore renewable energy schemes. Although no specific survey or application is made to the marine historic environment this is implicit as a component of the total scenic environment. The key feature of seascape characterisation is the establishment of broad-brush spatial planning units, based on the variation in seascape

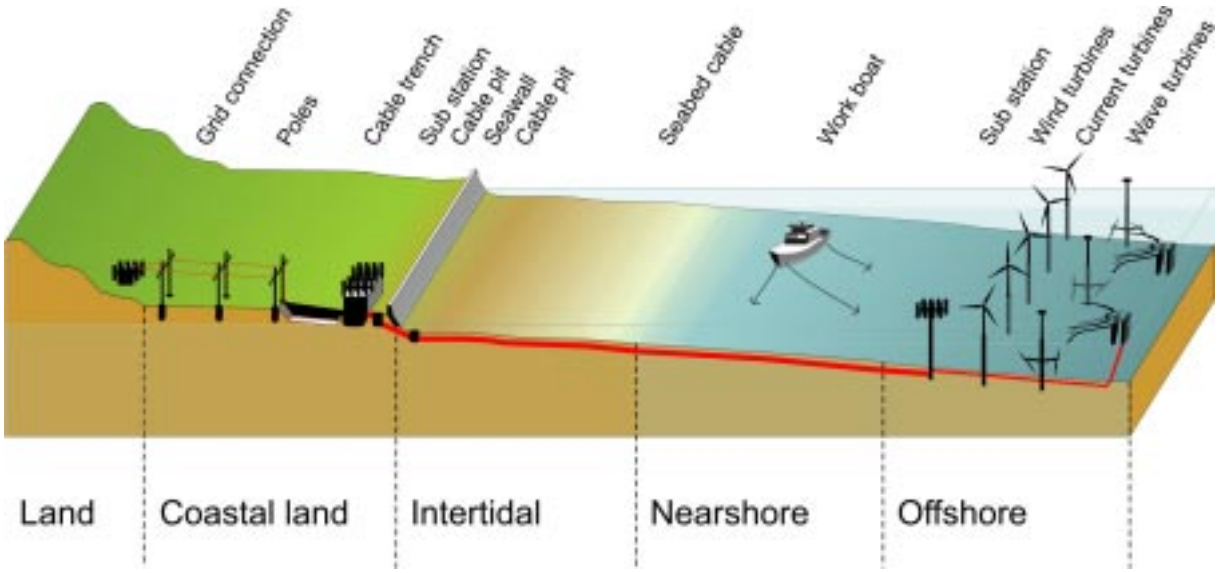



**Figure 8. Types of environment**

Offshore renewable schemes have impacts across a range of environments from land to sea, all of which need to be addressed in assessing likely effects on the historic environment.

**HISTORIC LANDSCAPE CHARACTERISATION**

The aim of Historic Landscape Characterisation is to characterise the current appearance of the historic urban and rural environments within a given area, and to use this information to manage change within the historic landscape.

England's national HLC programme is co-ordinated by English Heritage and is now more than half complete. Information on specific projects is available from English Heritage:

(http://www.english-heritage.org.uk),

the Countryside Agency:

(http://www.countryside.gov.uk) or from the relevant local authority.

English Heritage has recently sought to extend HLC to the sea, through the England's Historic Seascapes Project. One pilot area (Liverpool Bay) has been completed and four more pilots are in progress. Further details can be found at:

http://www.english-heritage.org.uk/server/show/nav.8684

In Wales the compilation of the Register of Historic Landscapes in Wales has been underway since 1998. The Welsh Register is a material consideration in the planning process, the application of which is covered in published guidance (see Further Reading below) and with the ASIDOHL methodology for assessment the significance of the impacts of development on historic landscape areas. Information can be obtained from Cadw:

(http://www.cadw.wales.gov.uk), the Countryside Council for Wales (http://www.ccw.gov.uk) or regional and local planning authorities.

Scotland's HLC programme, 'Historic Landuse', has been developed by Historic Scotland (http://www.historic-scotland.gov.uk/) and the Royal Commission on the Ancient and Historical Monuments of Scotland (http://www.rcahms.gov.uk). Further information can be obtained from either of these organisations or from regional and local planning authorities.

character between one area and another. As the concept develops more detailed and specific studies and methodological principles should develop to deal with specific aspects of these areas, including the historic component.

**2.4.9** Other conceptions of seascape such as marine Historic Landscape Characterisation (HLC) (see text box) are attempting to draw out the contribution of historical processes to the physical characteristics of the coast and seabed in the present day. In respect of fully marine features of the historic environment, the understanding of how they relate to their surroundings, how as a whole they constitute the marine historic environment, and how these relationships are affected by renewable energy schemes, are going to be areas of methodological development for several years to come.

## **2.5** Cumulative effects

**2.5.1** Cumulative effects are those individually minor but collectively significant effects that result from a project in combination with other projects and activities. Cumulative effects are incremental changes to the environment and are likely to manifest themselves in the medium or long-term. They are thus potentially more difficult to predict than other impacts on the historic environment.

**2.5.2** The difficulty in assessing cumulative effects on the marine historic environment is compounded by the general lack of detailed knowledge of the known and potential archaeological resource offshore and an as-yet embryonic understanding of how significant the incremental effects of marine development may be.

**2.5.3** A firm knowledge and understanding of the marine historic environment within an area may only arise at the point that archaeological studies and investigations are conducted by individual developers of offshore renewable energy schemes. As acknowledged by guidance on other topics, it may be advantageous for companies promoting offshore renewable energy schemes within a region to collaborate with each other, and with marine developers in other sectors, to address cumulative effects on the historic environment.

**2.5.4** Some context for the assessment of cumulative effects has been provided by the regulatory authorities that are responsible for the overall programme for offshore renewable energy in the UK, as a result of the SEA Directive (2001/42/EC). As in the EIA Directive, the SEA Directive includes the archaeological heritage among the elements of the environment that must be addressed. Accordingly, a SEA was commissioned by the Government ahead of the Round 2 offshore renewable energy leasing process, and the DTI has extended its SEAs for oil and gas to also include offshore renewable energy schemes in recent cases. The DTI SEAs have included technical reports on prehistoric archaeology and maritime archaeology (see http://www.offshore-sea.org.uk/site/scripts/sea_archive.php).

**2.5.5** Although SEAs may provide a starting point for the assessment of possible cumulative effects within a region, they are also constrained by current lack of knowledge and understanding of the historic environment. There is, as yet, no established methodology for addressing cumulative effects on the marine historic environment, and this is consequently another area where innovation is to be expected.

**2.5.6** In considering the cumulative effects of offshore renewable energy schemes on the historic environment, attention should be paid to the measures through which any such effects are to be monitored, and what provisions are to apply if cumulative adverse effects prove to be significant.

## 3.1 Archaeology and the development process

3.1.1 Several processes that have direct relevance to the historic environment intertwine in the development of an offshore renewable energy scheme:

- Development will be subject to one or more consent procedures, through which licences to carry out the works are sought from Government.
- The consent process will be accompanied by an Environmental Impact Assessment (EIA) process, through which the developer has to consider and mitigate any adverse implications of the scheme for the environment.
- A process of design will take place, seeking to optimise the scheme for its purpose given the constraints upon it.
- A site investigation process will be carried out to provide data upon which the design and environmental assessment processes can be based.
- All of these strands will take place within processes of project and financial management, to ensure that the progress of the scheme is efficient, and remains viable.

All of these processes are staged, iterative and incremental, and typically involve many parties acting on behalf of the scheme's sponsors.

3.1.2 Consideration of the historic environment is far from incidental to all of these processes. On the one hand, unforeseen archaeological problems can be time consuming and expensive, and threaten key aspects of scheme design or the award of consent. On the other hand, the historic environment can be dealt with adequately without incurring unreasonable costs if it is considered in the course of the processes outlined above.

3.1.3 Consequently, the historic environment is also best dealt with through a process, which is most effective when it is woven through the other strands. Over the last couple of decades, the process-based character of development-led archaeology has become recognised in a series of well-established stages of investigation, namely:

- archaeological appraisal;
- desk-based assessment;
- archaeological field evaluation;
- mitigation;
- monitoring;
- post-fieldwork assessment;
- analysis;
- publication and dissemination;
- archive preparation and deposition.

3.1.4 The relation between these stages of the archaeological process and stages of development processes can vary according to the development and to the scope of each archaeological stage. The advice of national and local curators will be especially important in establishing the content and timing of these stages (see Section 5 below for information about curators)

3.1.5 Archaeological appraisal is the stage at which curators are first alerted to a scheme, at which point they will identify the key issues for the historic environment raised by the scheme, and the measures that they would expect to be taken to address them. It is clearly advantageous to all parties if the curators are able to carry out their appraisal as early as possible, as appraisal will enable the subsequent stages to be targeted effectively.

3.1.6 Generally, in the context of offshore renewable energy schemes, desk-based assessment and non-intrusive forms of field evaluation (by walkover or marine geophysical survey, for example) are commonly conducted to inform EIA, before applications for consent are submitted. If intrusive field evaluation is required in order to establish the presence and importance of sites that may be critical in determining consent or the conditions that might apply, these will also have to occur before submission. Where intrusive evaluation is less critical to consent but will inform the detailed design of mitigation measures of the scheme itself, then it may be deferred post-consent.

3.1.7 Mitigation measures will generally have to be carried out between consent and the start of construction, or at least to be formally in place by that time. Monitoring will accompany construction and operation, for the duration of the process identified as requiring monitoring. Post-fieldwork assessment is a key stage, at which point the overall content and value of

archaeological investigations are reviewed, as a basis for recommendations for analysis and publication. Finally, as discussed above, the archive – including the material archive of any artefacts and structures recovered by fieldwork – will have to be prepared and deposited.

**3.1.8** A key finding, by archaeologists and developers alike, is that consideration of the historic environment should start early in the development process, and be maintained throughout.

## **3.2** Consent processes for offshore renewable energy schemes

**3.2.1** As a result of the current regulatory situation for marine development, various configurations of consents for offshore renewable energy schemes are possible. For offshore renewable energy schemes, two main routes for consent have been identified. Following one route, applications in respect of UK territorial waters and the Renewable Energy Zone (REZ) can be made under the Electricity

**PLANNING POLICY GUIDANCE**

In **England** PPG16: Archaeology and Planning (Department of the Environment 1990) sets out the Secretary of State's policy on archaeological remains in England. It acknowledges the fragile and finite nature of such remains, and states that the desirability of preservation of archaeological remains and their settings is a material consideration within the planning process. PPG16 provides that there is a presumption in favour of the preservation *in situ* of nationally important archaeological remains, and that where such preservation is not justified it is reasonable for planning authorities to require the developer to make appropriate and satisfactory provision for excavation and recording of remains.

English Heritage made the following statement in 'England's Coastal Heritage' (1996):

*Although it remains government policy not to extend the Town and Country Planning system to the territorial sea, the principles set out in ... PPG16 ... should be applied to the treatment of sub-tidal archaeological remains in order to secure best practice.*

In **Northern Ireland** planning law is used to regulate archaeology. Government policy on planning, archaeology and the built heritage is presented in Planning Policy Statement 6 (Department of the Environment Northern Ireland, 1999) and while the Planning Order (Northern Ireland) 1991 has application only to the low water mark, the principles of Planning Policy Statement 6 can be extended to the seabed.

National Planning Policy Guidelines (NPPGs) set out Government policy on nationally important land use and other planning matters in Scotland. 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).

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).

Welsh Office Circular 60/96 – Planning and the Historic Environment: Archaeology – provides advice on the handling of archaeological matters within the planning system in **Wales**. It supplements guidance in Planning Guidance (Wales): Planning Policy 1996.

Act (EA) 1989, which also requires consents under the Food and Environment Protection Act (FEPA) 1985 and the Coast Protection Act (CPA) 1949. These applications can be made to the Department for Trade and Industry, which will liaise with the Defra/DfT Marine Consents and Environment Unit (MCEU) in respect of FEPA and CPA consents. Under the second route, applications in respect of UK territorial waters (but not the REZ) can be made under the Transport and Works Act (TWA) 1992. Consent under the CPA is not required if the TWA route is followed, but a FEPA licence will still be required.

**3.2.2** An Environmental Impact Assessment is likely to be required irrespective of the consenting route that is chosen, as the requirements of the EIA Directive have been applied in whole or in part to the Electricity Act, Transport and Works Act and Coast Protection Act, and information equivalent to an EIA is required as a result of FEPA licensing policy.

**3.2.3** EIA requires consideration of the archaeological heritage. Consequently decisions regarding consent, and any conditions that are to be attached to such consent, may take account of any likely significant effects on the historic environment arising from proposed offshore renewable energy schemes.

**3.2.4** Other consents are likely to be required. In particular, planning permission under the Town and Country Planning Acts (TCPA) may be required for onshore elements. Under the TWA route, the developer can seek 'deemed' planning permission, whereas under the EA route, planning permission will have to be sought separately. An EIA may be required to support the application for planning permission, whether it is to be 'deemed' or sought separately. The DTI advises that the developer should make early contact with the appropriate Local Planning Authority (LPA) as to the environmental information that the LPA are likely to require, and notes that developers can expect to have planning conditions imposed to control and mitigate the impact of onshore elements. Archaeology is a material consideration in the TCPA process, and there are explicit policies in respect of the historic environment both nationally and in LPA development plans.

**3.2.5** The detail of the regulatory route being taken in respect of a particular offshore renewable energy scheme will be important in identifying the relevant archaeological curators (see below). It is especially important to note that a combination of both national and local curators is likely to become involved, each with their own remits. Moreover, multiple national and local curators might be involved because schemes traverse territorial boundaries, because of regional arrangements, and because of thematic specialisms (e.g. built historic environment, terrestrial archaeology, maritime archaeology).

**3.2.6** The detail of the consent processes is also likely to be important in correlating relevant guidance and policies in respect of the historic environment, and in identifying possible stakeholders and consultees. An understanding of the specific remits of archaeological curators may also help in structuring historic environment elements of the Environmental Statement, so that aspects of the baseline, assessment of effects and proposed mitigation to reflect their particular involvement.

## 3.3 Consents and other obligations relating to the historic environment

**3.3.1** Where a scheme impinges on a historic asset subject to statutory designation, then a specific consent or licence under the relevant Act may also be required.

### Protection of Wrecks Act 1973

**3.3.2** Under the 1973 Act, shipwrecks and wreckage of historical, archaeological or artistic importance within UK territorial waters can be protected by way of designation. Once a wreck has been designated it is an offence to carry out certain activities in a defined area surrounding the site, except where a licence for those activities has been obtained from the Government.

**3.3.3** Administration of this Act and associated licenses is the responsibility of English Heritage in England, Historic Scotland in Scotland, Cadw: Welsh Historic Monuments in Wales and the Environment and Heritage Service in Northern

Ireland. Requests for further information or applications for licences should be directed to the relevant national curator (see below).

**3.3.4** Presently designated wrecks in UK waters range in date from the Middle Bronze Age to the 20th century. Where a wreck is located that is considered worthy of designation the relevant Secretary of State is required to consult appropriate advisors prior to designation. However, developers should be aware that it is also possible, where a wreck or wreck material of importance is discovered during the course of a development, for such a site to be designated in an emergency.

## Ancient Monuments and Archaeological Areas Act 1979

**3.3.5** Monuments that are of national importance can be protected by being added to the schedule of monuments protected under the Ancient Monuments and Archaeological Areas Act 1979. It is an offence to damage, or to carry out a range of specified activities on such a 'scheduled monument', unless a license for these activities has been obtained from the relevant authority, in the form of 'scheduled monument consent'.

**3.3.6** 'Monument' is a wide term that covers many types of archaeological site, including buildings, structures, works, excavations and their sites. Monument can also mean the site of any vehicle, vessel, aircraft or other movable structure. The 1979 Act can therefore also be used to protect wrecks and has been used to protect other forms of nationally important monuments along the foreshore and below Mean Low Water. The Act is applicable to the limit of the UK Territorial Sea.

**3.3.7** In Northern Ireland, comparable provision is made under the Historic Monuments and Archaeological Objects (Northern Ireland) Order 1995.

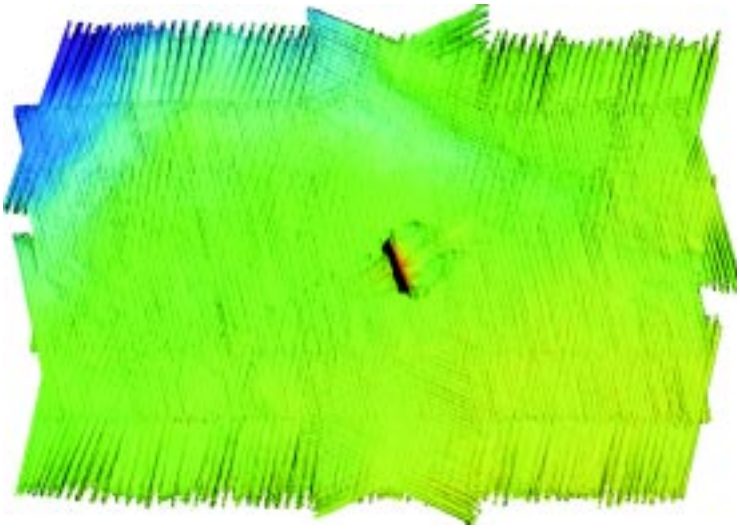
## Protection of Military Remains Act 1986

**3.3.8** The primary purpose of the Protection of Military Remains Act 1986 is to protect the resting places of military personnel from unauthorised disturbance. It allows the Ministry of Defence (MOD) to protect vessels and aircraft that were in military service when they were lost or wrecked. The MOD can designate any such named vessel lost after 4 August 1914 as a 'protected place', even if the position of the wreck is not known. In addition, the MOD can designate as a 'controlled site' any such wreck whose position is known. In the case of a wreck protected as a 'controlled site' no more than 200 years must have elapsed since its loss. In either case it is not necessary to demonstrate the presence of human remains in order for a wreck to be designated.

**3.3.9** Access is not prohibited at a 'protected place', but it is an offence to tamper with, damage, move or remove items from such a wreck without a licence. However, access, salvage and excavation are all prohibited on 'controlled sites', except where a licence for restricted activities has been obtained from the MOD.

**3.3.10** The remains of all aircraft that have been lost in military service are automatically classified as 'protected places' by the Act. Applications for licences in respect of aircraft lost in military service can be sought from the Central Casualty Section of the RAF Personnel Management Agency.

**3.3.11** The Protection of Military Remains Act 1986 also includes a prohibition on excavation for the purpose of discovering whether any



place comprises any remains of an aircraft or vessel lost in military service, except in accordance with a licence.

## Merchant Shipping Act 1995

**3.3.12** The Merchant Shipping Act 1995 is not a form of designation, but it will affect offshore renewable energy schemes if, in the course of site investigations or construction, any material is recovered which falls within the definition of 'wreck'. All wreck has an owner, and the Merchant Shipping Act sets out the procedure for returning recovered wreck to the owner or their successor. The Receiver of Wreck has to be notified of all recovered wreck, and will seek to identify the original owner so that it can be claimed. Ownership of unclaimed wreck from within territorial waters vests in the Crown or in a person to whom rights of wreck have been granted. Unclaimed wreck from beyond territorial waters is returned to the finder.

**3.3.13** The Receiver of Wreck has a duty to ensure that finders who report the wreck receive an appropriate salvage payment. In the case of material considered to be of historic or archaeological importance, a suitable museum will be asked to purchase the material at the current market valuation. The finder will receive 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 of Wreck will hold the wreck until the matter is settled, either through amicable agreement or by court judgement.

## Treasure and other archaeological finds

**3.3.14** In England, Wales and Northern Ireland, all finders of gold and silver objects that are over 300 years old – including groups of coins from the same findspot – are under a legal obligation in terms of the Treasure Act 1996 to report such items to a Coroner for the district in which they were found. Base-metal assemblages found after 1 January 2003 also qualify as Treasure if they are of prehistoric date.

**3.3.15** In Scotland all objects whose original owner or rightful heir cannot be identified or traced are the property of the Crown. The Crown Office, overseen by the Scottish Executive claims bona vacantia (or ownerless goods) and acting on behalf of the nation claims all archaeological finds and historic objects. Finders of archaeological objects are required to report their finds to the Treasure Trove Secretariat. A Treasure Trove Advisory Panel appointed by the Scottish Ministers provides advice to the Crown Office on matters relating to treasure trove (http://www.treasuretrovescotland.co.uk).

**3.3.16** In England and Wales, there is also a voluntary scheme for reports of all forms of archaeological find, known as the Portable Antiquities Scheme (PAS – http://www.finds.org.uk/index.php).

## Human remains

**3.3.17** If human remains – including cremated remains – are discovered in the course of site investigations or construction, they must not be exhumed unless a license has been obtained under the Burial Act 1857. The Department of Constitutional Affairs is responsible for burials in England, and it advises that anyone disturbing buried remains accidentally is advised to leave the remains in place and to contact them immediately. The responsibility for burials in Wales rests with the Welsh Assembly, and in Scotland the Scottish Executive is responsible.

## Ordnance and firearms

**3.3.18** If suspected ordnance is discovered at sea or in inter-tidal areas, record its position and contact HM Coastguard. Do not attempt to move it. Although ordnance may be of historic interest, the health and safety of employees and the public take precedence.

**3.3.19** Any firearms and ammunition (e.g. machine guns or hand guns from crashed military aircraft) are likely to be subject to the Firearms Acts. Ammunition should be regarded as ordnance, irrespective of its size; it may be unstable if moved and extremely hazardous.

## **3.4** Risk Management

**3.4.1** Aside from the formal requirements of development consents, EIA, historic environment designations and related obligations, adherence by developers to archaeological processes will help to identify, quantify and avoid risks to the scheme arising from the historic environment.

**3.4.2** As noted above, features of the historic environment are widespread and diverse. The location of many features is not known, particularly in the marine environment. Consequently, there is a risk that archaeological material might be discovered in the course of site investigations, during construction, or during operation. Such discoveries can have a big effect on development because of the physical constraints they place on activity, because of the public interest that may arise, and because of the financial consequences of having to deal with the unforeseen issue.

**3.4.3** The risk of significant impacts arising from the historic environment will be reduced by obtaining firm information on known and potential sites, and by putting measures in place to address discoveries if they occur. These precautions will normally be achieved by following the archaeological procedures set out in this guidance. However, it is worth noting that in some circumstances, prudent risk management may warrant archaeological investigations over and above those strictly required for the purpose of consents.

## 4.1 Advice

4.1.1 There is a wide variety of sources of archaeological advice and information available to offshore renewable energy developers. It is important to make the distinction between those sources that can provide archaeological advice and those that hold archaeological information. However, some of the public authorities that provide advice also maintain important sources of information.

### Curators

4.1.2 The regulatory authorities that decide whether consent is to be granted are advised, in respect of the historic environment, by national archaeological curators and by archaeological curators in local authorities. Advice from archaeological curators can also be sought by developers, to make sure that the proposals, for which they are seeking consent, and the environmental assessment of those proposals, are appropriately informed.

4.1.3 In their advice to regulators, and to offshore renewable energy developers, archaeological curators will be directed by their statutory remit and by published policies and guidance (see Further Reading below). Where available, their advice will also be guided by Strategic Environmental Assessments.

4.1.4 Responsibility for the historic environment is a devolved matter, so each home country has its own national curator. The national curators have responsibility for the historic environment in territorial waters, including statutory protection. The national curators are a key source of advice for developers in respect of the marine elements of each scheme.

#### National Curators

English Heritage Maritime Archaeology Team
Fort Cumberland, Eastney
Portsmouth PO4 9EF
Tel: 023 9285 6700
Fax: 023 9285 6701
Email: maritime@english-heritage.org.uk

English Heritage has a regional structure of offices. Developers are encouraged to establish contact with the relevant office. Contact details of the regional offices can be found at: www.english-heritage.org.uk

Historic Scotland
Longmore House, Salisbury Place
Edinburgh EH9 1SH
Tel: 0131 668 8600
Fax: 0131 668 8899
www.historic-scotland.gov.uk

Cadw
Plas Carew, Unit 5/7 Cefn Coed
Parc Nantgarw
Cardiff CF15 7QQ
Tel: 01443 33 6000
Fax: 01443 33 6001
Email: Cadw@Wales.gsi.gov.uk
www.cadw.wales.gov.uk

Historic Environment Services Northern Ireland
Waterman House
5–33 Hill St
Belfast BT1 2LA
Tel: 01443 33 6000
Fax: 01443 33 6001
www.doeni.gov.uk

#### Local Curators

Association of Local Government
Archaeological Officers (ALGAO)
http://www.algao.org.uk

4.1.5 Curatorial advice regarding the terrestrial and inter-tidal aspects of offshore renewable energy developments should also be sought from the relevant local government archaeological officer, usually within the local government heritage or environment service. A key role of local government archaeological officers is to advise local planning authorities, so it is particularly important that offshore renewable energy developers seek advice from local curators if any aspect of their scheme requires planning permission.

4.1.6 Major agencies and land holders such as the National Trust, Defence Estates and National Parks also employ archaeologists, who may also be an important source of advice if

elements of an offshore renewable energy scheme fall within their purview.

**4.1.7** Within the EIA process, curatorial authorities will provide developers with scoping advice where requested, and will engage in subsequent discussions about the conduct of EIA, the results of investigations, and the appropriateness of possible mitigation measures. Archaeological curators will, in due course, advise the regulator about the adequacy of Environmental Statements, the merits of consent, and any conditions that might be considered necessary. It is strongly advised for developers to consult the relevant curators as early in any project as possible, preferably not later than the scoping phase, and to maintain regular communication with the curator thereafter.

**4.1.8** Although archaeological curators will be able to provide guidance to developers, together with some information, they will not carry out any of the archaeological studies or investigations that contribute to EIA. The developer will be responsible for carrying out such studies, usually by commissioning an archaeological contractor or consultant.

**4.1.9** Developers are advised to consult the IFA Yearbook for the details of archaeological contractors/consultants with suitable previous experience.

## Consultants and contractors

**4.1.10** Offshore renewable energy developers can obtain independent archaeological advice by employing an archaeological consultant and/or contractor. Generally speaking, an archaeological consultant will guide the developer through archaeological aspects of the entire proposal whereas an archaeological contractor will carry out specific studies or investigations.

**4.1.11** There are numerous private and charitable organisations across the UK that can provide professional archaeological services. Additionally, some engineering and environmental consultancies employ professional archaeologists in-house and are able to provide such services.

**4.1.12** Developers should ask potential archaeological consultants/contractors to demonstrate that they have skills and knowledge appropriate to advising on offshore renewable energy schemes.

## Other archaeological interests

**4.1.13** There is a wide range of other organisations and individuals whose interest in archaeology and the historic environment should be considered during offshore renewable energy developments. Some may own or have

**IFA MEMBERSHIP AND IFA REGISTERED ARCHAEOLOGICAL ORGANISATIONS**

Membership of the Institute of Field Archaeologists provides a measure of the professional and ethical standards to which archaeological consultants and contractors ascribe. Individual archaeologists can qualify at a variety of corporate levels, each of which requires adherence to the IFA's Code of Conduct and other by-laws.

The IFA's Registered Archaeological Organisation (RAO) scheme extends these obligations to companies. Organisations registered with the IFA are committed to meeting IFA standards; they have formally resolved to carry out their work in line with the IFA Code of Conduct and other by-laws; their archaeological work is controlled by a Member of the Institute (MIFA); and their status as a registered organisation is reviewed annually by the IFA.

Further information can be found at:

http://www.archaeologists.net/modules/icontent/index.php?page=22

| Material type | NMRs | HERs | UKHO | CROs | RoW | PAS | Mus | MOD |
|---|---|---|---|---|---|---|---|---|
| Wreck data | " | " | " | | " | | | |
| Documented shipping losses | " | " | | | | | | |
| Military Remains | | | | | | | | " |
| Sites and Monuments | " | " | | | | | | |
| Finds (including wreck) | " | " | | | " | " | | |
| Listed Buildings | " | " | | | | | | |
| Historic Maps | | | | " | | | " | |
| Historic Charts and Sailing Instructions | | | " | " | | | " | |
| Aerial Photographs | " | " | | | | | | |
| Secondary Sources | | | | " | | | " | |

**Key:**

NMRs = National Monuments Records maintained by English Heritage, Royal Commission on the Ancient and Historical Monuments of Scotland (RCAHMS), Royal Commission on the Ancient and Historical Monuments of Wales (RCAHMW), Environment and Heritage Service, Northern Ireland.

HERs = Historic Environment Records (formerly Sites and Monuments Records – SMRs) maintained by Local Authorities.

UKHO = UK Hydrographic Office, Wreck Index and Archive

CROs = County Record Offices

RoW = Receiver of Wreck

PAS = Portable Antiquities Scheme

Mus = National and local museums

MOD = Ministry of Defence

interests in specific sites or wrecks, while others may have a more general concern for marine archaeology and the historic environment. This encompasses both the public concerned with a particular scheme because it may directly affect them – including national and local NGOs representing historic environment interests – and the wider public.

**4.1.14** The transparent and public nature of the offshore renewable energy application and licensing process allows anyone with an interest in a particular proposal to make a representation. Developers are therefore strongly advised to ensure that a wide range of interests related to the historic environment is considered at an early stage in preparing their application.

## 4.2 Information

**4.2.1** Archaeological and historical information required for the baseline study and impact assessment phase of offshore renewable energy developments can be obtained from the following sources.

### Information provided by developers

**4.2.2** A key source of primary information relating to the historic environment of any offshore renewable energy project is that likely to be held or acquired by developers themselves.

**4.2.3** In archaeological terms, the most important information that is often held by offshore renewable energy developers is the geophysical and geotechnical data that they acquire as part of the engineering and EIA process. For marine areas, this data is likely to be the most recent, most direct and highest quality data that is available to archaeologists. The usefulness to archaeologists of the developer's geophysical and geotechnical data will depend on the detail of the survey design and specification.

**4.2.4** It is best practice to obtain archaeological advice in the course of developing specifications for geophysical and geotechnical surveys, even if the primary purpose of such surveys is to acquire engineering or ecological data. The acquisition, processing and interpretation of geophysical and geotechnical data is considered in greater detail below.

**4.2.5** Another important set of information that developers hold is the detail of the scheme itself. Plans showing all the proposed elements of the scheme: structures; cables; sub-stations; compounds; access routes and so on will be needed to establish the study area for which archaeological data must be obtained, and any spatial coincidence between elements of the scheme and elements of the historic environment. Sections and levels may be very important in establishing whether scheme elements will penetrate horizons that are archaeologically sensitive. Textual descriptions of construction processes will help in identifying impacts, in assessing their effects, and designing effective mitigation measures.

**4.2.6** The refinement of schemes will affect their archaeological assessment as much as any other study, so it is essential that developers keep their archaeological consultants/ contractors appraised of changes in a timely fashion, and archaeological consultants/ contractors should ensure that they are kept informed.

**4.2.7** The developer is also likely to be a good source of other information that has a bearing on the historic environment and its assessment. Numerous studies that are commissioned in the course of developing offshore renewable schemes are relevant to archaeologists. Geological interpretations will help set the overall context within which the presence or potential for Quaternary or Holocene deposits can be gauged. Hydrological and sedimentological studies may indicate the scope for disturbance to archaeological features beyond the immediate footprint of construction. Visual assessments may indicate the envelope within which the setting of archaeological features is affected. Early integration of archaeologists within the development team will help to identify the added value to be obtained from other studies.

## Information from other sources

**4.2.8** A range of primary and secondary sources of information about the historic environment is available. The main data sources for the different types of historic and archaeological material are summarised in the table below, but other sources do exist, and developers will be guided in this regard by the archaeological consultant/ contractor.

# 5 Environmental Impact Assessment

**5.1** As noted above, the possible effects of an offshore renewable energy scheme on the historic environment may be considered by regulators in determining whether a scheme is to receive consent, or in deciding what conditions might apply. The presence of elements of the historic environment may have implications for the design of a scheme, either because additional statutory consents are required, or because of the constraints they place on construction. The risk of incurring costs and delays as a result of unexpectedly discovering an important archaeological site in the course of construction is also likely to be an incentive to careful consideration of the historic environment when developing a scheme.

**5.2** In addition to all these powerful motives, however, is the specific requirement to address the historic environment – the architectural and archaeological heritage and landscape – as part of Environmental Impact Assessment. The requirements of EIA are defined in European Council Directive on Environmental Assessment 85/337/EEC (amended in 1997 by Directive 97/11/EC) and the Directive has been incorporated into UK law through a series of sectoral regulations and policies. In practice, EIA has rapidly emerged as the central process for considering the historic environment for all the reasons set out above, as well as for satisfying EIA regulations themselves.

**5.3** It is important, nonetheless, to recall that EIA is only a partial mechanism for addressing the historic environment. Although EIA anticipates all stages of the development of a scheme – from construction through operation to decommissioning – EIA itself ceases at the point an application is submitted. Where the EIA process is being relied upon to arrange historic environment provision for the entire duration of a scheme, it is important that the EIA itself includes details of the implementation mechanisms that are to be employed in post-submission discussions with regulators, in detailed design, in the course of construction, and in monitoring thereafter. The responsibility for ensuring that consideration of the historic environment outlasts the EIA rests with both the developer and the regulator.

**5.4** The general application of Environmental Impact Assessment to offshore renewable energy developments is discussed in detail in DTI (2004) and CEFAS (2004) guidance documents, though only limited guidance is provided in respect of the historic environment. There is, however, a considerable body of practice relating to the historic environment in EIA on terrestrial developments both in the UK and on the Continent, and an increasing body of practice relating to EIA and the marine historic environment.

**5.5** The following Guiding Principles for Cultural Heritage in EIA have been proposed (see box):

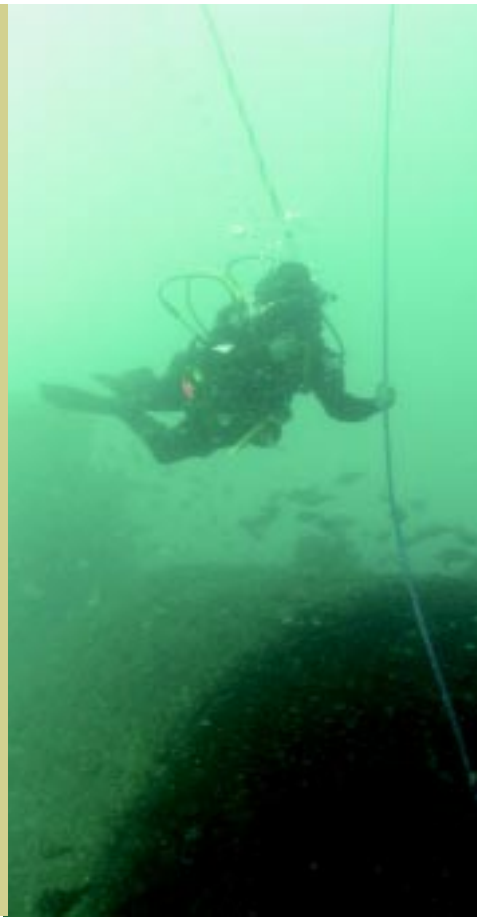
**5.6** The process of EIA culminates in the publication of an Environmental Statement (ES). As a result of the complexity of consents required for marine development, applications for some marine schemes (including some Round 1 offshore renewable energy schemes) have been accompanied by multiple Environmental Statements, each reflecting the specific scope of the consent being sought. Happily, for Round 2 offshore renewable energy schemes, the DTI has indicated that only one ES normally need be submitted to cover all of the consents applied for, provided that the scope of the ES is sufficient to embrace all the environmental issues that each consent can be expected to consider.

**5.7** Although there may be only one ES, there are a number of options for incorporating the historic environment within its pages. The conduct of EIA will probably be speedier if, at the outset, the developer, the consultants preparing the ES and any specialist archaeological consultants have a clear understanding of the structure that the ES is to take. It is common for the historic environment – as with other topics – to be addressed in a stand-alone Technical Report. The ES may then include only a summary of the Technical Report, with the Technical Report submitted as an appendix. Alternatively, the whole content of the Technical Report might be incorporated within the text of the ES as a 'historic environment chapter'. A further alternative is to split the baseline, assessment and mitigation sections of the historic environment topic into separate

**GUIDING PRINCIPLES FOR CULTURAL HERITAGE IN EIA**

1. Cover all aspects of cultural heritage.
2. Integrate cultural heritage expertise into all stages of EIA, from screening through to implementation.
3. Describe the project requiring assessment clearly and in sufficient detail to allow identification of all impacts that could affect the cultural heritage.
4. Define a suitably large study area to allow a clear understanding of the cultural heritage and the extent of potential impacts upon it.
5. Undertake all cultural heritage surveys and investigations to a high standard so as to ensure a full understanding of the nature and significance of the resource and to allow informed decisions to be taken.
6. Assess all beneficial and adverse impacts on cultural heritage, including direct, indirect, temporary, permanent and cumulative effects.
7. Evaluate the significance of any impacts on the cultural heritage resource to take account of both the intrinsic value of the resource and how much it will be changed. Use relevant international, national and local legislation and policy to explain the significance, and make explicit the basis for any statements concerning value or importance.
8. Consider the likely effects on cultural heritage assets of alternative scenarios, including doing nothing.
9. Consider a variety of approaches to mitigation, including design modification, appropriate investigation and recording measures. Make provision for unforeseen effects. Propose realistically achievable mitigation measures and fully monitor and document any agreed actions, including responsibility for their implementation.
10. Ensure all communication relating to cultural heritage in EIAs is clear, focused and accessible to the non-specialist. Archive and index all documentation in a clearly traceable manner.

Jones *et al.* 2006



sections, which are integrated with all of the other environmental topics in baseline, assessment and mitigation chapters respectively.

**5.8** There is also a variety of ways to structure a historic environment Technical Report, irrespective of the model adopted for the ES overall. Depending on the details of the scheme and of consent processes, it may be appropriate to divide the treatment of the historic environment by environment (offshore; inter-tidal; onshore), by theme (wrecks; prehistory; coastal heritage), or by investigative method (desk-based study; geophysical survey; geotechnical survey). No two Environmental Statements need be alike, so long as their coverage of the historic environment is adequate.

**5.9** A key consideration is the way in which specialist historic environment advice is incorporated into the ES. Again, there are a number of alternatives. In some cases, historic environment sections are prepared by non-specialists. In other cases, historic environment specialists are responsible only for the Technical Report, with the relevant text within the ES being compiled by an environmental consultant on the basis of the Technical Report. In other cases, the ES text might be drafted by an historic environment specialist, or at least be subject to checking by an historic environment specialist. As above, the key measure is whether the ES is adequate, though commentators have noted that the quality of Environmental Statements in respect of the historic environment is usually better where specialists have been employed.

**5.10** A clear finding of several commentaries has been that it is essential that the methodology used in various elements of the EIA process is made explicit, including the use of terminology. It may be useful to include a glossary of terms within the historic environment assessment.

**5.11** Even the terms 'impact' and 'effect' can be a source of confusion. For the purposes of this guidance, 'impact' is taken to mean the physical coincidence of a development activity and an element of the historic environment, whether it occurs through mechanical, chemical or biological processes. 'Effect' is taken to mean the consequence for the historic environment, taking account of the change in the public value of the historic environment that results from the impact, as well as the physical change. Hence the significance of an effect will be a product of both the magnitude of the impact, and the public importance of the historic environment asset that is impacted.

**5.12** The historic environment is made up of physical features, but the value or importance of such features arises from the attributions that are given to them by current (and, we anticipate, future) populations. Although it is common to regard the physical elements of the historic environment (wrecks; monuments; artefacts) as the 'receptors' that may be impacted by development, some attention is now turning to people as receptors, focusing on the degree to which peoples' enjoyment or awareness of the historic environment might be impacted by development. The identification of people as receptors may be important in addressing terrestrial, above-ground features including the built heritage and issues relating to setting and landscape/seascape. However, it should be acknowledged that physical components of the historic environment, both in the ground and on the seabed, may be receptors of impacts irrespective of whether any person is yet aware of them at the time of impact, and the consequent adverse effect on the historic environment may be significant nonetheless.

**5.13** Clear expositions of the methodologies that are adopted for gauging the magnitude of impacts, importance of receptors, significance of effects and so on are likely to be a key factor in achieving an adequate EIA. Effective assessment will require that such methodologies are tailored specifically to the characteristics of the historic environment. However, there will also be a need to ensure that methodologies are consistent and can be assimilated with the methodologies for assessing other environmental topics. Consequently, EIA methodologies may be driven by the overall requirements of the developer and their environmental consultants, rather than by historic environment specialists. In such cases, the appropriateness of the methodologies to the historic environment should be checked and confirmed explicitly.

# 6 Scoping and Archaeological Appraisal

**6.1** 'Scoping' is the EIA stage at which the developer may ask the regulator for their formal opinion on what should be included within the ES, and in most cases this will be the first contact between developer, curator and archaeologist. Developers will normally submit a scoping report to the regulator, which will set out the scheme details in outline, and also set out what the main environmental issues are thought to be and what will be done to investigate them in the course of EIA. As with all other environmental issues, preparation of the scoping report is a useful mechanism for prompting archaeological appraisal by the relevant curators, with a view to obtaining formal opinions on what the historic environment component of EIA should comprise.

**6.2** Developers of offshore renewable energy schemes should anticipate that the historic environment is likely to be identified as a key issue by the scoping exercise, although the detail will depend on the nature of the project, its location and its environment.

**6.3** Although scoping reports frequently address the historic environment, there is considerable variety in how this is done. Scoping and the initial archaeological appraisal can 'set the tone' for the relationship between developers and archaeological curators, so it is important that all parties make sure that they are well-informed about the development activities that might implicate the historic environment, and the background of archaeological data and policy. Scoping reports on the historic environment are sometimes prepared by environmental consultants who are not specialists on the topic. However, it may be advantageous for the developer to commission a specialist consultant even for this early stage, as a background of experience in dealing with the actual effects of offshore renewable energy schemes on the historic environment may enable both developer and curators to achieve a realistic understanding of each others' responsibilities and concerns.

**6.4** Although the curators' archaeological appraisal is likely to be prompted by the scoping report, there is nothing to stop developers from contacting curators pre-scoping for informal advice. Both national and local curators usually maintain websites that provide the background to their role and responsibilities, and there is an extensive range of published guidance available. Early contact is to be encouraged.

**6.5** The formal opinion provided by curators in response to the scoping report will be a key document in specifying the scope of EIA in respect of the historic environment. If an archaeological contractor/consultant is to be commissioned after the scoping phase, it is essential that they have access to these opinions at an early stage.

**6.6** Whether an archaeological contractor/consultant is employed at the scoping stage or subsequently, the developer and their environmental and engineering team should establish at an early stage the expected scope of communication between their archaeological contractor/consultant and the archaeological curators. Normally, all communication will take place through the developer or their environmental consultant, but some commentators have suggested that the benefits of ongoing and constructive dialogue – especially in areas where archaeological assessment methodologies are still developing – may require a greater level of communication between contractor/consultant and curator than is often the case.

**6.7** The scoping phase provides an opportunity to obtain archaeological curators' formal opinions on some problematic areas of marine archaeological assessment. In particular, opinions could be sought on:

- How extensive should Study Areas be?
- What forms of field evaluation are expected as part of EIA?
- What levels of analysis are expected as part of EIA?
- What framework should be adopted for ascribing importance to receptors?
- What framework is likely to be advocated for implementing mitigation?

**6.8** The scoping phase also represents an opportunity for developers to integrate their archaeological contractor/consultant within their overall environmental and engineering team. This integration will be useful in achieving a range of practical arrangements that are likely to improve the overall efficiency of the project, to submission of the ES and beyond. Integration is likely to facilitate:

- data management;
- access to other relevant specialist reports;
- opportunities for conducting combined site investigations;
- opportunities to design-out archaeological issues.

**6.9** An iterative process of discussion between developers and their archaeological consultant/contractor regarding the scheme design should reduce or eliminate possible archaeological constraints on the scheme and development impacts on the historic environment. This should result in benefits for the developer in terms of savings of time and money while at the same time optimising the preservation of the historic environment within the scheme area.

**6.10** Whilst the archaeological contractor/consultant will want to receive a detailed final plan of the scheme as early as possible, so that they can tailor their assessment accordingly, it has to be recognised that in many cases the design of an offshore renewable energy scheme will be informed by conclusions reached in the course of the EIA. While this does mean that there is scope to design-out archaeological issues by changing layouts and cable positions, for example, care has to be taken to ensure that design changes do not go outside the parameters of the archaeological assessment in respect of, for example, geophysical survey.

**6.11** The overall matter of how to balance the parameters of an EIA with flexibility in scheme design is now often addressed in terms of the 'Rochdale Envelope' of a scheme. Put simply, the Rochdale Envelope is a series of projected maximum extents to the development for which the significant effects are assessed. The detailed design of the scheme can then vary within this envelope without rendering the EIA inadequate. The scope of archaeological assessment will need to reflect discussions regarding the Rochdale Envelope of the scheme.

# 7 Baseline Studies

**7.1** The foundation of the EIA process is the collection of baseline data. These are used to assess the environmental character of the area likely to be affected by a development and to identify relevant natural and human processes or factors which may change or influence the character of the area. The historic environment baseline study equates with the process of 'desk-based assessment' that is broadly recognised in other forms of development-related archaeology. Desk-based assessment has been defined in the *IFA Standard and Guidance for Archaeological Desk-based Assessment* (1999) as:

*a programme of assessment of the known or potential archaeological resource within a specified area or site on land, inter-tidal zone or underwater. It consists of a collation of existing written, graphic, photographic and electronic information in order to identify the likely character, extent, quality and worth of the known or potential archaeological resource in a local, regional, national or international context as appropriate.*

**7.2** In general the objectives of the historic environment baseline study are to:

- Provide an overview of the historic environment in the area associated with the development, based on existing archaeological records and secondary sources;
- Highlight known features, including sites and areas subject to statutory protection, that may be impacted by the proposed scheme;
- Summarise the potential for the presence of hitherto unknown sites that may be impacted by the development;
- Comment on the importance of known and potential sites; and
- Set out the statutory, planning and policy context relating to the historic environment in the development area.

**7.3** The coarse nature of much of the information relating to the marine historic environment often makes it appropriate to define one or more relatively broad Study Areas for the baseline study. For maritime sites such as wrecks and casualties, a broad Study Area will help capture possible sites for which positional information is poor. For prehistoric material, a broad Study Area that encompasses adjacent coastlines can draw in sites on land that provide context for the former terrestrial archaeological and palaeo-environmental deposits that may occur offshore.

**7.4** The choice of Study Area will have to encompass the full extent of possible impacts, including indirect and secondary effects. At the same time however, overly extensive areas will draw in large volumes of data that are likely to prove irrelevant. The delineation of a Study Area has therefore, to be carefully balanced for optimal results.

**7.5** Baseline studies carried out in the course of EIA for other environmental issues are likely to generate results that are relevant to assessing

impacts of the scheme upon the historic environment. Sediment transport studies and visual assessments in particular may be used to check that impacts on the historic environment outside the immediate footprint of construction have been adequately addressed. Equally, the historic environment baseline may inform the geological baseline, and landscape assessments.

**7.6** The archaeological baseline should be clear in acknowledging the specific difficulties of interpreting the marine historic environment, which arise from weaknesses in available knowledge and understanding. The baseline should also address the characteristics of the types of site that fall within the scheme footprint such as:

- The scope for prehistoric sites to be highly concentrated or diffuse;
- The high quality of survival of inter-tidal and shoreline coastal sites;
- The fact that wrecks may occupy an extended area beyond the confines of any remaining hull; and
- The potential for stray items lost or thrown overboard to indicate preferred sea routes through the centuries.

The differences in former topography, bathymetry, geology and seabed type across the development area should also be addressed, with a view to characterising variation in archaeological potential arising from patterns of human activity or from differential preservation.

**7.7** The baseline is likely to cover the entire range of human history, in terms of terrestrial, of coastal and of maritime activity. Although the focus must be on the detail of the scheme, the current level of archaeological knowledge and understanding is such that broader generalisations will also be required. Where available, reference should be made to SEAs, marine Historic Landscape Characterisation or other regional overviews rather than seeking to write the entire history of a sea area.

**7.8** The baseline study should identify all the known elements of the historic environment that may be impacted by the scheme. Of these, the most obvious are likely to be the sites that are subject to statutory or planning designation, or other forms of quasi-legal registration, such as Protected Wrecks, Scheduled Monuments, Listed Buildings, Conservation Areas, Registered Battlefields and so on. There is also likely to be a considerable number of other wrecks, monuments and findspots whose locations are known more or less precisely.

**7.9** Beyond this 'known' archaeological heritage, the marine and coastal historic environment is characterised by a far wider 'potential' heritage, which must also be addressed by baseline studies. 'Potential' is taken to mean here that there are features present that have not yet been found, but the fact that they have yet to be found does not mean that they are any less susceptible to significant effects than the 'known' heritage. Potential sites will encompass the full range of periods and site types, from wrecks to coastal structures to submerged prehistoric sites. Geophysical and geotechnical surveys can play a large part in reducing potential by establishing the actual presence or absence of sites within an area, and by refining the extent of further 'potential'. A wide range of archaeological data, historic maps, documentary and secondary sources can be used in conjunction with geophysical and geotechnical results in seeking to map archaeological potential.

**7.10** 'Potential' will also need to be addressed by baseline studies in respect of features that are clearly present but whose origin and character cannot be determined from the available evidence. Of particular concern are the large numbers of indeterminate seabed anomalies that arise from geophysical survey, or are listed within monument and wreck indexes as anomalies or fishermen's net fastenings. A large proportion of these are likely to prove to be of non-archaeological interest, being geological exposures, bed features or modern debris. Among their number, however, may be some highly important sites. The cost of investigating each anomaly by diver or ROV is likely to be prejudicial to the overall scheme, especially prior to consent. Consequently, the baseline study will need to be explicit about how such anomalies are to be regarded for the purpose of assessing the scheme's effects, indicating either precautionary mitigation or the conduct of further investigation at a later stage.

| Maritime | Coastal | Prehistoric | |
|---|---|---|---|
| Known, named wreck | Building | Flint scatter | Known |
| Known, un-named wreck | Ruin | Peat outcrop; palaeo-channel | |
| Surface anomaly; trawl fastening | Humps and bumps | River terrace; palaeo-landsurface | |
| Magnetic anomaly | Geophysical anomaly; crop mark | Sub-bottom features | |
| Receiver of Wreck report | Find spot | Find spot; organics in borehole | |
| Documented loss (casualty) | Documented record | Historical reference to 'submerged forest'; moorlog | |
| Historically charted hazard | Place name | Terrestrial finds in same catchment | |
| General history of navigation | Regional history | History of sea-level change | Potential |

**Figure 9. Known and potential**

The historic environment includes features on a spectrum that ranges from 'known' to 'potential'. Different types of evidence – all with their own particular characteristics – have to be used in combination to arrive at an adequate assessment.

**7.11** Baseline studies will have to ascribe importance to both the 'known' and 'potential' archaeological heritage as a basis for the subsequent assessment of significant effects. Even where elements of the historic environment are 'known' it can be difficult to ascribe importance, partly because the character of the 'known' feature will often be obscured because it is buried, and partly because the archaeological importance of any feature is rooted in the intellectual enquiries of the discipline. For many archaeological sites, their importance will depend on what is brought to them by investigation. There are a number of schemas available for ascribing importance to archaeological sites, and baseline studies should be transparent and consistent in bringing these to bear. It should be noted that references to different forms of designation as a proxy for importance, as is common in respect of species and habitats, will not suffice in an archaeological context.

# 8 Acquiring, Processing and Interpreting Marine Geophysical and Geotechnical Data

## 8.1 Overview

**8.1.1** Geophysical and geotechnical data are usually gathered for offshore renewable energy schemes as part of the design process or to inform EIA topics such as seabed ecology. As noted above, these data are very important to assessing the effects of offshore renewable energy schemes on the historic environment. Geophysical and geotechnical surveys are likely to be among the most expensive and time-consuming elements of preparing an offshore renewable energy scheme, both in terms of survey fieldwork – which is subject to weather and other operational vagaries – and the processing of huge volumes of resulting data.

**8.1.2** There are several options to consider in seeking the overall integration of archaeological objectives with geophysical and geotechnical surveys, within the overall context of developing a scheme. In early examples of archaeological assessment of marine development, it was not unusual for geophysical and geotechnical surveys to be entirely completed before archaeological interests were considered. Although there would still be scope for archaeologists to make use of the resulting data, the utility of the data for archaeological purposes could be limited, especially where key material – such as samples from boreholes – had already been discarded. To enable these surveys to provide data that supports historic environment analysis, it is important that archaeological objectives are an integrated component of planning geophysical and geotechnical surveys from the outset. It should be noted that surveys only designed to fulfil engineering objectives to aid site evaluation do not directly equate with a survey strategy necessary to inform historic environment examination.

**8.1.3** Ideally, geophysical and geotechnical surveys should be informed by prior desk-based studies, which should have identified known features and key deposits that can then be targeted. Equally, the overall historic environment baseline should incorporate the results of geophysical and geotechnical surveys, so the subsequent assessment is based as firmly as possible on data relating to the site, rather than on broader generalisations from existing records and secondary sources. It may, however, be difficult to achieve the desired integration within an EIA programme, especially if surveys are hampered by weather. In practice, the incorporation of geophysical and geotechnical surveys within offshore renewable EIAs has been achieved in a variety of configurations. It may be advisable to seek the views of archaeological curators if, for operational reasons, the historic environment baseline is to be submitted before there has been an opportunity to interpret geophysical and geotechnical results.

**8.1.4** Marine geophysical surveys can – with care – be carried out over inter-tidal areas when the tide is high, providing a degree of overlap with terrestrially-based techniques such as reviewing historic and modern air photographs, and carrying out walkover surveys. Geotechnical surveys can directed to fully marine, to inter-tidal and to fully terrestrial areas, though the methods used will vary according to the operational requirements of each environment. On land, conventional archaeological techniques such as fieldwalking, terrestrial geophysics, test-pitting and evaluation trenching can all be employed. Guidance on the application of these techniques can be obtained from national and local curators.

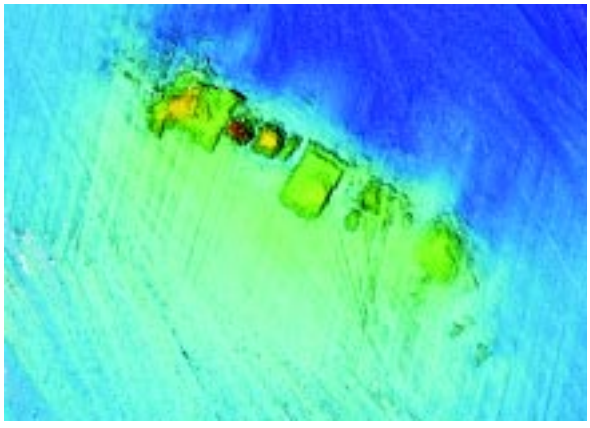
## 8.2 Surveying wrecks and debris

**8.2.1** The known and potential archaeological resource of ship and aircraft wrecks, and other forms of historic maritime material, as identified by the prior desk-based studies require corroboration by data derived from geophysical and geotechnical surveys.

**8.2.2** Sidescan sonar survey can be used to obtain an image of wrecks and related debris of all periods that lie (at least in part) above the surface of the seabed. On previously known wrecks, sidescan can confirm their presence and provide information on their position, extent, and apparent character. Sidescan data can also be reviewed in the search for previously unknown wrecks and features. Sidescan continues to be the pre-eminent tool for identifying wrecks from wide area surveys.

**8.2.3** Multibeam bathymetric survey can be used to obtain a high density of quantitative data from wreck sites. The data can be especially useful in seeking to identify wrecks on the basis of their documented dimensions, and as a basis for subsequent survey by divers or Remote Operated Vehicle (ROV). Multibeam survey can be used to some degree when trying to check for wrecks within an area, especially if the wreck is has considerable height or is indicated by a seabed feature such as scour or a ridge. Although multibeam data is quantitative, it is generally less dense than the qualitative data provided by sidescan, which means that multibeam is generally inferior to sidescan in characterising known wrecks or checking for the presence of as yet unknown wrecks. However, the use of multibeam and sidescan data combined in a suitable visualisation package can be a very powerful combination.

**8.2.4** Magnetometer data may help to characterise known wrecks by providing data on the amount of ferrous material present (indicating whether a ship has a wooden or metal hull, for example). Magnetic anomalies may also indicate the presence of as yet unknown ferrous material that is buried and therefore not visible to sidescan. In the context of offshore renewable energy schemes, magnetometer surveys are unlikely to be conducted at line densities sufficient to identify all the anomalies within an area, and so are not appropriate as a tool for prospecting for wrecks on their own. However, they can be a useful and relatively inexpensive adjunct to sidescan surveys, even though the line spacing may be relatively wide.



**8.2.5** It may be difficult using sub-bottom (boomer, pinger, chirp) surveys to resolve the often shallow deposits that occur even on known wrecks. However, in some instances a fortunately-placed line of shallow seismic data can help confirm the presence of a wreck that is barely visible on the surface. Sub-bottom survey can help in assessing the potential for wrecks to be present by identifying deposits or buried features – such as now-buried but once-navigable channels – within which wrecks might survive.

## **8.3** Surveying seabed prehistory

**8.3.1** Geophysical and geotechnical methods can be used in combination to address prehistoric deposits.

**8.3.2** Bathymetric survey, using single beam or multibeam systems, can be used to establish the basic framework for gauging the presence of prehistoric material. The height of the seabed, in conjunction with secondary sources relating to sea level rise, sets the broad parameters for when that area of seabed might have been exposed, and therefore inhabitable. Bathymetric survey may also indicate the topography of the land surface that was inundated, but in many cases the former topography will have been buried, eroded or otherwise masked by a variety of processes, so bathymetry alone may be an unreliable guide.

**8.3.3** Sub-bottom (shallow seismic) survey is likely to be the most productive tool in seeking to understand the prehistory of the seabed, as it can show the deposits, cuts and surfaces of the previous architecture of the land, and of the sequences through which it changed. Ideally, shallow seismic survey should be supported by borehole or vibrocore surveys, to confirm the sediments that have given rise to the acoustic reflections seen using geophysics. Where possible, horizons that have been identified as being of archaeological interest on the basis of geophysical data should be targeted by boreholes and cores. Where an appropriate archaeologically-informed methodology is employed, samples from boreholes and cores can provide direct evidence of palaeo-environmental conditions and may be suitable

for scientific dating. Such samples may also contain direct evidence of human inhabitation.

**8.3.4** If a suitable methodology is employed, grab sampling of the seabed may provide evidence of the presence or absence of prehistoric artefactual material at or just below the surface of the seabed. Grab sampling has also been used to map the extent of deposits of prehistoric archaeological interest such as peat, if they outcrop on the seabed.

**8.3.5** Although sidescan survey is of limited use in addressing prehistoric material, it can sometimes reveal geological outcrops that have a bearing on archaeological potential. Sidescan traces of bedforms can also be used to help map former topographies and their subsequent modification.

## **8.4** Survey design

**8.4.1** Although geophysical and geotechnical data are also an important primary source of information about the historic environment, their value in this respect can only be realised if archaeological objectives are added to the engineering or other environmental purposes for which the surveys are instigated.

**8.4.2** Early consultation between the developer and archaeological curators, preferably including the developer's archaeological consultant/contractor and geophysical or geotechnical contractor, is essential to ensure that archaeological considerations are taken into account in planning geophysical and geotechnical surveys.

**8.4.3** Geophysical and geotechnical surveys should be informed by such desk-based archaeological information as is available at the time of the survey. Surveys should cover the entire extent of the scheme, to include cable routes to shore as well as the principal development area.

**8.4.4** As best practice, archaeological survey should always be incorporated with the primary geophysical and geotechnical surveys. The specification of the geophysical and geotechnical surveys (e.g. line spacing and equipment used) should be designed to ensure the adequate detection of archaeological material

**8.4.5** In addition to incorporating archaeological advice into the detailed specification of the geophysical survey, it may be helpful for the developer's archaeological contractor to be present on board in the course of the survey, to enable their advice to be accommodated within the survey whilst it is still under way. This will be especially helpful where anomalies or material are detected during the survey that can be further investigated by quickly modifying the survey plan, by acquiring more lines of data or by revising the position of cores or grabs, for instance.

**8.4.6** Surveys should be carried out to a single datum and co-ordinate system, preferably WGS84 UTM. All survey data – including

navigation (position, heading and velocity) – should be acquired digitally in industry-standard formats. Care should be taken to maintain the orientation and attitude of sensors on line. Trackplots should be corrected for layback (including catenary effects) and made available in digital (GIS) form.

**8.4.7** Once the surveys have been processed to meet their primary objectives, the survey data – together with factual reports – should be made available in digital formats to the developer's archaeological contractor for archaeological analysis and interpretation.

**8.4.8** Sidescan sonar survey should be carried out at frequency, range and gain settings capable of resolving all objects that are 0.5m and above throughout the survey area. Preferably, line spacing should be equal to or less than the effective range, and no more than 1.75x the effective range. Anomalies of apparent archaeological potential should be 'boxed' by at least two and preferably four lines along and across the principal axis of the anomaly. These lines should be offset so that the anomaly does not lie immediately beneath the fish, and run at optimal frequency and range settings for imaging the anomaly. For archaeological purposes, true sidescan is preferable to multibeam pseudo-sidescan. Sidescan sonar data should be made available in the form of raw, un-mosaiced files in a suitable proprietary format.

**8.4.9** Sub-bottom survey should be carried out using a source capable of resolving internal structures to the full depth of anticipated scheme impacts within Quaternary deposits. Line and cross-line spacings and orientations should be sufficient to resolve the extents and characteristics of the principal Quaternary deposits. A single beam echosounder should be run in conjunction with the sub-bottom survey; the first reflector (seabed) should be levelled with reference to a tide gauge. Sub-bottom data should be made available in a suitable proprietary format.

**8.4.10** Magnetometer survey should be carried out using a caesium gas or equivalent system capable of resolving anomalies of five nanoTeslas and above. Lines can be run in conjunction with other sensors (i.e. on the same line spacings and orientations) but provision should be made to run additional lines and cross-lines in areas of apparent archaeological potential as indicated by the desk-based information or any of the other sensors. Magnetometer data should be made available as cleaned, de-spiked text (x,y,z) files for each line, including layback.

**8.4.11** Multibeam survey should be carried out using a system capable of achieving an effective cell/bin size better than 1m. Use of a beam-forming system is preferred. The entire survey area should be ensonified. Where an anomaly of apparent archaeological potential is identified, an additional single slow pass should be carried out at the highest possible ping rate. Single beam and multibeam data should be made available as de-spiked and tidally-corrected text (x,y,z) files for each line, in addition to any gridded/rendered surfaces.

**8.4.12** Archaeological interest in boreholes and vibrocores will be confined to Quaternary deposits, especially fine-grained material indicative of low energy deposition, and peaty horizons indicative of vegetated land surfaces. Engineering logs are unlikely to record sufficient detail for archaeological purposes, but they can be used to target further studies. It is essential that cores are logged relative to a known vertical datum, together with their position. Where possible, opportunities should be taken to target planned cores on deposits identified from desk-based studies or sub-bottom geophysical surveys. If fine grained or peaty horizons are anticipated, provision should be made to obtain undisturbed cores that can be cut or extruded under archaeological supervision, to enable archaeological logging and sub-sampling. Material from disturbed cores can also be sub-sampled archaeologically, but the important stratigraphic relationships within the core will have been lost. Subject to the results of archaeological logging, sub-samples may be assessed for the presence of usable quantities of microscopic palaeo-environmental remains, such as pollen, diatoms and foraminifera. If the assessment is favourable, analysis and scientific dating may be warranted to provide detailed information about the previously inhabitable land, and about

how that environment changed in the course of sea-level rise. This information will, in turn, facilitate assessment of the potential for prehistoric artefacts and sites to be found in the vicinity.

**8.4.13** The stages of acquiring, logging, assessing, analysing, dating and interpreting cores can be prolonged, especially as assessment, analysis and dating can take several months. Depending on the anticipated consequences of the results for the scheme, the later stages of this process may be deferred as they may be considered to amount to mitigation rather than evaluation. The views of curators on the timing of geoarchaeological investigations relative to the development process should be sought in advance.

**8.4.14** As noted above, grab sampling may be used to gather data on the presence or absence of prehistoric artefacts on or close to the seabed. Provision can be made either to process archaeologically the mineral residues of samples obtained for assessing benthic ecology, or to carry out grab sampling specifically for archaeological purposes. Grabbing for benthic ecology will generally be carried out on a less dense survey pattern than archaeological grabbing. In either case, the position of each sample needs to be recorded on site. Samples can be processed in whole or in part while on board, or returned for processing ashore. Standard artefact-sieving procedures can usually be carried out, and any artefacts quantified, assessed and mapped relative to the topographies identified by geophysical survey. If peaty deposits are recovered in grabs, they should not be sieved; they are best retained as entire samples and processed as waterlogged remains in the laboratory.

**8.4.15** Developers need to be aware that intrusive activities that disturb the seabed, such as coring and grab sampling may require agreement from The Crown Estate and consent under the Coast Protection Act 1949.

# 9 Identifying Impacts and Assessing Effects

**9.1** As noted above, 'impact' is taken here to mean the physical coincidence of a development activity and an element of the historic environment, whether it occurs through mechanical, chemical or biological processes. 'Effect' is taken to mean the consequence of the impact for the historic environment, taking account of the change in the public value of the historic environment that results from the impact, as well as the physical change.

**9.2** The coincidence of development activities and the known and potential archaeological heritage can be established by mapping the footprint of the scheme onto the results of the baseline study. Care must be taken to ensure that all impacts have been identified, including indirect and secondary impacts, with reference to the assessments carried out for other topics. Care must also be taken to understand the detail of how development activities will be carried out, partly as a basis for subsequently assessing the effect, and partly to identify opportunities for mitigation and monitoring.

**9.3** For the coastal and marine historic environment, knowing the vertical extent of an impact can be as important as knowing the horizontal footprint. For example, proposed cable laying may coincide horizontally with known deposits of prehistoric interest on the seabed and in the inter-tidal area. However, if the cable is to be laid wholly within marine sediments that have been deposited or re-worked on top of the prehistoric deposits, then the impact will be avoided. Equally, piles driven through a sandbank may have no archaeological impact throughout much of their length, except for where they puncture the veneer of prehistoric land surface immediately overlying the Tertiary deposit into which the pile is to be driven.

**9.4** Offshore renewable energy schemes often allow a fair amount of flexibility in the details of their layout relative to other forms of marine development. Consequently, the process of identifying impacts on the historic environment can be a productive opportunity for seeking minor design changes to avoid impacts, especially in respect of foundation structures and cable routes, both offshore and on land. The impact identification stage can also be used to flag specific constraints if avoidance is not possible, such as the need to obtain licences for any works – including site investigations – that fall within statutorily heritage designations.

**9.5** Where unavoidable impacts are identified, it may be helpful to classify them by the stage at which they will occur, their duration, and their magnitude.

**9.6** The assessment of significant effects will usually be carried out by correlating impacts upon receptors with the importance of the receptor, as ascribed in the baseline study. If both magnitude of impact and importance of receptor have been classified, then a simple

matrix may be used to determine the significance of effects. Classifications of importance, impact and the significance of effect, combined within a matrix, have the advantage of offering a transparent methodology, and may also enable cross-correlation with effects arising from other environmental topics. However, many such schemes have been designed for dealing with such other environmental topics, and their application to the historic environment may be inappropriate. More qualitative, textual descriptions of effects may be more sympathetic to the characteristics of the historic environment and to the current state of knowledge and understanding resulting in an assessment that is more adequate overall.

**9.7** Where effects are assessed, it should be made clear whether the assessment is without mitigation, or whether it assumes the implementation of the mitigation proposed in the ES. The effect 'with mitigation' is sometimes referred to as the 'residual effect'. It might be appropriate to record only residual effects where mitigation is to take the form of avoidance by a modification to the scheme design that has already been implemented. However, effects without mitigation should be recorded where the implementation of that mitigation is not yet assured, either because the necessary investigations have not been commissioned, or because the measures will be subject to a condition or agreement that has not yet been concluded.

**9.8** As indicated previously, EIA should identify beneficial effects as well as adverse effects. For the historic environment, beneficial effects such as improved access or the contribution to new knowledge that arises from investigation are likely to depend on the implementation of mitigation measures. As above, beneficial effects that have been designed-in to the scheme can be highlighted, but beneficial effects that are subject to unconfirmed measures should be dealt with more cautiously.

**9.9** Gaps in data or methodology should be highlighted where uncertainty remains about known or potential sites, about importance, about impacts, or about effects.

## 10.1 Overview

10.1.1 The elimination of adverse environmental effects or their reduction to an acceptable level is the essence of EIA. Mitigation measures are those design and operational modifications or other measures implemented to avoid, minimise or offset the adverse effects and enhance the positive effects of a development during each stage of its life.

10.1.2 Mitigation can take place at various stages during the project life and for each scheme will be based primarily on the measures proposed in the EIA. Some mitigation may be implemented pre-submission or pre-consent. There may be a requirement to implement mitigation measures, such as exclusion zones around archaeological sites and features, during the project design stage. Other measures may be required during the construction, operation and decommissioning of a scheme.

10.1.3 Mitigation measures applicable to archaeological sites generally take three forms:

- Prevention or avoidance.
- Reduction.
- Remedying or offsetting.

## 10.2 Prevention or avoidance

10.2.1 Government policy and international best practice favour the preservation *in situ* of nationally important archaeological remains. In addition, the finite and non-renewable nature of archaeological sites and material means that the prevention of significant effects by re-designing schemes to avoid sites should be viewed as the preferred means of mitigation.

10.2.2 Preservation *in situ* has a practical advantage to offshore renewable energy developments. The nature of the offshore working environment means that marine archaeological site investigation and excavation is expensive and time consuming. The avoidance of identified sites and thereby reducing the possibility of direct or indirect impacts helps to alleviate the risk to developer of having to support site excavation and removal, and the subsequent stages of investigation (e.g. post-fieldwork assessment and publications) as set out in 3.1.3 above.

10.2.3 Avoidance of known sites can be obtained through the implementation of archaeological exclusion zones around either discrete sites or more extensive areas identified in the EIA. Exclusion zones preclude development-related activities within their extents. If exclusion zones will not impede scheme activities, they are a low cost solution and can be used widely and in a precautionary manner even if the actual character of the site is not known. In this respect they are useful means of dealing with unidentified anomalies or areas of potential. However, if the implementation of an exclusion zone is likely to have an impact on development activities, the additional costs arising from the constraint might warrant archaeological field evaluation to establish the actual presence and character of the feature, enabling the exclusion zone to be refined or removed entirely.

10.2.4 The position, extent and design of exclusion zones should be based on the best available data for each site, taking into account local geology, hydrology and sediment transport to ensure the continued stability of the sites throughout the period that the zone is operational. Exclusion zones should be considered at a very early stage of project planning so that they can inform the layout and cabling of proposed schemes. As with all aspects of mitigation, early discussion with archaeological curators about the position and design of exclusion zones is advisable.

## 10.3 Reduction

10.3.1 Notwithstanding precautions to avoid archaeological material, it is possible that previously unknown archaeological sites or material will be encountered only in the course of the construction, operation or decommissioning of a scheme. The effects upon unexpected material can be reduced by putting in place measures to ensure that such material receives rapid archaeological attention.

10.3.2 In the case of inter-tidal and terrestrial areas, an archaeological watching brief can be an effective mechanism for monitoring development activities for archaeological deposits, the presence and character of which could not be established (or established with sufficient certainty) in advance of development activities. The purpose of a watching brief is to record such deposits and recover any finds when they are encountered. A watching brief can also be used to trigger a more intensive archaeological intervention if warranted by the discovery.

10.3.3 Where there is continuing potential for archaeological material to be present offshore, and the specific construction methods are amenable to archaeological monitoring, then an offshore watching brief might be a viable option. However, the offshore marine environment and the construction methods often associated with offshore renewable energy schemes may be such that an offshore watching brief is not a practical or effective option.

10.3.4 Where the potential for previously unknown archaeological material to be encountered or recovered during offshore scheme works is more general, appropriate measures will need to be in place to ensure that any finds are promptly reported, archaeological advice is obtained, and any recovered material is stabilised, recorded and conserved. These measures can be set out in a formal protocol, as discussed below.

## 10.4 Remedying or offsetting

10.4.1 In some cases, it may not be possible to avoid a known site by design or the implementation of an exclusion zone. In these circumstances, the effects of the scheme can be remedied by carrying out excavation and recording prior to the impact occurring. Although the site will be destroyed, the information embedded within it will be 'preserved by record'.

10.4.2 Intrusive investigation can be complicated and time consuming, and in marine and coastal environments it is likely to result in the recovery of finds and structural material that will be unstable unless conserved. Consequently, the developer will be responsible for any intrusive investigation and all associated post-excavation stages of evaluation through to dissemination and deposition of the archive. Careful planning by the developer is therefore essential to ensure sufficient resources are allocated to support such work to established archaeological practice (see 3.1.3).

10.4.3 Intrusive investigation requires careful planning and it may be advisable to carry out one or more incremental evaluations prior to commencing open excavation. Evaluation is likely to require a physical inspection by diver or Remote Operated Vehicle (ROV), possibly followed by the excavation of small trenches, to obtain results that can inform the overall programme for site excavation and recording. Such work should take place well in advance of the anticipated impact. Where this is not possible, sufficient time and funding must be provided within the construction programme for the work to be undertaken. Adequate provision will also be required for post-fieldwork activities through to dissemination and deposition of the archive.

10.4.4 Other forms of remedy might include re-stabilising sites that have been destabilised (but not destroyed) by development, or offsetting damage to a site by detailed analysis and safeguarding of otherwise comparable sites elsewhere.

## 11.1 Conditions on consent

11.1.1 Consent for an offshore renewable energy scheme is likely to be subject to conditions. Many of these conditions will give effect to mitigation proposed within the ES, and will aim to ensure that the measures identified in the ES are implemented. Where the ES has identified significant effects on the historic environment, developers should expect consent conditions that require the implementation of archaeological mitigation.

11.1.2 Although the details of mitigation measures will differ from scheme to scheme, two general measures are likely to be encountered among consent conditions, namely the preparation and acceptance by the relevant curators of:

- An overall framework for archaeological mitigation and/or monitoring during the construction, operation and decommissioning of the scheme, usually referred to as a Written Scheme of Investigation (WSI); and
- A formal mechanism for intercepting and reporting accidental discoveries of archaeological material in the course of construction, operation and decommissioning, referred to as a Protocol for Unexpected Discoveries or similar.

## 11.2 Written Schemes of Investigation

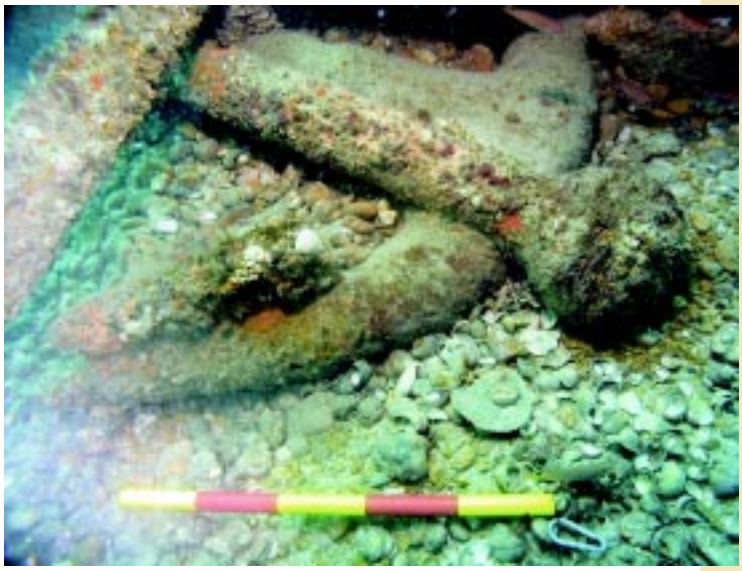
11.2.1 The design and implementation of mitigation measures should be informed by best archaeological practice and is likely to take the form of a Written Scheme of Investigation, which is a document that can be used to explain when, how and why mitigation measures recommended in the ES are to be implemented for any given scheme. In designing mitigation measures, reference should be made to the opinions provided by curators during scoping. It is advisable to discuss the content of a WSI with the relevant curators in the course of its preparation.

11.2.2 The objectives of a WSI are to:

- Set out the respective responsibilities of the developer, main contractors, and archaeological contractors/consultants, to include contact details and formal lines of communication between the parties and with archaeological curators;
- Ensure that any further geophysical and geotechnical investigations associated with the project are subject to archaeological input, review, recording and sampling;
- Provide for archaeological involvement in any diver and/or ROV obstruction surveys conducted for the scheme;
- Establish the exact position and extent of archaeological exclusion zones, and methodologies for their monitoring, modification and/or removal;
- Propose measures for mitigating effects upon any archaeological material encountered during the operation and decommissioning of the scheme; and
- Establish the reporting, publication, conservation and archiving requirements for the archaeological works undertaken in the course of the scheme.

## 11.3 Protocols for Unexpected Discoveries

11.3.1 Unexpected archaeological material or sites may be encountered during works associated with construction, operation or decommissioning. In anticipation of such instances, offshore renewable energy



developments can be accompanied by formal protocols for reporting discoveries, which will establish the procedure for reporting such finds. Such protocols may form part of the WSI. Once agreed by the developer and the relevant curators they can be reproduced in forms suitable for use by project staff.

**11.3.2** The aim of protocols for unexpected discoveries is to reduce any adverse effects of the development upon the marine historic environment by enabling people working on the project to report their discoveries or recovered material rapidly in a manner that is convenient and effective. The protocol will set out the respective responsibilities of the developer, main contractors, and archaeological contractors/consultants, to include contact details and formal lines of communication between the parties and with archaeological curators. The protocol therefore provides a mechanism to aid compliance with the Merchant Shipping Act 1995 in respect to recovery of 'wreck', as defined by the Act and reporting of military vessel and aircraft wrecks to the Ministry of Defence.

**11.3.3** The response to reported finds will be implemented through measures set out in the protocol, which may include the provision of prompt archaeological advice, archaeological inspection of significant features prior to further construction in the vicinity, and the establishment of archaeological exclusion zones if appropriate.

# 12 Monitoring

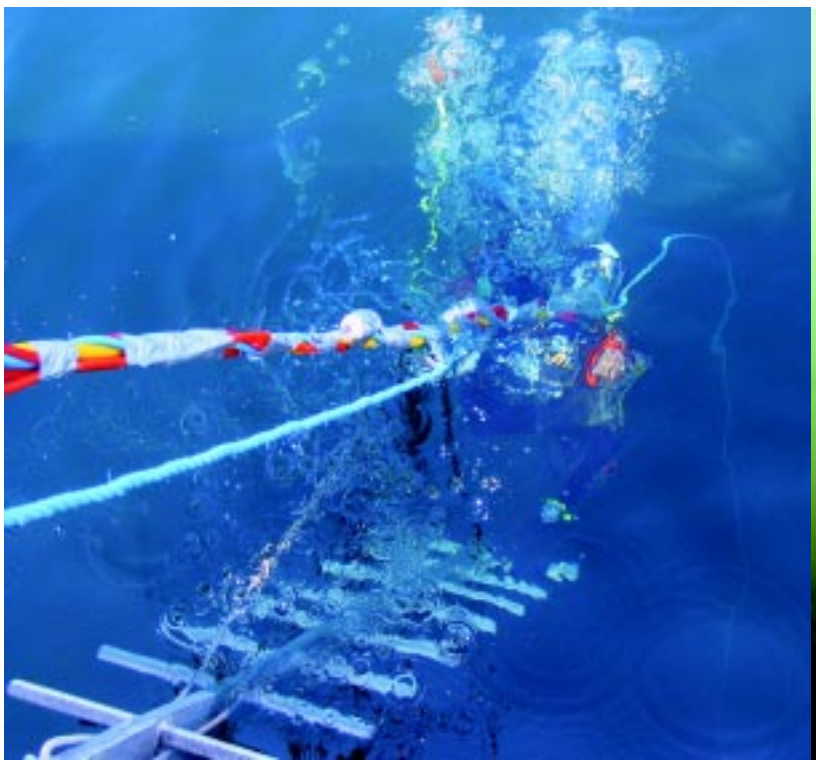
**12.1** The provision made by a developer for implementing mitigation measures will need to include measures to ensure that the implementation is effective. The developer's monitoring methods can be set out in the WSI, and may include periodic reporting on adherence to exclusion zones and the results of watching briefs.

**12.2** Protocols can be monitored by means of periodic visits to construction vessels. Provision should be made for periodic reporting on the implementation of the protocol. A requirement to report periodically on implementation of the protocol even if no reports have been made (e.g. by a weekly note that 'nothing has been reported') will help to ensure continuing awareness of the protocol.

**12.3** Copies of monitoring reports should be submitted to the relevant curators, who may also wish to set up arrangements for their own monitoring of mitigation measures, especially where these are subject to conditions on consent. Curators are likely to undertake a programme of visits to observe the implementation of mitigation measures, as well as requiring a formal structure for reporting and signing off the implementation of the WSI, including post-fieldwork provisions, during the life of the project. The scope of curatorial monitoring may need to be agreed as part of the WSI itself.

**12.4** At a broader level, provision should be made for monitoring the accuracy of the EIA process in respect of the historic environment. In particular, measures should be put in place to establish whether indirect impacts and secondary impacts occur – and are mitigated – as predicted. Monitoring can also address anticipated cumulative effects, with a relevance that extends to other schemes in the region.

**12.5** For monitoring to have any value in mitigating significant effects it will have to be accompanied by a scheme of adaptive management. Mechanisms must be in place to allow the results of monitoring programmes to inform subsequent development activities throughout the construction, operation and decommissioning of the scheme.



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# Glossary

**Archaeology** The study of the development of the human species and its environment through their material remains.

**Archive** All parts of the archaeological record, including finds and digital records as well as written, drawn and photographic documentation.

**Artefact** Any object or part of an object which has been made, used or modified in some way by human beings. Common examples include tools, utensils, art, food remains, and other products of human activity.

**Bronze Age** The period in history after the Stone Age characterised by the development of bronze and its use, especially for weapons and tools. In the UK the Bronze Age dates to 2,400–700 BC and is divided into three phases – Early (2,400–1,500 BC), Middle (1,500–1,100 BC) and Late (1,100–700 BC).

**Coastal margin** Shallow coastal waters, beaches, dunelands, lowland rivers, estuaries, salt marsh and all adjacent land areas that are affected by potential and actual impacts caused by the dynamic marine environment.

**Contractor** A person or organisation commissioned to undertake archaeological research and fieldwork usually to a brief set by a curator.

**COWRIE** Collaborative Offshore Wind Research Into the Environment

**Curator** A person or organisation responsible for the conservation and management of archaeological evidence by virtue of official or statutory duty, including for example County, District or Council archaeological officers, and the national bodies, English Heritage, Historic Scotland, Cadw (Wales), and Department of Environment, Northern Ireland.

**Defra** Department for Environment, Food and Rural Affairs.

**Deposit** Any accumulation laid down by human occupational activities.

**DTI** Department of Trade and Industry.

**Feature** Evidence of human activities visible as disturbances in the soil. Such disturbances are produced by digging pits for storage, setting posts for houses, or by constructing a hearth for cooking. These disturbances are often distinguished by soil discolorations or non-natural formations of stone, shell, bone, soil, coals, wood, etc.

**Foreshore** The area of a shore that lies between the average high tide mark and the average low tide mark.

**GIS** Geographic Information System.

**Hard** A firm or paved beach or slope convenient for hauling vessels out of the water.

**ICOMOS** The International Council on Monuments and Sites (see http://www.international.icomos.org/about.htm)

***In situ* preservation** The retention of archaeological items in the location where they were last deposited.

**Inter-tidal zone** see 'Foreshore'.

**Iron Age** A cultural stage characterised by the first use of iron as the main metal. In the UK the Iron Age dates to the period between c. 700 BC and 43 AD.

**Medieval** The period between the Dark Ages and the Renaissance (11th–14th centuries AD).

**Mesolithic** A transitional period of the Stone Age intermediate between the Palaeolithic and the Neolithic periods, characterised by adaptation to a hunting, collecting, and fishing economy based on the use of forest, lakeside, and seashore environments.

**Middle Bronze Age** see 'Bronze Age'.

**Mitigation** The process of avoiding, reducing or remedying adverse effects On the environment.

**National curator** see 'Curator'.

**Palaeoenvironmental** Relating to past environmental/climatic conditions.

**Palaeolithic** The earliest of three subdivisions of the Stone Age, preceding the Mesolithic and Neolithic. It lasted several million years, from the first appearance of stone tools to the Mesolithic microlith-using hunter-gatherers of the most recent postglacial period (± 8,500 years BC), and is normally divided into Lower, Middle and Upper phases.

**Post-medieval** The term used to describe the period covering the last 500 years, or since the end of the 14th century. In other areas it may be known as Historical Archaeology.

**Prehistoric** The period prior to written records for any given area which is revealed by archaeological methods and interpreted with the help of anthropological and historical analogies.

**Receptor** Means any sites or objects which are, or may be expected to be affected by activities related to, in this case, offshore renewable energy development.

**Roman** Refers to the period between AD 43 and AD 410 when parts of the UK were under Roman control.

**SEA** Strategic Environmental Assessment.

**Site** A location where human activities once took place and left some form of material evidence.

**UNESCO** United Nations Educational, Scientific and Cultural Organisation (see http://portal.unesco.org)

This report was commissioned by COWRIE (Collaborative Offshore Windfarm Research Into the Environment). COWRIE is a registered Charity set up to raise awareness and understanding of the potential environmental impacts of the UK offshore windfarm programme. It was created following the completion of the second licensing round for UK offshore windfarms, and is funded by developers' non-refundable option fees. The Charity carries out three inter-related strands of work: Data Management, Education and Communication, and Generic Environmental Research.

This report provides generic guidance in relation to the survey, appraisal and monitoring of the historic environment during the development of offshore renewable energy projects in the United Kingdom. It covers both the marine and coastal environments and those areas further inland likely to be affected by such developments.

The guidance is intended to promote the development of best practice in relation to the marine historic environment for the offshore renewable energy sector. It is also intended to promote an understanding of the conservation issues arising from the impacts of offshore renewable energy projects on the historic environment, and in this way develop capacity amongst developers, consultants and contractors.

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