

European Offshore Wind Deployment Centre Environmental Statement

Chapter 18: Marine and Maritime Archaeology



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18 MARINE AND MARITIME ARCHAEOLOGY

18.1 Introduction

- 1 An Environmental Impact Assessment (EIA) has been undertaken for the proposed European Offshore Wind Deployment Centre (EOWDC) by Wessex Archaeology, to support this Environmental Statement (ES). The impact of eleven wind turbines with inter-array cabling and export cabling to the coast (to the mean high-water mark) upon cultural heritage receptors in marine contexts was assessed. The EIA is underpinned by a baseline technical report which incorporates information from documentary sources and from a geophysical assessment of the seabed and sub-seabed sediments to identify cultural heritage assets within the marine study area (MSA).
- 2 The following technical reports support this chapter and can be found as:
 - Marine and Maritime Archaeology Baseline Technical Report (Appendix 18.1)
 - Marine and Maritime Archaeology Environmental Impact Assessment Technical Report (Appendix 18.2)

18.1.1 Methodology Consultation

- 3 During the preparation of this baseline report organisations were consulted. These are listed below:
 - UK Hydrographic Office (UKHO) (101201), documentary sources of wrecks and seabed obstructions
 - Royal Commission on the Ancient and Historic Monuments of Scotland (RCAHMS) (101201), documentary sources of wrecks, recorded losses
 - Ministry of Defence, Third Sector Heritage (110128), supplementary background source for protected places and control sites

18.1.2 Key Guidance Documents

- 4 The following guidance documents have been utilised:
 - The Code of Practice for Seabed Developers, Joint Nautical Archaeology Policy Committee 2006 (JNAPC 2006)
 - Historic Environment Guidance for the Offshore Renewable Energy Sector, COWRIE 2007 (Wessex Archaeology 2007)
 - Guidance for Assessment of Cumulative Impacts on the Historic Environment; from Offshore Renewable Energy, COWRIE 2008 (Oxford Archaeology & George Lambrick Archaeology and Heritage, 2008)
 - Protocol for Archaeological Discoveries: Offshore Renewables Projects, The Crown Estate, 2010 (Wessex Archaeology, 2010)
 - Offshore Geotechnical Investigations and Historic Environment Analysis: Guidance for the Renewable Energy Sector (Gribble & Leather/COWRIE 2011)

18.1.3 Data Information and Sources

- Archaeological records for the MSA available in the maritime section of the CANMORE database held by the RCAHMS which constitute the National Monuments Record for Scotland (NMRS), also interrogated via a map interface, CANMAP
 - Archaeological records for the MSA held locally in the Aberdeenshire, Moray and Angus Sites and Monuments Record (SMR)
 - Records of wrecks and obstructions collated by the UK Hydrographic Office (UKHO)
 - Records of Protected Places and Controlled Sites provided by the Ministry of Defence
 - SeaZone datasets including basemapping and wreck information (derived from UKHO records)
 - British Geological Service (BGS) mapping and UKHO charts
 - Various secondary sources relating to the palaeo-environment of the area and to the Palaeolithic and Mesolithic archaeology of Northern Europe
 - Secondary sources relating to wrecks and the maritime environment and the history and archaeology of Aberdeen and its surrounding area
- 5 Geophysical data that have been archaeologically assessed as part of this report is associated with the following reports:
- Emu Ltd (2008) Geophysical and Seabed Habitat Assessment of the Proposed Aberdeen Offshore Wind Farm for Aberdeen Offshore Wind Farm Ltd. Report No. 07/J/1/02/1136/0716
 - Osiris Projects (2010) Aberdeen Offshore Wind farm Geophysical Survey. Volume 1: Operations Report. No. C10023

18.2 Baseline Assessment

18.2.1 Maritime Cultural Heritage Assets

- 6 A total of two sites designated as of anthropogenic origin and of archaeological interest (WA 7071 and WA 7072) have been identified during the assessment of geophysical survey data within the MSA, located approximately 40 m apart. Of these, one is a previously uncharted wreck site (WA 7071) and the other is possibly a large piece of debris relating to a wreck (WA 7072).
- 7 It is not currently possible to define the type, identity and archaeological importance of the unidentified wreck (WA 7071). The sonar dimensions of the vessel are 25 m long by 6.5 m wide and it is partially buried by seabed sediment from the east. The wreck is associated with a small magnetic anomaly suggesting it could be of partly metal construction.
- 8 Both cultural heritage assets are in close proximity to the proposed location of Wind Turbine 8 (maximum distance around 60 m not including foundation dimensions) and the possible inter-array cable routes between Wind Turbines 8 - 9, 8 – 11 and 8 – 5 (around 30 m at nearest points not including trenching dimensions).

- 9 No other specific wreck sites have been identified in the MSA through geophysical survey interpretation. A magnetic anomaly WA 7070 (potentially an unknown wreck/aircraft crash site) is situated close to the proposed location of Wind Turbine 3 (maximum distance around 40 m not including foundation dimensions).

18.2.2 Submerged Prehistory & Palaeo-landscape Potential

- 10 The shallow geological sequence underlying much of the survey area represents a prograding shoreline sequence and records changes in sea level in the area since the Last Glacial Maximum. This, makes it a potentially important palaeogeographical and palaeoenvironmental sequence in relation to local and regional patterns of early prehistoric coastal activity and now-submerged archaeological landscapes.
- 11 The sandy sediment type suggests that potentially important organic palaeoenvironmental indicators may not have been preserved and that prehistoric archaeological material if present and preserved could mainly be lithic in nature.
- 12 The nature of the local Mesolithic records of lithic scatters associated with coastal sand dunes directly adjacent to the MSA suggests there may be potential for encountering early prehistoric lithic finds in offshore sediments of Holocene age.

18.3 Impact Assessment

18.3.1 Impact Assessment Methodology

- 13 Cultural heritage receptors are a finite resource, they cannot recover following physical impacts upon them and the security of the context in which they are found is critical to their value and importance. A summary of the nature and type of impacts is given in Table 18.1.
- 14 The adverse and beneficial impacts affecting cultural heritage receptors can be seen to derive from three main activities during the lifetime of the proposed project. Primary impacts are products of the main activities occurring within the project and would derive from:
- installation of inter-array and export cabling and
 - installation of wind turbine foundations
- 15 Secondary impacts are produced as a consequence of other impacts such as primary impacts and would derive from:
- the seabed footprint of attending vessels which may also cause impacts during construction, operation and decommissioning of the project
- 16 Both primary and secondary impacts can be direct or indirect. Direct impacts, as the name suggests, directly affect cultural heritage assets, eg excavation or compression of the seabed.. Indirect impacts, via an additional process or processes, affect cultural heritage assets, eg erosion of the seabed by turbulence induced by a seabed structure..

18.3.1.1 Impacts

Impact	Nature of Impact	Type of Impact
Direct damage to both <i>in situ</i> cultural heritage assets and assets in secondary contexts	Adverse	Direct
Disturbance of relationships between structures, artefacts and their surroundings or contexts	Adverse	Direct
Destabilisation and erosion of sites through changes to seabed characteristics	Adverse	Indirect
Burial of sites due to re-deposited sediment, potentially protecting and promoting the favourable preservation of cultural heritage receptors	Positive	Indirect

18.3.1.2 Cultural Heritage Receptors

- 17 The Cultural Heritage Receptors examined in this study are presented in Table 18.2. Baseline conditions highlight the presence or potential of prehistoric, maritime and aviation archaeology

Prehistoric Archaeology	Maritime Archaeology	Aviation Archaeology
Post-glacial submerged landscape features & fills	Known wreck sites	Unknown aircraft crash sites
Isolated prehistoric finds	Unknown wreck sites	

18.3.1.3 Sensitivity of the Receptor

- 18 The security of the context in which cultural heritage receptors are found is a key factor in assessing their value and importance. Generally impacts have adverse effects upon archaeological materials but some effects can be positive.
- 19 The sensitivity of the cultural heritage receptors is based on the definitions in Table 18.3. Cultural heritage receptors may be important for other reasons such as wartime significance (eg protected under the Protection of Military Remains Act 1986).
- 20 The terms used in the impact assessment are defined in Table 18.3. Where the importance or significance is unknown or cannot be clearly defined (eg for unknown distributions of prehistoric archaeological materials or unidentified wrecks), a precautionary approach is taken and receptors' archaeological potential, if adversely directly impacted, is assessed.

TABLE 18.3	
Definition of Terms Associated with the 'Sensitivity of Receptor'	
Sensitivity	Definition
Very High	Feature of International Importance OR best known example and/or significant potential to contribute to knowledge and understanding and/or outreach.
High	Feature of National Importance OR above average example and/or high potential to contribute to knowledge and understanding and/or outreach.
Medium	Feature of Regional Importance OR average example and/or moderate potential to contribute to knowledge and understanding and/or outreach.
Low	Feature of Local Importance OR below average example and/or low potential to contribute to knowledge and understanding and/or outreach.

- 21 For some cases, a negligible significance of impact may be surmised in association with Table 18.5. In relation to cultural heritage assets this would be defined as a "poor example and/or little or no potential to contribute to knowledge and understanding and/or outreach".

18.3.1.4 Magnitude of Effect

- 22 The magnitude of effect is assessed relative to the worst realistic case and the impact of development upon specific or regional cultural heritage assets relative to baseline conditions. The terms are defined as shown in Table 18.4:

TABLE 18.4	
Definition of Terms Associated with the 'Magnitude of Effect'	
Magnitude	Definition
Very High	Total loss or very major alteration to key elements/features of the baseline conditions such that post development character/composition/attributes would be fundamentally changed and may be lost from the site altogether.
High	Major alteration to key elements/features of the baseline (pre-development) conditions such that post development character/composition/attributes would be fundamentally changed.
Medium	Loss or alteration to one of more key elements/features of the baseline conditions such that post development character/composition/attributes of baseline would be partially changed.
Low	Minor shift away from baseline conditions. Change arising from the loss/alteration would be discernible but underlying character/composition/attributes of baseline condition would be similar to pre-development circumstances/patterns.
Negligible	Very slight change from baseline condition. Change barely distinguishable, approximating to the 'no change' situation.

18.3.1.5 Assessment of Significance

- 23 Based upon these criteria a judgement on receptor's sensitivity and the magnitude of effect is made. The significance of impact is then derived from Table 18.3 and Table 18.4 and guided by the matrix shown in Table 18.5.

TABLE 18.5**Matrix for Significance of Impact**

	Sensitivity of Receptor				
		Very High	High	Medium	Low
Magnitude of Effect based on spatial, duration and scale of effect	Very High	Major	Major	Major	Moderate
	High	Major	Major	Moderate	Minor
	Medium	Major	Moderate	Moderate	Minor
	Low	Moderate	Minor	Minor	Negligible
	Negligible	Minor	Negligible	Negligible	Negligible

18.4 Impact Assessment

- 24 During construction, without mitigation there may be adverse impacts of moderate significance to currently unknown/unidentified prehistoric cultural heritage receptors - submerged landscape features and fills, and potentially to isolated prehistoric finds within the MSA from development activities associated with cable trenching and wind turbine foundations.
- 25 Without mitigation there may be impacts of major significance to maritime archaeology receptors, in particular known wreck sites.
- 26 In addition, secondary impacts to known wreck sites of potentially major significance may also occur during operation and decommissioning phases of the project. This is due to the close proximity of known wreck site WA 7071 to the proposed position of Wind Turbine 8 and inter-array cable routes.
- 27 Using a worst case approach there may be several direct effects upon cultural heritage assets WA 7071 (unidentified wreck) and WA 7072 (possible debris) of anthropogenic origin of archaeological interest by a gravity base structure, skirting and scour protection at the Wind Turbine 8 position and cable trenching between Wind Turbines 8 and 9 (maximum 10.38 m width x 3 m deep).
- 28 There may be several direct effects in particular locations within the MSA from multiple export cable routes (up to a maximum of four 10.38 m width x 3 m deep trenches). The exact location of these is currently not fixed within the indicative export cable corridor. In the seabed area between the MCA designated anchorage abutting the south of the MSA and the exclusion zone around the Black Dog rifle range to the north, the concentration of trenching would be greater, increasing the spatial extent of adverse effects upon cultural heritage receptors that may be present in a localised area.
- 29 As a precautionary mitigation strategy, 50 m exclusion zones (buffered around the visible extents of each cultural heritage asset) have been recommended for WA 7071 and WA 7072 (see Appendix 18.2 Figure 1). WA 7070 cannot currently be identified as an anthropogenic feature and therefore has not been given a precautionary exclusion zone. Avoidance, or further site examination to identify the archaeological importance of WA 7070, 7071 and 7072, is proposed.

18.4.1 Cumulative and In-combination Effects

- 30 There may also be cumulative effects upon cultural heritage assets within the MSA in association with the following activities:
- a potential Ocean Laboratory to the south of Wind Turbine 1
 - Maritime and Coastguard Agency (MCA) designated anchorage area
 - commercial fisheries activity
 - subsea cables within the Blackdog Rifle Range exclusion zone
 - port/harbour dredging operations
- 31 In-combination effects, in this case, are not applicable to cultural heritage assets only to European sites associated with the EU Habitats Directive.
- 32 Recent and future developments are subject to EIA and mitigation strategies derived during this process should effectively manage impacts to cultural heritage receptors.
- 33 Table 18.6 presents a summary of the assessment for adverse impacts and positive impacts, as outlined in Table 18.1.

TABLE 18.6 Impact Assessment				
Potential Impact / Receptors	Significance Level	Mitigation	Residual Significance	Monitoring
Construction – Cable Trenching, Wind Turbine Foundations & Secondary Impacts from Vessel Seabed Footprints – ADVERSE IMPACTS				
Post-glacial submerged landscape features & fills	Moderate	Avoidance, Reporting protocol	Minor	Geophysical survey, ROV, finds reporting protocol
Isolated prehistoric finds	Moderate	Reporting protocol	Minor	Geophysical survey, ROV, finds reporting protocol
Known wreck sites	Major	Avoidance, Research, reporting protocol	Minor / Negligible	Geophysical survey, ROV, finds reporting protocol
Unknown wreck sites	Minor	Reporting protocol	Minor	Geophysical survey, ROV, finds reporting protocol
Unknown aircraft crash sites	Minor	Reporting protocol	Minor	Geophysical survey, ROV, finds reporting protocol
Operation – Secondary Impacts from Vessel Seabed Footprints – ADVERSE IMPACTS				
Known wreck sites	Major	Avoidance, Research, reporting protocol	Minor	Geophysical survey, ROV, finds reporting protocol
Decommissioning – Secondary Impacts from Vessel Seabed Footprints – ADVERSE IMPACTS				
Known wreck sites	Major	Avoidance, Research, reporting protocol	Minor	Geophysical survey, ROV, finds reporting protocol
Construction – Cable Trenching & Wind Turbine Foundations – POSITIVE IMPACTS				
All receptors	Negligible	-	-	Geophysical survey, ROV, finds reporting protocol

18.5 Summary

- 34 Impacts to cultural heritage receptors have been assessed for the proposed EOWDC. The significance of adverse impacts to potential prehistoric archaeology receptors, isolated prehistoric sites and finds and submerged landscape features, are assessed to be moderate. Following mitigation the significance of impacts is likely to be minor.
- 35 Adverse impacts relating to the damage and disturbance of known cultural heritage assets have been identified primarily with respect to the unidentified wreck (WA 7071) in close proximity to Wind Turbine 8 and associated inter-array cable routes between Wind Turbines 8 and 9, 8 and 11 and 8 and 5 (Figure 18.1). Without mitigation adverse impacts to this heritage asset are likely to be major. With mitigation, impacts may be avoided or significantly reduced.
- 36 Further research and site inspection of this feature may be an effective method for ascertaining the archaeological importance of this unidentified wreck and ultimately the most appropriate methods for impact mitigation.
- 37 The significance of adverse impacts to potential maritime archaeology and aviation archaeology receptors – unknown wreck sites and unknown aircraft

crash sites – are assessed to be moderate. Following mitigation the significance of impacts is likely to be minor.

- 38 Avoidance, where practicable, is the preferred mitigation strategy for known cultural heritage assets. Minor amendments to the position of cable trenching and the configuration or placement of the foundation of Wind Turbine 8 have been outlined.
- 39 There is potential for encountering previously unknown archaeology in the. Strategies have been proposed to mitigate adverse impacts to these receptors.
- 40 Research, particularly the geoarchaeological examination of vibrocores and grab samples from sub-seabed sediments, taken for engineering or other development purposes provides a cost-effective mitigation strategy to directly investigate the age and archaeological potential of sub-seabed sediments of potential prehistoric archaeological importance. The integration of this kind of geoarchaeological analysis early in the sequence of development activities is advisable to provide the most effective mitigation strategy (Gribble and Leather 2011).
- 41 Monitoring may be achieved through remote means such as geophysical or ROV survey. In addition, The Crown Estate has recently published a reporting protocol for finds from offshore developments (The Crown Estate/Wessex Archaeology 2010). Best-practice and effective monitoring may be partly achieved by implementing this protocol. Added value would also be provided to the National Monuments Record.

18.6 References

COWRIE, 2008, '*Guidance for Assessment of Cumulative Impacts on the Historic Environment; from Offshore Renewable Energy*', Commissioned by COWRIE Ltd project reference CIARCH-11-2006). Project contractors: Oxford Archaeology with George Lambrick Archaeology and Heritage.

Gribble, J., and Leather, S., for EMU Ltd, '*Offshore Geotechnical Investigations and Historic Environment Analysis: Guidance for the Renewable Energy Sector*', Commissioned by COWRIE Ltd (project reference GEOARCH-09).

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