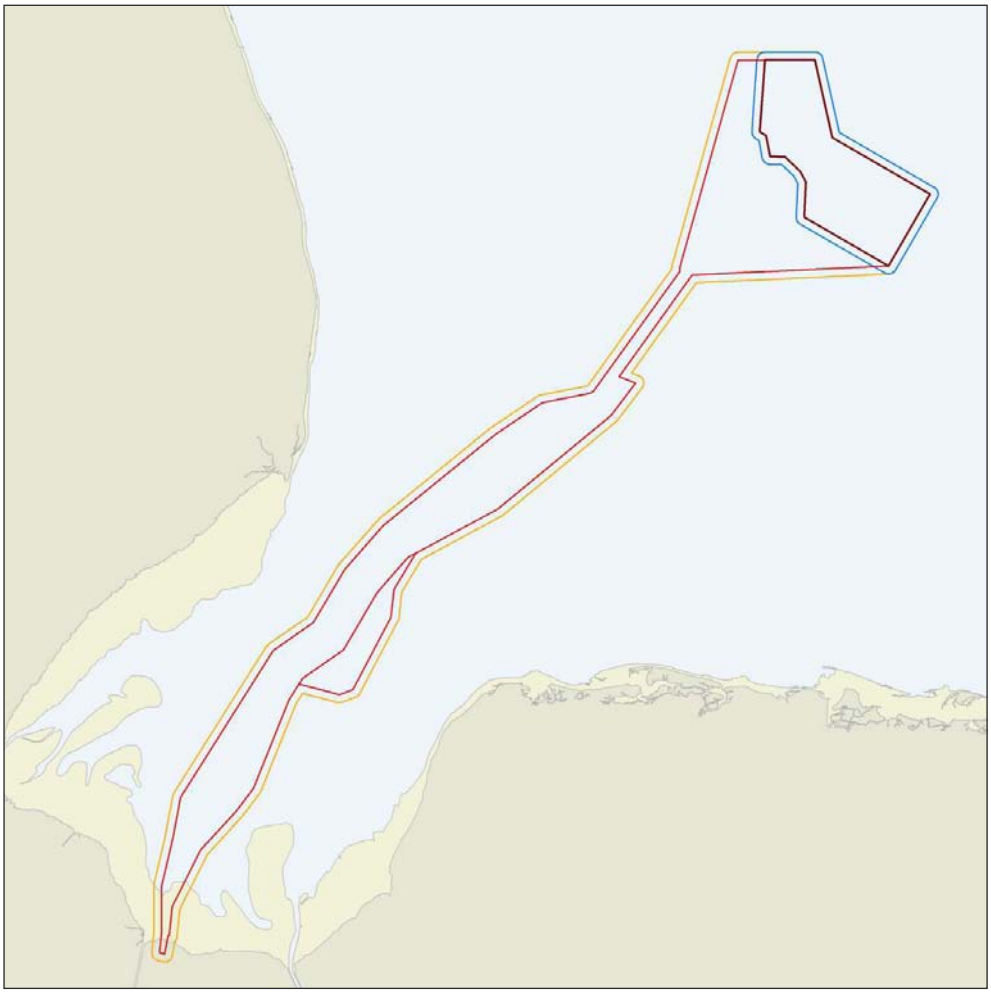
making sense of heritage

Race Bank Offshore Wind Farm

Archaeological Monitoring and Mitigation
Written Scheme of Investigation
Second Revision



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December 2014

coastal&marine

RACE BANK OFFSHORE WIND FARM

ARCHAEOLOGICAL MONITORING AND MITIGATION: WRITTEN SCHEME OF INVESTIGATION SECOND REVISION

Prepared on behalf of:

DONG Energy
33 Grosvenor Place – Belgravia
London
SW1X 7HY

By:

Wessex Archaeology
Portway House
Old Sarum Park
Salisbury
SP4 6EB

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RACE BANK OFFSHORE WIND FARM

ARCHAEOLOGICAL MONITORING AND MITIGATION: WRITTEN SCHEME OF INVESTIGATION SECOND REVISION

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RACE BANK OFFSHORE WIND FARM

ARCHAEOLOGICAL MONITORING AND MITIGATION: WRITTEN SCHEME OF INVESTIGATION SECOND REVISION

Report ref. 106940.01

1 INTRODUCTION

1.1 Project Background

1.1.1 Wessex Archaeology (WA) was commissioned by DONG Energy to update the Revised Race Bank Offshore Wind Farm ('the Project') Written Scheme of Investigation (WSI) for the offshore elements of the Project.

1.1.2 The Project received consent from the Department of Energy and Climate Change (DECC) in July 2012. The application for the Project, of a maximum generating capacity of 620 MW (maximum of 206 wind turbine generators), was submitted to DECC in 2009 as an application for consent under Section 36 of the Electricity Act 1989 (for all infrastructure installation and associated works up to a level of MHWS), with parallel applications to the Marine and Fisheries Agency (MFA) for licences under the Food and Environment Protection Act 1985 (Part II) (FEPA) and under Section 34 of the Coast Protection Act (CPA).

1.1.3 Subsequent modifications to the scope of the Project were submitted to DECC in July 2011, principally to reduce predicted impacts on Sandwich terns from the North Norfolk Coast Special Protection Area (SPA). These modifications reduced the maximum capacity of the Project to 580 MW.

1.1.4 The original FEPA and CPA applications were superseded, by the introduction of the Marine and Coastal Access Act 2009, so that in parallel with the approval of the Section 36 consent by DECC, the Marine Licence L/2012/00217 for the Project was granted by the Marine Management Organisation (MMO) in July 2012. The Marine Licence L/2012/00217 (as amended) provides consent for the construction of the Project with a maximum capacity of up to 580 MW, comprising between 82 and 101 wind turbine generators. A number of licence variations have been granted in relation to the Project with the current Marine Licence L/2012/00217/7 dated July 2014.

1.1.5 The archaeological WSI was originally submitted to fulfil Licence Condition 3.1.4 of Marine Licence L/2012/00184 which stated:

> *An Archaeological Written Scheme of Investigation (WSI) is to be prepared in agreement with the MMO and English Heritage to address the geotechnical survey techniques and methodologies to be employed in the proposed survey programme. The agreed WSI is to be supplied*

to the MMO and English Heritage at least 21 days before the start of the survey and works must not commence until the licensing authority has provided written approval.

1.1.6 The WSI was revised in August 2012 to include changes to the project study area and additional survey areas.

1.1.7 This updated WSI incorporates the current consented boundary, updates to the project description, and the second issue of the *Protocol for Archaeological Discoveries: Offshore Renewables Projects* (ORPAD) (The Crown Estate 2014).

1.1.8 This WSI is being submitted to fulfil Marine Licence L/2012/00217/7 Condition 3.1.17 which states that: The Licence Holder must submit a Written Scheme of Investigation (WSI) to the Licensing Authority in consultation with EH [English Heritage] and Norfolk County Council Historic Environment Service at least **four months** prior to construction'. The WSI must include:

- An Archaeological Reporting Protocol for the prompt reporting and recording of archaeological remains encountered, or suspected, during all phases of construction, operation and decommissioning. This must be set out in accordance with The Crown Estate Protocol for Archaeological Discoveries: Offshore Renewables Projects (first published 2010: The Crown Estate 2014);
- Responsibilities of developer, archaeological consultant;
- Details of contractors and curators (national and local);
- Methodology for further site investigation including survey;
- Specifications for geophysical, geotechnical and diver/ROV investigations;
- Archaeological analysis and reporting of survey data and diver/ROV investigation to the Licensing Authority;
- Delivery of mitigation including use of archaeological construction exclusion zones in agreement with the Licensing Authority; and
- Monitoring during construction through to decommissioning; and conservation, publication and archiving duties for archaeological material.

1.1.9 In addition, the Licence includes conditions related to the implementation of measures to mitigate any potential negative impacts of the construction of the scheme on archaeology and cultural heritage (3.1.18 – 3.1.21).

1.1.10 'Construction' is considered for the purposes of this WSI to comprise all forms of activity associated with the development of the Project that may cause, directly or indirectly, an impact on the surface or sub-surface of the sub-tidal seabed. Construction includes geotechnical surveys, piling, excavation, dredging, emplacement and dumping, as well as post-construction activities, such as monitoring surveys, the results of which will be subject to archaeological assessment.

1.1.11 This WSI reflects a considerable amount of previous research, including the results of the following reports:

- Wessex Archaeology 2006, Docking Shoal and Race Bank Offshore Wind Farms, Archaeological Desk Based Assessment, ref 62550.02;
- Wessex Archaeology 2006, Wash Cable Route Corridor, Marine Archaeological Desk Based Assessment, ref 62550.03;
- Wessex Archaeology 2006, Docking Shoal Offshore Wind Farm and Wash Cable Route Corridor: Geophysical Data Audit and Review, ref 62550.04;
- Wessex Archaeology 2007, Wash Cable Route Corridor, Archaeological Assessment, ref 62550.06;
- Wessex Archaeology 2007, Race Bank Offshore Wind Farm: Geophysical Data Audit and Review, ref 62550.07;
- Wessex Archaeology 2007, Race Bank Offshore Wind Farm : Archaeological Monitoring and Mitigation: Written Scheme of Investigation, ref. 62553.01;
- Wessex Archaeology 2008, Race Bank Offshore Wind Farm, Archaeological Assessment, ref 62554.04;
- Wessex Archaeology 2010, Race Bank and Docking Shoal Offshore Wind farms, Additional Areas in the Wash: Assessment of Marine Geophysical Data and Archaeological Assessment, ref 62556.04;
- Wessex Archaeology 2010, Race Bank Offshore Wind Farm: Stage 1 Geoarchaeological Recording of Borehole Samples, ref 62557.01;
- Wessex Archaeology 2010, Race Bank Offshore Wind Farm: Stage 2 Geoarchaeological Recording of Borehole Samples, ref 62557.02;
- Wessex Archaeology 2012, Race Bank Offshore Wind Farm, Archaeological Monitoring and Mitigation: Written Scheme of Investigation (Revised), ref 62555.05;
- Wessex Archaeology 2012, Race Bank Offshore Wind Farm, Data Audit of 2006 and 2009 (Cable Route) Data, Ref 62558.01;
- Wessex Archaeology 2012, Race Bank Offshore Wind Farm, Geoarchaeological Review (Cable Route): Method Statement, ref 62558.02;
- Wessex Archaeology 2012, Race Bank Offshore Wind Farm, Additional 2006 Data Assessment, ref 62558.03; and
- Wessex Archaeology 2014, Race Bank Offshore Wind Farm, Stage 1 and 2 Geoarchaeological Assessment, ref 62559.02.

1.1.12 The Environmental Statement Chapter is not included in the reports list as it was amalgamated into the overarching Environmental Statement.

1.2 Development Description

1.2.1 The Project is located off the Lincolnshire and north Norfolk coasts, to the north of the rejected Docking Shoal Offshore Wind Farm (Docking Shoal) project and directly to the north-east of Lincs Offshore Wind Farm (Lincs). The southern boundary of the Project is approximately 22km off the north Norfolk coast. The Project will consist of up to 91 x 6.3 MW turbines, to be installed on the Race Bank and North Ridge sandbanks in water depths of 4m to 22m above lowest astronomic tide (LAT). The Project's footprint is an irregular polygon that will cover an area of about 75km² . The location of the Project is shown in **Figure 1**.

1.2.2 The Project will consist of three physical elements:

- The offshore wind farm (OWF), comprising:
  - 91 x 6.3 MW wind turbine generators (WTGs), with up to 7m diameter monopile foundations;
  - up to two (2) offshore sub-stations with four legged jacket foundations, secured to the seabed with up to 2.4m diameter pin piles; and
  - inter-turbine cables.
- The offshore export cables, comprising of a maximum of two pairs of cables running in a corridor from the OWF to a landfall on the coast in The Wash, including an additional area that has been separately assessed (WA 2010a);
- The terrestrial export cables, including the connection chambers or jointing bays, buried cables and the wind farm sub-station at Walpole.

1.2.3 This WSI considers the first two of these elements, covering the area **below** the **Mean High Water Springs mark**. The terrestrial elements of the scheme above the inter-tidal zone are considered in a separate WSI.

1.2.4 Buried inter-turbine cables will link the WTGs and the two (2) offshore substations within the project site. Maximum inter-array cable length will be 209km. It is anticipated that the inter-array cabling will be buried to at least 1m, although this is subject to detailed assessment.

1.2.5 The Project will be connected to the onshore electrical system via up to two (2) buried submarine export cables, to be laid on the eastern side of a 2,500m wide corridor that will also serve the Lincs Offshore Wind Farm (Lincs). It is likely that these will be laid in pairs, although this is also subject to detailed assessment. The Race Bank cable route corridor will be routed south-west through The Wash, coming ashore approximately 1km east of the mouth of the River Nene (**Figure 1**).

1.2.6 The export cable length from the site boundary to the landfall is approximately 59km. Of this the last approximately 6km is inter-tidal mudflat, with a 850m fringe of salt marsh on the landward edge and sea defences directly behind this. Approximate water depth relative to LAT is 3 – 14m offshore and 0 – 3m in the inter-tidal zone.

1.2.7 To allow for anchor handling, construction width requirements for cable-laying will be ±100m in both the offshore and inter-tidal zones, to allow for variations in positioning and micro-siting.

1.2.8 Export cable installation will be by ploughing, jetting or rock cutting or a combination of these methods. The offshore and terrestrial cables will be connected in a jointing pit to be constructed on the landward side of the sea defences.

1.2.9 Clearance of seabed debris may be necessary before cable-laying. This consists of detecting and removing obstructions by towing a snagging device. Where required, grappling or grabbing may also be employed to remove obstructions.

1.2.10 It is intended that the export cables will be buried to a depth in excess of 1m, with this being determined by further assessment.

1.2.11 The Project's output will be transferred to the National Grid via the buried terrestrial export cables which will connect the landfall to a new 220kV / 400 kV sub-station at Walpole Marsh, Norfolk, approximately 11km south of the landfall.

1.3 Construction Programme

1.3.1 Final scheme details are not yet available, and although the final construction programme remains under development and may be subject to change, it is currently anticipated that work will be undertaken between Q1 2015 and Q1 2017. It is anticipated that the installation of the offshore elements of the Project will be divided into the following phases (although not necessarily in the following order):

- Onshore cable installation from Q2 2015;
- Onshore substation installation from Q1 2015;
- Intertidal export cable installation from Q2 2016;
- Array cable installation from 2017;
- Offshore substation 1 installation Q3 2016;
- Offshore export cable installation Q2 2016;
- Scour protection installation Q2 2016;
- Foundation and WTG installation from Q1 2017.

1.3.2 Cable-laying is likely to be divided into the following phases:

- Investigations along the export and inter-turbine cable routes;
- Route clearance and pre-lay grapnel operations; and
- Cable lay and burial from the beach to the OWF, followed by connection at the offshore sub-stations.

1.3.3 Borehole drilling and cone penetration testing (CPT) testing was undertaken in 2010 and data and samples from these investigations were subject to geoarchaeological investigation (WA 2010b, 2010c). Further geotechnical

works were undertaken in 2013, and these were also subject to geoarchaeological investigation (WA 2014).

1.4 Previous Archaeological Assessment

1.4.1 Baseline reviews of the known and potential archaeology within the OWF footprint, export cable route corridor and extended cable route study area were carried out by WA (WA 2006b, 2006c, 2007c, 2008, 2010a, 2010b, 2010c, 2012 and 2014). These reviews included the archaeological assessment of available geophysical and geotechnical survey data as well as coastal sites in the vicinity of the landfall. In addition, archaeological assessments have been carried out for the (since rejected) Docking Shoal project (WA 2007b), and the operational Lynn and Inner Dowsing Offshore Wind Farm (LID) projects (WA 2002), and Lincs project (WA 2006a). Together these assessments have built up a picture of the offshore archaeology of the region.

1.4.2 These reviews identified known and potential archaeological resources that comprised:

- The possible presence of drowned land surfaces and drowned terrestrial sites;
- Known or charted wrecks, aircraft crash sites and seabed obstructions;
- Recorded or documented shipping and aircraft losses;
- Evidence for unknown and undocumented wrecks from various periods;
- Possible stray finds of maritime debris from various periods and debris associated with aircraft casualties and activity; and
- Geophysical anomalies that appear to be wreck sites or wreck debris, including aircraft.

1.5 Summary of Known and Potential Historic Assets

Offshore Wind Farm

1.5.1 Within the Race Bank array, Holocene marine sediments consisting of slightly gravelly sand up to 7.5m thick, overlie glacially deposited Bolders Bank Formation sediments (approximately 5m deep), which in turn overlie Cretaceous chalk bedrock.

1.5.2 There are no known prehistoric terrestrial sites within the boundary of the Project. However, in some cold periods during the Lower and Middle Palaeolithic and for approximately 10,000 years between the end of the last ice age (c.18,000 BP) and the Mesolithic, the area occupied by the Project was a potentially habitable terrestrial environment. The potential therefore exists for the Race Bank site to contain drowned terrestrial archaeological sites. Terrestrial peat and other sediments with the potential to contain well-preserved organic material of archaeological and palaeo-environmental potential have been noted in the course of geo-archaeological investigation

(WA 2010b and 2014). Seven (7) channel features are identified in the Offshore Wind Farm area (**7172** – **7176**) (**Figure 2**).

1.5.3 In terms of maritime sites and material within the OWF Study Area there are:

- 149 geophysical anomalies identified within the geophysical data (**Table 1a; Figure 3**). The geophysical anomalies have archaeological potential but are otherwise unidentified.
- Two (2) known 'live' wrecks charted by the UKHO (**Table 1a; Figure 3**).
- Two (2) further wrecks recorded by the UKHO as 'dead', but no trace of these wrecks were found in the geophysical assessment. However, it is still possible that material remains buried at the site.

1.5.4 The archaeological assessment also identified a total of 118 documented or recorded losses at two Named Locations in the general area, for which no known sites exist. Given that there may also have been many unrecorded losses, the potential exists for wreck and other sites of all periods from the Mesolithic onwards to be found within the OWF.

1.5.5 Five (5) military aircraft recorded as lost in the general area of the OWF were noted in the archaeological assessment, and some of these aircraft are potentially present in the OWF footprint. If found, these sites are automatically protected by the Protection of Military Remains Act (1986).

Area	Geophysical Anomalies	Previously Recorded Sites	NRHE Records	Aircraft Losses	Total
OWF	149	4	118	5	276

Table 1a Known and Potential Archaeological Historic Assets in the vicinity of the Project

Export Cable Route

1.5.6 The Project's export cable corridor passes west of the Docking Shoal project and then through The Wash, a low-lying coastal embayment. The morphology of The Wash is undulating seabed with shifting sandbanks, many of which are exposed at all states of the tide. Seabed sediments are mainly sand or gravels. Near shore, the route crosses an inter-tidal zone of muddy sediment in the form of mudflats and salt marshes.

1.5.7 There are no known prehistoric sites along the export cable corridor. However, in some cold periods during the Lower and Middle Palaeolithic and between the last ice age and the late Bronze Age, parts of the area traversed by the export cable route were a potentially habitable terrestrial environment. A palaeo-channel has been located by geophysical survey and the potential therefore exists for prehistoric archaeological sites and finds and palaeo-environmental evidence to be present in the area to be impacted by the export cable. In addition, a number of vibrocores from within the consented cable corridor that were archaeologically assessed contained organic-rich deposits of particular archaeological interest (Wessex Archaeology 2014).

1.5.8 The archaeological assessment of the geophysical data for the consented cable corridor within a 500m buffer identified:

- 337 geophysical anomalies (including five (5) geophysical anomalies which are also within the 500m Offshore Wind Farm buffer (**Figure 3, Table 1b**));
- Twelve (12) Live wrecks and obstructions recorded by the United Kingdom Hydrographic Office (UKHO); and
- One (1) wreck listed as 'dead' by the UKHO, although no evidence of either was found in the geophysical data. However, it is still possible that material remains buried at the site.

1.5.9 As with the OWF, the potential exists for recorded shipping losses whose location is unknown to be present within the cable route areas. The National Records of the Historic Environment (NRHE) currently records 87 of these losses at seven Named Locations in these areas. In addition, there is potential for unknown maritime casualties of all periods to be present.

1.5.10 Lastly, nine (9) military aircraft lost in the general area were identified during the archaeological assessment and some of these aircraft are potentially present in the cable route areas. If found these sites are automatically protected by the Protection of Military Remains Act (1986).

Area	Geophysical Anomalies	Previously Recorded Sites	NRHE Records	Aircraft Losses	Total
Cable Route	337	13	87	9	446

Table 1b Known and Potential Archaeological Historic Assets in the vicinity of the Project Consented Cable Corridor

1.6 Anticipated Impacts

Offshore Wind Farm

1.6.1 The Project area is considered to be an area of high archaeological potential on account of its location within a formerly terrestrial prehistoric landscape that, post-inundation, went on to become a well-utilised stretch of seaway for maritime vessels and aircraft. Any installation and other works that disturb the seabed within the OWF therefore have the potential to negatively impact archaeological deposits and material. These deposits include currently unknown prehistoric sites and land surfaces from the Palaeolithic to the Neolithic and possibly later.

1.6.2 There are 153 geophysical anomalies with archaeological potential, and previously recorded wrecks and obstructions within the OWF study area, 12 of which are of sufficient interest to require Archaeological Exclusion Zones (AEZ). There are also 118 documented maritime losses of unknown location. Some of the documented losses may lie outside the 500m buffer zone around the OWF footprint. Five (5) reported military aircraft losses may lie within the cable route corridor and unknown maritime casualties (wrecks and debris), dating from the Mesolithic to the present, may also be present.

1.6.3 The most obvious way in which these archaeological sites and deposits can be negatively affected by scheme activities is by direct impact damage from, for example, drilling/piling for foundation installation, cable-laying, the dropping or recovery of anchors and the use of grapnels. There are a number of ways in which archaeological sites and material have the potential to be impacted and these may occur immediately or may be long-term post-installation processes, such as scouring. These potential impacts can be summarised as follows:

- Displacement, which disturbs the context of the archaeological deposit (the relationship between the structures or artefacts that make up the deposit and their surroundings) and thereby reduces the amount of archaeological information that can be recovered from it;
- Erosion of the deposit or surrounding/covering seabed, resulting in damage and displacement and possibly prompting further erosion or instability; and
- Destabilisation, resulting in accelerated deterioration of the deposit through corrosion, erosion, etc.

1.6.4 Foundation installation is invasive and will have a negative impact upon archaeological deposits of any type in the foundation footprints. The severity of the impact will depend upon the horizontal and vertical extent of the footprint and, therefore, on the foundation type chosen. Destruction or removal of archaeological deposits within the foundation footprint is probably inevitable but the impacts are likely to be localised around each foundation.

1.6.5 The overall scale of the impact from the foundations themselves is likely to be very small if it is assumed that there is an even spread of submerged prehistoric material across the area. In practice, submerged prehistoric material will not be evenly spread, and impacts from turbine foundations on discrete areas of such material are likely to be higher.

1.6.6 Some monopiles will require additional scour protection in the form of rock dumping on the seabed around the foundation. This is likely to have a limited additional impact on surface and shallow deposits in the immediate vicinity of the foundation.

1.6.7 The inter-array cables are likely to be laid and buried by ploughing or jetting. The impact footprint of this activity will be within a narrow corridor along the cable route, as laid, and will probably be limited to a zone no greater than the width of the plough. The depth of the impact will depend upon the depth of burial required, which is not yet known. However, only surface or shallow buried archaeological deposits (probably less than 1.5m) are likely to be affected.

1.6.8 In addition, pre-construction debris clearance in and around each turbine footprint and along the inter-array cable routes may result in the destruction or removal of surface and shallow buried archaeological deposits. The depth of the impact will depend upon the equipment used.

1.6.9 Marine operations ancillary to installation are likely to impact upon surface or shallow, buried archaeological deposits. The use of mooring anchors for positioning installation and support vessels may create the following potential impacts:

- Impact damage and possibly displacement as anchors are dropped during positioning or repositioning by anchor handlers;
- Seabed scarring and impact damage from the movement of anchors as cables are pulled taught;
- Seabed scarring from the movement of cables under load.

1.6.10 The extent and seriousness of the impact damage and seabed scarring depends upon a number of factors, including:

- Vessel size and type and the number of anchors used;
- Anchor size, type and weight;
- Nature of the seabed sediment;
- Load placed upon the vessel and hence anchors by prevailing weather and currents; and
- Vessel and anchor handler crew skill.

1.6.11 The use of a jack-up barge or similar vessel may have the following impacts upon surface or shallow buried archaeological deposits:

- Impact damage and possible displacement caused by spud cans (the degree of impact will depend upon the number of the spuds and the size of their footprint and depth of penetration);
- Similar impacts to the above from the use of additional anchors; and
- Destruction and/or displacement during debris clearance of the anticipated spud footprints.

1.6.12 The use of dynamically positioned (DP) vessels is likely to minimise the negative impact of installation operations on archaeological deposits present, as the deployment of spud feet and the use of anchors will not be required.

Export Cable Route

1.6.13 The export cable route is considered to be an area of high archaeological potential. Any installation and other works that disturb the seabed therefore have the potential to negatively impact archaeological deposits and material. These include unknown, but potential prehistoric artefacts and sites, and land surfaces from the Palaeolithic to the Neolithic and possibly later.

1.6.14 There are 350 geophysical anomalies with archaeological potential, and previously recorded wrecks and obstructions within the cable route corridor, 38 of which are of sufficient interest to require AEZ. There are also 87 documented maritime losses, with unknown locations. Some of the documented losses may lie outside the 500m buffer zone around the cable route corridor. Nine (9) reported military aircraft losses may lie within the

cable route corridor, and unknown maritime casualties (wrecks and debris) dating from the Mesolithic to the present may also be present.

1.6.15 The details of the cable installation have not yet been finalised but it is anticipated that the cables will be laid one after the other, rather than simultaneously. The offshore cable is likely to be laid from a lay-barge (self-propelled or supported by tug or anchor barge) and buried to a depth of at least 1m, either by ploughing or jetting or, if these are impracticable, by trenching.

1.6.16 Cable installation has the potential to impact on surface and shallow buried archaeological deposits. The impact will manifest itself as direct impact damage, displacement or erosion, as described above. The impact will be localised, but surface and near surface deposits may be impacted for the full width of the plough or jetting machine.

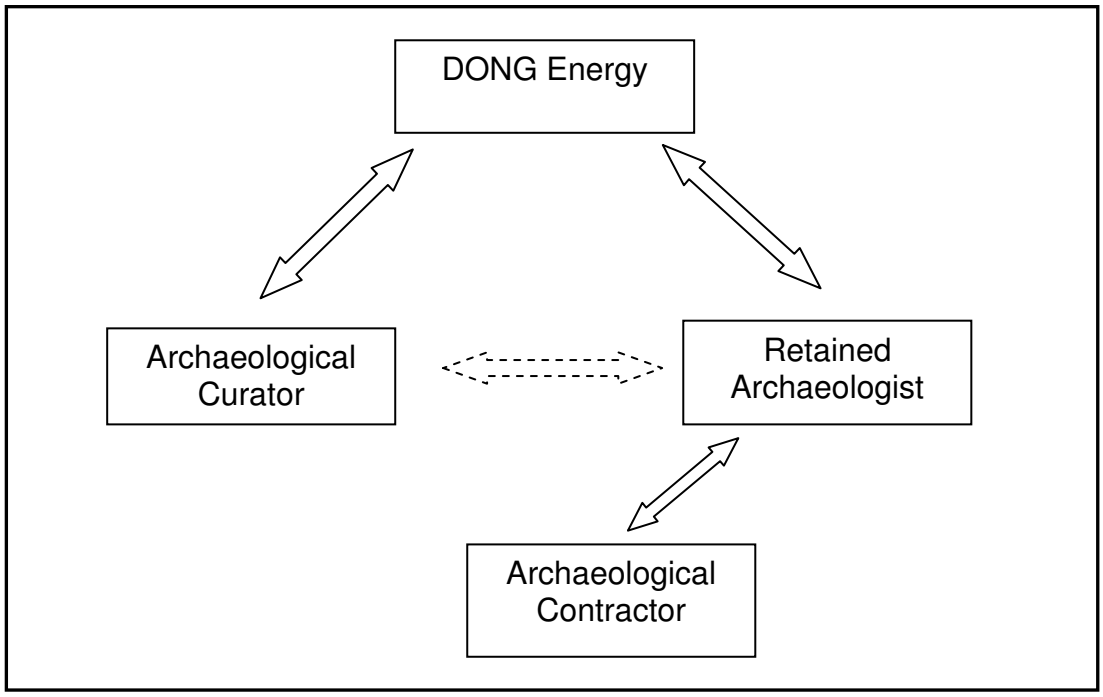
1.6.17 The scale of these impacts is uncertain; however the export cable route is about 59km long and assuming jetting is used, the typical width of a jetted trench is 300mm with a burial depth of 1m. This will mean the disturbance of roughly 17,700m^3 of seabed deposit, approximately 0.00265% of the total area of The Wash.

1.6.18 If the cable-lay vessel is positioned and moved by means of an anchor pattern, there is a risk of additional impacts. The zone of potential impact from anchoring is likely to be at some distance from the cable-lay vessel and will depend upon the length of anchor cable required. Surface and shallow buried deposits in the path of the anchors will be vulnerable to damage and/or displacement.

2 RESPONSIBILITIES AND COMMUNICATION

2.1.1 DONG Energy will retain the services of a suitably qualified and experienced archaeological contractor (the Retained Archaeologist) to ensure the effective implementation of the WSI and other contractual commitments in relation to archaeology.

2.1.2 The following diagram shows the lines of communication between DONG Energy, the Archaeological Curator and the Retained Archaeologist/Archaeological Contractor:



2.1.3 The English Heritage Maritime Team is the Archaeological Curator responsible for heritage matters offshore. The primary point of contact at English Heritage is:

- Dr. Chris Pater, English Heritage Marine Planning Unit, English Heritage, Eastgate Court, 195 – 205 High Street, Guildford, GU1 3EH

2.1.4 The English Heritage Maritime Team may consult English Heritage's Regional Science Advisor for the East of England with regard to activities undertaken as part of this WSI. English Heritage's Regional Science Advisor for the East of England is:

- Ms. Helen Chappell, English Heritage Regional Science Advisor, East of England Region

2.1.5 Contact with the Archaeological Curator will be administered by DONG Energy, advised by the Retained Archaeologist.

2.1.6 In relation to the implementation of the WSI the Retained Archaeologist will report to DONG Energy's Environment and Consents Manager (ECM).

2.1.7 Interaction with DONG Energy's Construction Team will be administered by the ECM, advised by the Retained Archaeologist.

2.1.8 The ECM will advise the Retained Archaeologist of his/her requirements or responsibilities under any Environmental Management Plan and the Construction Method Statement for the project.

2.1.9 The responsibilities of the Retained Archaeologist will include:

- Maintaining, reviewing and updating this WSI, as required;
- Advising DONG Energy's Contractor(s) which elements warrant archaeological involvement;
- Advising DONG Energy's Contractor(s) in the course of evaluating scope of work specifications on their capacity to meet archaeological requirements;
- Advising DONG Energy on the necessary interaction with third parties with archaeological interests, including the Archaeological Curator;
- Advising DONG Energy on the implementation of generic archaeological requirements applicable to all construction and operational activities;
- Advising DONG Energy's ECM on Method Statements for archaeological investigations;
- Preparing detailed Method Statements for all archaeological activities;
- Ensuring that the ECM copies Method Statements to the Archaeological Curator for approval;
- Monitoring the work of and liaising with the Archaeological Contractor/s where this is not the Retained Archaeologist;
- Monitoring the preparation and submission of Archaeological Reports as appropriate and making them available to the Archaeological Curator;
- Preparing provisions for the management of the project archives in consultation with an appropriate Museum; and
- Advising DONG Energy on final arrangements for analysis, archive deposition, publication and popular dissemination.

2.1.10 The responsibility of the Implementation Service is implementing and monitoring the *Protocol for Archaeological Discoveries: Offshore Renewables Projects* (The Crown Estate 2014).

2.1.11 Where Method Statements, reports or other deliverables are submitted by DONG Energy to the Archaeological Curator, their agreement/acceptance will be assumed if no contrary response is received within 30 working days of submission.

2.1.12 All Construction Contractors engaged in the construction of the project will:

- Familiarise themselves with the generic requirements of the WSI and make them available to their staff;
- Obey legal obligations in respect of 'wreck' and 'treasure' under the Merchant Shipping Act 1995 and the Treasure Act 1996 respectively;
- Respect constraint maps and Archaeological Exclusion Zones;
- Assist and afford access to archaeologists employed by DONG Energy;

- Inform the Retained Archaeologist of any environmental constraint or matter relating to health, safety and welfare of which they are aware that is relevant to the archaeologists' activities; and
- Implement the *Protocol for Archaeological Discoveries: Offshore Renewables Projects* (ORPAD) (The Crown Estate 2014).

3 ARRANGEMENTS FOR MONITORING AND REVIEWING THE WSI

3.1 Monitoring and Reviewing the WSI

3.1.1 The aim of this WSI is to put in place the archaeological mitigation measures set out in the Archaeological Assessments (WA 2006b, 2006c, 2007c, 2008, 2010a, 2010b and 2014) undertaken for the Project.

3.1.2 The objectives of the offshore WSI are as follows:

- To fulfil the requirements of the Archaeological Curator in respect of archaeological monitoring and mitigation of works associated with this project;
- To establish the exact position and extent of any Archaeological Exclusion Zones;
- To ensure consultation with archaeologists on the elements of scheme design that have the potential to impact archaeological sites and materials;
- To ensure that any further geophysical investigations associated with the project are subject to archaeological input, review, recording and sampling;
- To ensure archaeological involvement in any diver and/or ROV obstruction surveys conducted within the area of the wind farm and along the cable route;
- To propose measures for the mitigation of archaeological remains encountered during further geotechnical sampling or investigations, or during the construction and operational work associated with the project; and
- To establish the reporting and archiving requirements for the archaeological works undertaken during construction and post-construction monitoring.

3.1.3 At each stage of the project, the Retained Archaeologist will advise DONG Energy's ECM as to the potential requirements of the specific archaeological investigations as outlined in this document. Appropriate method statements will be prepared as required for each element, in line with the requirements of the WSI, and these will be submitted to the Archaeological Curator for approval. Approval by the Curator will be assumed if no contrary response is received within 30 working days of submission.

3.1.4 These method statements will include provision for the Archaeological Curator to monitor the progress of the archaeological investigations, as

appropriate to that element; be that through site visits or meetings with DONG Energy, the Contractor(s) and the Retained Archaeologist.

3.1.5 Provision will be made for the WSI to be revised as appropriate should elements of the project change or particular archaeological issues come to light. Any revisions will be prepared by the Retained Archaeologist and submitted to DONG Energy's ECM who will ensure they are submitted to and approved by the Archaeological Curator. Approval by the Curator will be assumed if no contrary response is received within 28 working days of submission.

3.1.6 The performance of the WSI will be monitored through the provision of a series of archaeological reports prepared to inform on the results of various activities undertaken under its auspices. These include a review of new geophysical, geotechnical and environmental data; the results of any inter-tidal cable installation watching brief and the implementation of the *Protocol for Archaeological Discoveries: Offshore Renewables Projects* (The Crown Estate 2014). These reports will be submitted to DONG Energy's ECM who will ensure their dissemination to the Archaeological Curator.

3.1.7 The responsibility for ensuring the implementation of the *Protocol for Archaeological Discoveries: Offshore Renewables Projects* (The Crown Estate 2014) rests with DONG Energy, who will ensure that its agents and contractors are contractually bound to implement the Protocol.

3.1.8 Based on **Section 6.3** below DONG Energy and the Retained Archaeologist will agree the system for archaeological reporting.

3.1.9 The Archaeological Curator will be notified in advance by DONG Energy of work timetables and the commencement of any work on site that may impact on the archaeology and will be informed at this time of the Retained Archaeologist's key staff.

3.1.10 A programme of monitoring visits (if deemed appropriate) by the Archaeological Curator and DONG Energy will be agreed in advance of the commencement of work on site.

3.1.11 During any site evaluation/investigation or construction work that has the potential to impact on archaeology the Retained Archaeologist may liaise directly with the Archaeological Curator with regard to site monitoring and reporting. DONG Energy will be kept informed of all such contact between the Retained Archaeologist and the Archaeological Curator.

4 HEALTH AND SAFETY

4.1.1 DONG Energy's ECM will ensure that the Retained Archaeologist is made aware of the relevant requirements of all Health and Safety Plans that are put in place for the project.

4.1.2 The Retained Archaeologist will ensure that any method statements prepared to meet the requirements of the WSI are compliant with the requirements of DONG Energy's Health and Safety Plans for the project.

4.1.3 Health and Safety considerations will be of paramount importance in conducting all fieldwork. Safe working practices will override archaeological considerations at all times.

4.1.4 All work will be carried out in accordance with the Health and Safety at Work etc. Act 1974, the *Health and Safety Management Regulations* 1992, the SCAUM (Standing Conference of Archaeological Unit Managers) health and safety manual, *Health and Safety in Field Archaeology* (2007), *Construction, Design, and Management Regulations* 2007, and all other relevant Health and Safety legislation, regulations and codes of practice in force at the time.

4.1.5 The Archaeological Contractor(s) will supply the Retained Archaeologist with Risk Assessments in advance of any work. The Retained Archaeologist will in turn supply DONG Energy with copies of archaeological Risk Assessments before the commencement of any fieldwork. Risk Assessments will be read and acknowledged by all members of archaeological staff involved in the fieldwork.

4.1.6 Risk Assessments will incorporate an interface document between the Health and Safety system of the Archaeological Contractor(s) and that of the construction/installation contractor/s.

5 SCHEME OF INVESTIGATIONS

5.1 Standards and Guidance

5.1.1 This WSI is based on recommendations made regarding the Race Bank Offshore Wind Farm: The Wash Cable Route Archaeological Assessments, the Assessment of additional areas in The Wash and the Geoarchaeological Recording of Borehole Samples (WA 2008, 2007c, 2010a, 2010b, 2012 and 2014).

5.1.2 The method statements and specifications in this document are based on archaeological best practice and guidance for offshore development. The principal sources are:

- Model Clauses for Archaeological Written Schemes of Investigation: Offshore Renewables Projects. (The Crown Estate 2010);
- Joint Nautical Archaeology Policy Committee (JNAPC) Code for Practice for Seabed Development 2006;
- COWRIE *Historic Environment Guidance for the Offshore Renewable Energy Sector* (Wessex Archaeology 2007);
- COWRIE *Guidance for Assessment of Cumulative Impacts on the Historic Environment from Offshore Renewable Energy* (COWRIE 2008);
- COWRIE Guidance *Offshore Geotechnical Investigations and Historic Environment Analysis* (Gribble and Leather (EMU Ltd. 2011); and
- *The Protocol for Archaeological Discoveries: Offshore Renewables Projects* (ORPAD) (The Crown Estate 2014).

5.2 Overview

5.2.1 The mitigation measures set out in this document relate to the Project area and the offshore export cable route to the Mean High Water Springs (MHWS) mark.

5.2.2 The methodology for laying sub-sea cables does not generally support a watching brief. The mitigation measures proposed below for that element of the work are, therefore, considered to be the most effective means of obtaining archaeological information for the OWF and the offshore cable route, and are supported by the *Protocol for Archaeological Discoveries: Offshore Renewables Projects* (The Crown Estate 2014), which covers any chance finds of archaeological material during the course of construction.

5.2.3 Likewise, the methodology for installing foundations also does not generally support a watching brief. The mitigation measures proposed below rely on the availability of good pre-construction geophysical and geotechnical data and analysis of suitable core samples and geophysical data.

5.3 Call-out Investigations in Response to Discoveries

5.3.1 Provision will be made for Implementation Service (IS) archaeologists to travel to site to inspect finds or data made available as a result of a find reported through the Protocol during construction activities.

5.3.2 Such call-out investigations will take place as quickly as is feasible and will include provision for the immediate preparation and submission an initial response, to include recommendations in respect of the resumption of construction. Summary Reports relating to all discoveries, including those for call-out investigations will be submitted by the IS to the parties specified in the Protocol.

5.3.3 Method Statements for call-out investigations will be submitted to the Archaeological Curator by the Retained Archaeologist four weeks prior to construction commencing and will include provisions to ensure the availability of rapid archaeological advice on receipt of a report of a discovery. The Method Statements for call-out investigations will be consistent with the methods set out in **Section 7** below.

5.4 Archaeological Exclusion Zones

5.4.1 Avoidance will be the principal method used to preserve *in situ* any features or deposits of potential or known archaeological interest and this will be principally achieved through the implementation of AEZ around known sites.

5.4.2 The *Protocol for Archaeological Discoveries: Offshore Renewables Projects* (The Crown Estate 2014) provides for Temporary Exclusion Zones (TEZs) to be established when discoveries are made. The TEZ may be lifted following advice or may be the basis for an AEZ in the event that further disturbance should be avoided.

5.4.3 AEZs are areas of the seabed in which no scheme activities are permitted, and this prohibition will apply to all construction works, vessel mooring and any other activities that may disturb the seabed during the construction of the wind farm.

5.4.4 Although AEZs are fixed, provision is made for their alteration, following appropriate archaeological investigation and consultation, should this become necessary before or during construction (see below).

5.4.5 DONG Energy will ensure that the AEZs are marked on the project master plans, including contract documents, and will advise of any alteration or removal of AEZs.

Basis for Proposed Archaeological Exclusion Zones

5.4.6 The AEZs listed in this document are based on information available at the time of the compilation of the desk-based assessments and review of marine geophysical data (WA 2007c, 2008 and 2010a). They may thus be subject to change, in the manner detailed below, if further information becomes available.

5.4.7 AEZs are suggested for:

- Identifiable shipwrecks noted within the geophysical data;
- The positions of known, charted wrecks;
- Sidescan sonar anomalies considered to be of high or medium archaeological potential;
- Sidescan sonar anomalies of low archaeological potential where they are close to, and thought to be related to sites of higher archaeological potential; and
- Sidescan sonar anomalies of low archaeological potential but associated with magnetic anomalies.

5.4.8 In the case of anomalies identified during the 2007c and 2008 studies AEZs were originally drawn as a circle around the centre point of geophysical anomalies identified as wrecks or with high or medium archaeological potential. This circle was then buffered by 100m to form the AEZ.

5.4.9 For geophysical anomalies identified during the 2010a study AEZs were originally drawn as a polyline around single or grouped geophysical anomalies identified as wrecks or with high or medium archaeological potential to give the basic exclusion shape. This shape was then buffered by 50m or 100m to form the AEZ. The methodology for proposing AEZs in the data previously assessed was not revisited.

5.4.10 For the known or charted wrecks within the development area listed by the UKHO or NRHE, including those for which no geophysical anomalies were identified in the EIA AEZs have also been created. The AEZs for these known sites were created with a radius of 100m (i.e. a 200m diameter circle), centred on the given wreck positions. Although further geophysical and/or Remotely Operated Vehicle (ROV)/diver surveys may allow the extents of

these exclusion zones to be refined or reduced, because they apply to known archaeological sites it is unlikely that they will be removed altogether.

5.4.11 Those locations where the given UKHO or NRHE position corresponded with observed geophysical anomalies were initially buffered by both types of exclusion zones: a polygon around the geophysical anomalies and a 200m diameter circular buffer around the UKHO, SMR, and NRHE position. The two shapes were then joined to produce a combined shape for these AEZs.

5.4.12 The geophysical data were generally gathered from a single pass by the survey vessel and towfish, and anomalies were not 'boxed' or surveyed from different directions to double-check the accuracy of the logging of the anomaly. These caveats need to be borne in mind in the use of interpretations made from the geophysical data.

5.4.13 In addition to the AEZs proposed above, it is recommended that all single geophysical anomalies within the OWF, export cable route and associated buffer zones are treated as *de facto* excluded areas, albeit without defined extents. These geophysical exclusion zones should be viewed as points of heightened archaeological potential, associated with geophysical anomalies, the precise nature and archaeological potential of which cannot be determined from the available geophysical data.

5.4.14 Once scheme details have been finalised any of these anomalies that will be subject to either direct or secondary impacts from the scheme should be investigated further to determine whether or not they represent archaeology. It has been assumed that impacts may occur where construction activities take place within a 50m radius of an anomaly. In situations where such investigation suggests an archaeological origin the anomalies in question may be subject to formal AEZs.

OWF and Export Cable Archaeological Exclusion Zones

5.4.15 On the basis of the archaeological and geophysical assessments conducted to date, a total of 50 wrecks and geophysical anomalies are considered to be of sufficient interest to be subject to AEZs (**Figure 3**). Twelve (12) AEZs are proposed for the OWF area (**Table 2**), and 38 AEZs for the Race Bank export cable route corridor, including the additional nine (9) AEZs from the extended route corridor (**Table 3**).

5.4.16 The sites proposed for AEZs in the OWF area and cable route corridor are listed below and are illustrated in **Figure 2** and **Figure 3**. The following colour scheme applies:

- Sites in black are from Wessex Archaeology 2006c (ref: 62550);
- Sites in orange are from Wessex Archaeology 2008 (ref: 62554); and
- Sites in blue are from Wessex Archaeology 2010a (ref: 62556);

WA ID	UTM E	UTM N	Description	LxBxH (m) / Amp (nT)	Interpretation / Name	Exclusion Zone (m)	From Dataset
7007	354520	5910102	Anomaly	25.6 x 8.3	Seafloor disturbance	100	62554
7013	355852	5909636	Anomaly	41 x 20	Dark reflectors	100	62554
7017	353271	5910726	Debris and Anomaly	81 x 70	Debris	100	62554
7043	355358	5908044	Anomaly	52 x 15.3	Debris	100	62554
7049	357482	5906277	Anomaly	21 x 7.5	Wreck	100	62554
7065	356090	5906903	Wreck	12.4 x 6.2 x 1.1	Wreck	100	62554
7066	358376	5905426	Wreck	16.1 x 12.6 x 1.4	Wreck	100	62554
7074	359388	5904411	Wreck	41.9 x 15 x 2.7 88.5nT	Wreck	100	62554
7099	358772	5904643	Wreck	30.5 x 13.8 x 0.6	Wreck	100	62554
7116	355080	5906634	Wreck	53 x 9.5	Seafloor disturbance	100	62554
7150	360364	5900709	Anomaly	16.9 x 7.7 x 0	Bright reflector	100	62554
7151	354692	5904124	Wreck	25.7 x 7.4 x 0.5 104.5nT	Wreck	100	62554

Table 2: Archaeological Exclusion Zones within the OWF (buffered by 500m) (WGS84, UTM Zone 31N)

WA ID	UTM E	UTM N	Description	LxBxH (m) / Amp (nT)	Interpretation / Name	Exclusion Zone (m)	From dataset
6026	344460	5895086	Anomaly	17.8 x 11.6	Dark reflector. Possible wreck	100	62550
6127	344455	5894243	Anomaly	568.5nT	Magnetic anomaly	100	62550
6158	342950	5892345	Anomaly	203.1nT	Magnetic anomaly	100	62550
6196	343425	5893940	Anomaly	304.3	Magnetic anomaly	100	62550
6211	343190	5893884	Foul	2.0x2.0x1.0	Foul. Machinery unit	100	62550
6300	317854	586797	Wreck	48.0 x 22 x 0.5	Uncharted wreck	100	62550
6301	320287	5873331	Wreck	16.7 x 7.8 x 1	Uncharted wreck	100	62550
6322	331847	5883767	Anomaly	10.7 x 8.5	Seafloor disturbance. Possible wreck	50	62550

WA ID	UTM E	UTM N	Description	LxBxH (m) / Amp (nT)	Interpretation / Name	Exclusion Zone (m)	From dataset
6341	334928	5884960	Anomaly	20.4 x 6.8	Seafloor disturbance. Possible wreck	100	62550
6346	337002	5888179	Anomaly	20.4 x 19	Seafloor disturbance	100	62550
6351	334379	5884078	Anomaly	23.1 x 22.5	Seafloor disturbance. Possible wreck	100	62550
6425	330232	5882822	Anomaly	10.5 x 6.9 152.9 nT	Bright reflector	50	62550
6426	323158	5875605	Anomaly	8.0 x 5.3 x 2.8 77. 7nT	Possible wreck	50	62550
6435	340784	5889038	Wreck	22.4 x 10.1 x 1.9	Possible wreck	100	62550
6438	340423	5888357	Debris	2.3 x 1.6 x 2.4	Debris	50	62550
6444	329676	5882385	Anomaly	38.1nT	Magnetic anomaly Possible wreck	100	62550
6512	314512	5863667	Wreck	Unknown	Dead UKHO wreck	100	62550
6513	318563	5871871	Wreck *Borderer*	14m long	Live UKHO wreck	100	62550
6515	330219	5881389	Wreck	Unknown	Wreck-Unknown	100	62550
6516	331521	5883580	Wreck	Unknown	Live UKHO wreck	100	62550
6517	334970	5886234	Foul	Unknown	Fisherman's fastener. Classified as live by UKHO	100	62550
6519	349769	5902486	Wreck	Unknown	UKHO classified as abey	100	62550
7000	334284	5888485	Wreck	Unknown	UKHO Record 8600	50	62556
7001	337048	5888235	Wreck	Unknown	UKHO Record 8599	100	62556
7002	337369	5888502	Wreck	30.9 x 7.2 x 0.3	Possible wreck	100	62556
7038	314630	5859633	Wreck	20.9 x 6.9 x 1.5	Possible wreck	100	62556
7039	315210	5861513	Debris	91.8 x 79.9 x 0.7	Debris	100	62556
7040	314790	5861216	Wreck	4.9 x 3.9 x 0	Possible wreck	100	62556
7041	314845	5859600	Wreck	11.3 x 3.7 x 0	Possible wreck	100	62556
7042	314386	5861057	Wreck	37.4 x 7.8 x 0	Possible wreck	100	62556
7043	314764	5860188	Wreck	10.4 x 6.3 x 0	Possible wreck	100	62556

WA ID	UTM E	UTM N	Description	LxBxH (m) / Amp (nT)	Interpretation / Name	Exclusion Zone (m)	From dataset
7050	350226	5910905	Anomaly	11.5 x 3.0	Dark reflector. Possible wreck	100	62554
7131	349936	5909541	Anomaly	4.1 x 1.4 x 3.6	Debris	100	62554
7185	348725	5903108	Anomaly	8.2 x 9.0 x 0	Dark reflector	100	62554
7187	355174	5899925	Wreck	15.7 x 7.0 x 0.6	Wreck	100	62554
7188	353114	5899264	Wreck	27.6 x 7.7 x 1.1 5.1nT	Wreck	100	62554
7189	349537	5899294	Wreck	20 x 15 x 1.2 18.9nT	Debris – possibly UKHO 8610	100	62554
7194	349274	5898744	Debris	8 x 8 x 0.4	Debris – possibly UKHO 9172	100	62554

Table 3: Archaeological Exclusion Zones within the Consented Cable Route Corridor (buffered by 500m) (WGS84, UTM Zone 31N)

5.4.17 The final extent and selection of anomalies for protection by AEZs is therefore still to be confirmed and the above tables are subject to review and revision during the life of the project as new data become available, as detailed below.

5.4.18 Geophysical anomalies **6513** and **6519** were not initially given AEZs, however, upon further assessment during the production of this WSI, AEZs were provided of 100m around the centrepoint of the UKHO coordinate.

Establishing New Archaeological Exclusion Zones

5.4.19 All finds of archaeological material made during construction will be reported in accordance with the *Protocol for Archaeological Discoveries: Offshore Renewables Projects* (The Crown Estate 2014). The IS will inform DONG Energy and the Archaeological Curator of the assessed potential of archaeological finds.

5.4.20 In the event of archaeological discoveries all activities that may impact on the seabed in the vicinity of any find will cease within a TEZ until the IS has issued an initial response and, if necessary an archaeological inspection of the material and site has taken place.

5.4.21 If discoveries are assessed to be of high archaeological potential the location from which they were recovered may be subject to the implementation of additional AEZs.

5.4.22 The Archaeological Curator will be consulted by the Retained Archaeologist on the need for, and the design (position, extent) and implementation of any such new AEZs.

Altering Archaeological Exclusion Zones

5.4.23 AEZs may be altered (enlarged, moved, reduced or removed) as a result of further data assessment or archaeological field evaluation of data covering those areas that are subject to AEZs. Further data assessment could include a formal archaeological analysis of new geophysical data, and archaeological field evaluation could include suitable high-resolution marine geophysical survey, and/or survey by diver or ROV.

5.4.24 The alteration of AEZs will only be undertaken with the agreement of the Archaeological Curators. Following alteration a new plan giving details of the AEZs will be drawn up and issued to each relevant party.

Monitoring Archaeological Exclusion Zones

5.4.25 The effectiveness of the AEZs will be monitored through regular review by the Retained Archaeologist of vessel track plots and anchor spots supplied by DONG Energy. Monitoring will take place relative to the baseline data used to establish the AEZ. The frequency and timing of these reviews will be agreed with the Archaeological Curator once the construction programme is known.

5.4.26 Development-related activities will not be undertaken within an AEZ. If it becomes apparent that activities have taken place within any AEZ, the party responsible will obtain advice from the Retained Archaeologist in accordance with their obligations with respect to AEZs.

5.4.27 Periodic Archaeological Reports will be prepared by the Retained Archaeologist to review whether there have been any incursions into each AEZ and whether there are still archaeological grounds for maintaining each AEZ. Archaeological Reports on AEZs will include recommendations regarding amendment of the extent or removal of existing AEZs or the creation of new AEZs.

5.4.28 On completion of the construction phase, the Retained Archaeologist will compile a report on the effectiveness of the AEZs, any alterations to them, and the results of monitoring.

5.5 Archaeological Involvement in Further Survey Work

Anticipated Site Investigations

5.5.1 Geophysical surveys targeting areas of the seabed to be impacted by the scheme are scheduled to be conducted pre-construction.

5.5.2 Additionally, should any further geotechnical work be planned, there should continue to be archaeological involvement from the outset.

5.5.3 Other possible site investigations include the collection of benthic grab samples, seabed photography, underwater obstruction surveys and/or clearance and unexploded ordnance surveys.

5.5.4 These surveys should be subject to advice and input from the Retained Archaeologist. Input may be either directly through the presence of an

archaeologist during the surveys, or through an archaeological assessment of the survey results.

5.5.5 Detailed methodologies for this archaeological input are presented in **Section 7** below.

Survey/Fieldwork Planning

5.5.6 When planning future scheme-related geophysical, geotechnical or other surveys, DONG Energy will advise the Retained Archaeologist well in advance that further surveys are being planned and seek their input into the scope of work and tender specifications.

5.5.7 Archaeological input will take the form of advice from the Retained Archaeologist on measures to optimise archaeological results from the planned geotechnical, geophysical and other surveys. Areas to be considered by the Retained Archaeologist when providing this advice will include:

- The available details of previously identified sites and/or anomalies and areas of heightened archaeological potential;
- The archaeological potential of areas where no existing sites and/or anomalies are yet known;
- The equipment, equipment settings, survey methodology and data collection points that will optimise the recovery of archaeological information; and
- The requirements for data analysis, interpretation and archiving.

5.5.8 The required response to elements of archaeological input may include:

- 'Boxing' wreck sites during geophysical survey to provide the best possible images and positional data
- Altering vibrocore/borehole positions to maximise the potential for the collection of archaeological data; and
- Altering grab sample positions to maximise the potential for the collection of archaeological data.

Geophysical Surveys

5.5.9 New marine geophysical data that cover areas of development impact and AEZ will be subject to analysis by a suitably qualified Archaeological Geophysical Contractor. This archaeological analysis will, however, be limited to:

- Those areas of the seabed which will be directly impacted by the development (such as, for example, turbine foundation footprints and final cable alignments);
- Previously identified sites and/or anomalies in order to alter or remove an AEZ; or
- Areas not covered by the existing geophysical data should the scheme footprint change.

5.5.10 Where further geophysical survey work has as one of its objectives the re-survey of previously identified sites and/or anomalies in order to alter or remove an AEZ, DONG Energy will make provision for a suitably qualified Archaeological Contractor to be present on the survey vessel during data collection.

5.5.11 The archaeologist will ensure that the best possible data are collected for those anomalies subject to review.

Other Surveys

5.5.12 **Benthic grab samples** will be subject to archaeological assessment and analysis of the coarse residue by a suitably qualified Archaeological Contractor, once ecological assessment has been completed.

5.5.13 **Seabed photography** will be subject to archaeological assessment and analysis by a suitably qualified Archaeological Contractor.

5.5.14 Information concerning the implementation of **underwater obstruction surveys/clearance** work and ordnance surveys is not currently available. An appropriate archaeological response to such surveys will be:

- Diver/ROV obstruction surveys of the export and inter-array cable routes will require an archaeological assessment of the survey dataset (video and positional data);
- If seabed clearance (by trenching or grappling) prior to cable-laying is to be employed an archaeological watching brief will be required during these works. DONG Energy will make provision for a suitably qualified Archaeological Contractor to be present on the survey vessel during these works;
- Should archaeological material be encountered during underwater obstruction survey or clearance work sufficient time and resources will be made available to ensure the archaeological assessment of such material. This assessment will take place as soon as possible after seabed clearance works, but not necessarily prior to cable-laying, unless the site/s concerned will be impacted by the cable-laying. Such assessment would serve as compensatory work to mitigate the damage to the site/s caused by seabed clearance. The scope of the assessment will be agreed with the Archaeological Curator and, where necessary, further suitable mitigation measures will be put in place in agreement with the Archaeological Curator.

5.5.15 If an **unexploded ordnance survey** is conducted the magnetometer dataset will be subject to archaeological analysis as these data may clarify the nature and extent of known archaeological sites and anomalies, and identify as yet unknown buried sites.

5.5.16 All the above works will be subject to the planning, fieldwork and data analysis regime detailed above and will be overseen by the Retained Archaeologist.

5.6 Pre-Construction Archaeological Investigations

Diver/ROV Surveys

5.6.1 Archaeological diver and/or ROV surveys can be employed in order to gather archaeological data concerning wreck sites and geophysical anomalies to safeguard the archaeological record or to alter existing AEZs or TEZs. Specifically an archaeological diver or ROV-based assessment may be required where it is not possible to protect an archaeological site through the implementation of an AEZ or where visual clarification is sought in order to confirm or amend an AEZ or TEZ.

5.6.2 Diver/ROV assessment primarily for archaeological purposes will be undertaken by an Archaeological Contractor with a marine archaeological team with the appropriate expertise and experience of the environment/conditions likely to be encountered.

5.6.3 Every dive will be recorded using a digital video system with helmet-mounted camera or the ROV's onboard instrumentation.

5.6.4 The position of the diver/ROV will be determined using an acoustic navigation system. The position will be integrated into a diver tracking and recording system where the position of the objects on the seabed can be compared to the geophysical data, and the extent and character of the features recorded.

5.6.5 Recording will be conducted to a level whereby a statement can be made as to the date, character, extent and archaeological importance of the site. Significant diagnostic features will be recorded by photography backed up with written records and measurements. Limited documentary research may also be required to support the assessment of importance.

5.6.6 Details of levels for wreck recording are outlined in **Appendix 1**.

5.6.7 The archaeological results of any diver/ROV survey will be compiled in a report by the Archaeological Contractor. The report will include a statement of the likely requirements (if any) for further archaeological work.

5.6.8 The report will be prepared in a manner consistent with the Model Clauses on reporting and agreed with the Archaeological Curators prior to finalisation and deposit.

5.7 Archaeological Watching Brief

Marine Watching Brief

5.7.1 Due to the nature of the proposed construction works no archaeological watching briefs are proposed during the installation of turbine foundations or the laying of the submarine cables. The *Protocol for Archaeological Discoveries: Offshore Renewables Projects* (The Crown Estate 2014), will be used should any finds of archaeological material come to light during pre-construction or construction activities.

Inter-Tidal Zone Watching Brief

5.7.2 An archaeological watching brief may be required during the course of cable installation in the inter-tidal zone.

5.7.3 The Archaeological Contractor will seek to minimise any impact on the Developer's programme caused by the archaeological investigation.

5.7.4 The requirement for any additional archaeological works, resulting from the finds made during the watching brief will be agreed following consultation with the Archaeological Curator.

5.7.5 Provision will also be made for the collection of palaeo-environmental samples if peat or organic-rich deposits are encountered during the course of the watching brief. Should it become clear that widespread, archaeologically significant peat horizons are present within the area traversed by the cable route then a document detailing a more formal sampling strategy will be prepared.

5.8 Protocol for the Reporting of Archaeological Finds

5.8.1 The *Protocol for Archaeological Discoveries: Offshore Renewables Projects* (The Crown Estate 2014) (the Protocol) will be implemented during all marine construction works for the Project.

5.8.2 The aim of the Protocol is to reduce any adverse effects of the development on the historic environment by enabling people working on the development to report archaeological finds in a manner that is both convenient to their everyday work and effective with regard to curatorial requirements.

5.8.3 Archaeological finds made during the course of pre-construction and construction activities are important because they can shed light on past human use of the landscape, sea and seabed. The information that such discoveries bring to light can help archaeologists better understand the human past and should, therefore be conserved to better protect these aspects of our history on behalf of future generations.

5.8.4 The Protocol anticipates discoveries being made by Staff, who report to a Site Champion (ideally the Master) on their vessel, who then reports to a person within the construction contractor (the Nominated Contact) who has been nominated by the Contractor to co-ordinate implementation of the Protocol.

5.8.5 All finds of archaeological material will be reported by the Construction Contractor, in accordance with the communication plan, to the Nominated Contact within their organisation, who will inform the Implementation Service (IS). The IS will in turn inform the Archaeological Curator and DONG Energy's ECM. If the find is a 'wreck' within the meaning of the Merchant Shipping Act (1995) then the IS will also make a report to the Receiver of Wreck. Full contact details for all relevant parties will be included in the Protocol.

5.8.6 The response to reported finds will be implemented through the measures set out in the Protocol, including further survey or the establishment of new AEZ, if appropriate.

5.8.7 Once agreed by DONG Energy and the Archaeological Curator, the Protocol will be reproduced in a form suitable for use on board construction vessels. DONG Energy will implement measures, advised by the Retained Archaeologist, to ensure that the construction staff, agents and other contractors are aware of the Protocol, understand how it functions and have access to the Protocol document, including material to be produced by the Retained Archaeologist detailing the find types that may be of archaeological interest and the potential importance of any archaeological material encountered.

5.8.8 The Protocol implementation will be initiated by a visit by a representative of the IS to the relevant vessels to ensure that all staff are aware of what constitutes an appropriate find.

5.8.9 The Protocol will be accompanied by measures to monitor its implementation, including periodic visits from the IS and the preparation of periodic archaeological reports, based on reports from the Nominated Contacts. The frequency and timing of these visits and reports will be determined once the construction programme is known.

5.8.10 At the end of the construction phase, the IS will prepare a report on the results of the Protocol. The results will be included in the final archaeological report in the section covering maritime sites and finds within the area affected by the wind farm.

6 ACTIVITIES SUBSEQUENT TO INVESTIGATIONS

6.1 Introduction

6.1.1 Any finds and environmental samples will be processed according to professional standards for finds analysis, environmental sampling and archive preparation, and in accordance with the Institute for Archaeologists' *Standard and Guidance for the collection, documentation, conservation and research of archaeological materials* (IfA 2005), and other relevant documentation specified in *Model Clauses for Archaeological Written Schemes of Investigation* (The Crown Estate 2010a), as discussed in the method statements below.

6.1.2 Finds and other items of archaeological interest recovered offshore in the course of investigation are the property of The Crown Estate as the landowner, with the exception of all human remains, items that are 'treasure' for the purposes of the Treasure Act 1996 (as amended in 2002) and 'wreck' for the purposes of the Merchant Shipping Act 1995.

6.1.3 DONG Energy will seek permission from the landowner to donate finds to an appropriate Museums Service prior to depositing the archive.

6.1.4 In the event of the discovery of items that fall under the Treasure Act 1996 (as amended), the IS will immediately notify the Retained Archaeologist, who will notify the District Coroner within 14 days. DONG Energy and the Archaeological Curator will be notified as soon as possible. Items falling under the Treasure Act (as amended) will be removed from the site by the IS and stored in a secure location, pending a decision by the Coroner.

6.2 Archives

6.2.1 The Archaeological Curator will be notified of any archaeological investigation in advance of fieldwork and any specific requirements relating to the preparation and deposition of project archives will be accommodated as appropriate.

6.2.2 Where there is the likelihood of any archaeological fieldwork, the Retained Archaeologist will contact an appropriate Museum to discuss the intended fieldwork and seek its agreement to accept the site archive for long-term storage and curation.

6.2.3 The Retained Archaeologist will consult the Museum with regard to its policy on the selection, retention and disposal of excavated material, and to confirm the requirements in respect of the format, presentation and packaging of archive records and materials.

6.2.4 The Retained Archaeologist will notify the receiving Museum in advance of any fieldwork, and a museum Accession Number will also be sought on each occasion.

6.2.5 The timetable for depositing archives with the Museum after completion of the post-fieldwork programme will be set out in the relevant Method Statement.

6.3 Reports

6.3.1 In the event that little of significance is found during the course of the offshore construction work, a final report on the investigative work will be prepared by the Archaeological Contractor within twelve weeks of completion of all scheme works (see **Section 7.6**).

6.3.2 If significant archaeological sites and finds are recorded then this final report will be preceded by the submission to the Retained Archaeologist by the Archaeological Contractor/s of investigation reports following the completion of fieldwork (see **Section 7.6**). A programme for the submission of these reports will be agreed between DONG Energy, the Archaeological Curator and Retained Archaeologist once the extent of significant finds is known.

6.3.3 The Archaeological Contractor will also be required to produce an assessment report which will establish the value of the recorded archaeology and provide a costing for the post-excavation analysis, publication and archiving (including deposition of archive).

6.3.4 Each draft report will be sent to the Retained Archaeologist for submission to DONG Energy and will satisfy the Method Statement for the investigation. Each report will present the project information in sufficient detail to allow interpretation without recourse to the project archive.

6.3.5 DONG Energy will forward a digital (pdf) copy of each report to the Archaeological Curator for comment.

6.3.6 Decisions regarding the level of post-excavation work required will be taken following submission of investigation reports and consultation by DONG Energy and the Retained Archaeologist with the Archaeological Curator.

6.3.7 Full copyright of each report shall be retained by the originator under the Copyright, Designs and Patents Act 1988 with all rights reserved, excepting that DONG Energy will be licensed to use each report in all matters directly relating to the project as described in the specification.

6.4 Publication

6.4.1 In consultation with DONG Energy and the Archaeological Curator, the Retained Archaeologist will ensure that the results of archaeological discoveries made and investigations undertaken in connection with the project will be published in an integrated manner.

6.4.2 Following construction, a final Post-Investigation Assessment will be compiled by the Retained Archaeologist that will establish final arrangements for publication (**Section 7.6**).

7 METHOD STATEMENTS

7.1.1 Detailed Method Statements will be produced by the Retained Archaeologist, for agreement with and approval by DONG Energy and the Archaeological Curator in advance of each archaeological element discussed below. Approval by the Archaeological Curator will be assumed if no contrary response is received within 30 working days of submission of individual method statements.

7.2 Marine Geophysical Surveys

Attendance

7.2.1 In addition to incorporating archaeological advice into the detailed specification of the geophysical survey, DONG Energy will, where appropriate, make provision for a suitably qualified Archaeological Contractor to be on the survey vessel during data collection. The Archaeological Contractor will seek advice from the Retained Archaeologist when required.

7.2.2 The onboard presence of the Archaeological Contractor will be particularly important where anomalies or material are detected during the survey that can be further investigated by quickly modifying the survey plan by, for instance, acquiring more lines of data.

Geophysical Survey Specifications

7.2.3 Where geophysical surveys are to be carried out for archaeological purposes then the following specifications, based on the COWRIE Guidance (WA 2007a), are proposed. The specifications for an archaeological survey can be more stringent than the IHO Order 1 requirements. However it is recognised that surveys may be acquired for a number of purposes and may be to a lower specification for a variety of sound operational reasons. If this is the case, provision for seeking advice from the Retained Archaeologist, as mentioned above, is very important and scope should be made for additional survey lines to be run to 'box in' anomalies.

7.2.4 Surveys will be carried out to a single datum and co-ordinate system, preferably WGS84 UTM31N. All survey data, including navigation (position, heading and velocity) will be acquired digitally in industry-standard formats. Care will be taken to maintain the orientation and attitude of sensors on line. Trackplots will be corrected for layback (including catenary effects) and made available in digital (GIS) form.

7.2.5 Sidescan sonar survey will 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 will be equal to or less than the effective range and no more than 1.75 times the effective range. Anomalies of apparent archaeological potential will be 'boxed' by at least two and preferably four lines along and across the principal axis of the anomaly. These lines will 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 multi-beam pseudo-sidescan. Sidescan sonar data will be made available in the form of raw, un-mosaic files in a suitable proprietary format.

7.2.6 Sub-bottom survey will be carried out using a source capable of resolving internal structures to the full depth of anticipated scheme impacts within Quaternary deposits.

7.2.7 The system should be able to penetrate up to 40m sub-seabed with a vertical resolution of 0.3m or better at the seabed with no ringing. A pulse test of the seismic source will be undertaken prior to survey.

7.2.8 Line and cross-line spacing and orientations will be sufficient to resolve the extents and characteristics of the principal Quaternary deposits. A single beam echosounder will be run in conjunction with the sub-bottom survey; the first reflector (seabed) will be levelled with reference to a tide gauge. Sub-bottom data will be made available in a suitable proprietary format.

7.2.9 Magnetometer survey will be carried out using a caesium gas or equivalent system capable of resolving anomalies of 5 nanoTeslas (nT) and above. The magnetometer towfish should be towed as close to the seafloor as possible and operated with a sample rate of at least 4Hz. Lines can be run in conjunction with other sensors (i.e. on the same line spacing and orientation) but provision will 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.

7.2.10 Magnetometer data will be made available as cleaned, de-spiked text (x, y and z) files for each line, including layback.

7.2.11 Where a multi-beam survey is to be carried out solely for archaeological purposes then a system capable of achieving an effective cell/bin size better than 1m is preferred.

7.2.12 Use of a beam-forming system is preferred. The entire survey area will be ensonified. Where an anomaly of apparent archaeological potential is identified, an additional single slow pass will be carried out at the highest possible ping rate.

7.2.13 Single beam and multi-beam data will be made available as de-spiked and tidally-corrected text (x, y and z) files for each line, in addition to any gridded/rendered surfaces. In relation to multibeam data, backscatter data should be included (if collected) along with the associated survey log.

Geophysical Interpretation

7.2.14 Once the surveys have been processed to meet their primary objectives, the raw survey data, together with factual reports, will be made available in digital formats to DONG Energy's Retained Archaeologist, or a suitably qualified Archaeological Contractor for archaeological analysis and interpretation.

7.2.15 Archaeological interpretation will include:

- Examination of sidescan, magnetometer, multi-beam and seismic data for areas within the vicinity of known wreck sites and previously identified geophysical anomalies;
- Examination of sidescan, magnetometer, multi-beam and seismic data within areas that will be subject to scheme impacts in order to identify any as yet unknown wreck remains;
- The assessment of seismic data in order to plot the general trend of the sub-surface sediments with archaeological potential; and
- Further detailed interpretation of seismic data should be undertaken following the initial assessment within those areas that will be subject to scheme impacts.

7.2.16 Sidescan and sub-bottom data will be interpreted initially on the basis of line-by-line review in an un-mosaiced format. The interpretation of point data (multibeam, single beam and magnetometer) will include reference to original point-cloud data and not be limited only to post-processed surfaces.

7.2.17 The archaeological results of any further geophysical survey will be compiled as a report by the Archaeological Contractor and will include likely requirements (if any) for further archaeological work. The report will be submitted to DONG Energy by the Retained Archaeologist who will submit it to the Archaeological Curator. The scope of any further work will be agreed by DONG Energy and the Archaeological Curator.

7.3 Archaeological Assessment of Diver/ROV Survey Data

7.3.1 In order to maximise the potential benefits of any proposed diver/ROV surveys, DONG Energy will seek archaeological input at the planning stage of any such works.

7.3.2 Archaeological input will take the form of advice from the Retained Archaeologist on measures to optimise archaeological results from the planned survey. Advice will include:

- The available details of sites and/or anomalies identified in the desk-based assessment;
- The archaeological potential of areas where no existing sites and/or anomalies are yet known;
- The type and level of diver/ROV positioning, voice recording and video/still recording to be utilised; and
- The provision of clear guidance on the types of sites and finds that are to be reported and recorded.

7.3.3 Consideration will be given to having an Archaeological Contractor present during any diver or ROV surveys, either as an observer(s) or participating diver(s) to optimise archaeological results and thereby reduce the need for repeat survey. However, operational constraints will have to be taken into account when trying to accommodate archaeologists aboard.

7.3.4 Following the completion of the diver/ROV survey all data, including video footage, will be reviewed by the Archaeological Contractor.

7.3.5 This review will identify any sites that are potentially of archaeological interest. Typically this will involve the identification of vessel remains, rather than just stray artefacts. A report will identify those sites and/or geophysical anomalies that are of sufficient archaeological interest to warrant further investigation. It will also identify those sites that are no longer of archaeological interest, and hence may be removed from the list of AEZs or TEZs.

7.3.6 Diver/ROV assessment primarily for archaeological purposes will be undertaken by an Archaeological Contractor with a marine archaeological team with the appropriate expertise and experience of the environment/conditions likely to be encountered.

7.3.7 Every dive will be recorded using a digital video system with helmet-mounted camera or the ROV's onboard instrumentation.

7.3.8 The position of the diver/ROV will be determined using an acoustic navigation system. The position will be integrated into a diver tracking and recording system where the position of the objects on the seabed can be compared to the geophysical data, and the extent and character of the features recorded.

7.3.9 Recording will be conducted to a level whereby a statement can be made as to the date, character, extent and archaeological importance of the site. Significant diagnostic features will be recorded by photography backed up with written records and measurements. Limited documentary research may also be required to support the assessment of importance.

7.3.10 The archaeological results of any diver/ROV survey will be compiled in a report by the Archaeological Contractor. The report will include a statement of the likely requirements (if any) for further archaeological work

7.3.11 The report will be forwarded to the Retained Archaeologist, who will submit it to DONG Energy and the Archaeological Curator for a decision on the scope of (any) further work.

7.4 Geotechnical Surveys

7.4.1 The archaeological review of geotechnical logs and assessment of samples will follow the COWRIE guidance for *Offshore Geotechnical Investigations and Historic Environment Analysis* (Gribble and Leather (EMU Ltd.) 2011) and adopt the following staged approach. A recommendation as to the need for further archaeological work will be made at the end of each stage.

7.4.2 Each stage of this phased assessment of the cores is dependent on the results of the preceding stage. Stage 5 is a reporting phase which will take place at whatever stage in the process further archaeological assessment or analysis is not required.

Stage 1 – Archaeological Assessment of Geotechnical Logs

7.4.3 This involves a review by a competent Archaeological Contractor of the borehole/vibrocore/CPT logs on completion of the geotechnical investigations carried out by the Geotechnical Contractor.

7.4.4 This review will provide an overview of the sedimentary sequence within the area, including whether there is any organic material present and whether there are homogenous sedimentary layers across the area.

7.4.5 Based on this review, recommendations will be made regarding the need for further (Stage 2) analysis of core samples. The scope of any further work will be agreed by DONG Energy and the Archaeological Curator. If no further work is recommended a final report will be produced by the Archaeological Contractor.

Stage 2 – Archaeological Recording of Geotechnical Cores

7.4.6 If the Stage 1 assessment identifies sedimentary horizons with archaeological potential, a Stage 2 recording of core samples will be undertaken. This will entail the detailed recording of the sediments within selected cores for a range of palaeo-environmental indicators and dating material.

7.4.7 The geotechnical core samples, or a representative sample agreed with the Archaeological Contractor, must therefore be retained, undisturbed until the

selection for archaeological recording has been made. One undisturbed half of each selected core sample is required for archaeological recording. The assessment programme will comprise:

- The longitudinal splitting of each core sample and the cleaning of half of each sample; and
- The detailed archaeological recording of each sample, noting sediment colour, type and inclusions.

7.4.8 A Stage 2 outline report will present the results of the archaeological recording and will indicate whether Stage 3 sampling and laboratory assessment of the cores is warranted. The scope of further work will be agreed by DONG Energy and the Archaeological Curator. If no further work is recommended a final report will be produced by the Archaeological Contractor.

Stage 3 – Laboratory Analysis of Samples

7.4.9 If the Stage 2 recording identifies sedimentary horizons with the potential for the preservation of palaeo-environmental evidence a Stage 3 sampling and assessment programme will be undertaken. Stage 3 will comprise the sampling and laboratory analysis of selected core or cores to a level sufficient to enable an assess**s**ment of the value of the palaeo-environmental material (pollen, diatoms, ostracods and foraminifera) surviving within the cores. The sampling and assessment programme will comprise:

- The collection of small circa 1cm^3 samples from selected points within the sedimentary sequence in the selected core(s);
- Laboratory assessment of the samples in order to identify the presence and relative quantity of any pollen, diatoms, ostracods and foraminifera; and
- Sampling for C^{14} (Radiocarbon) dating purposes.

7.4.10 A Stage 3 outline report will present the results of the laboratory assessment and will indicate whether further, detailed (Stage 4) analysis of samples is required. If no further work is recommended, the Archaeological Contractor will produce a final report.

Stage 4 – Full Laboratory Analysis of Samples

7.4.11 If the Stage 3 recording identifies significant palaeo-environmental evidence Stage 4 analysis will be undertaken. Stage 4 involves the full counts and analysis of the pollen, diatom, ostracod and foraminifera samples. Typically, Stage 4 will be supported by radiocarbon dating of suitable sub-samples.

7.4.12 This phase will result in an account of the successive environments within the coring area, a model of environmental change over time, and an outline of the archaeological implications of the analysis. It will include the incorporation of the results into a model of the seabed sediments and palaeo-topography based on the analysis of the seismic data. If full seismic analysis has not been undertaken prior to this point it will be required.

Stage 5 – Final Report

7.4.13 The Archaeological Contractor will produce a final, Stage 5, report at the end of the last stage of assessment, recording and analysis. This will cover all aspects of the palaeo-topography and prehistory of the area affected by the development. It may include relevant data generated by the desk-based assessment, foreshore coring, terrestrial watching brief and geophysical surveys, and particularly seismic data.

7.4.14 The report will be forwarded to the Retained Archaeologist, who will submit it to DONG Energy and the Archaeological Curator.

7.5 Archaeological Watching Brief

7.5.1 A watching brief will involve attendance by an Archaeological Contractor during any groundworks in the inter-tidal zone and during offshore obstruction clearance activities associated with the scheme.

7.5.2 All watching brief activities will be conducted in compliance with the standards outlined in the Institute for Archaeologist's *Standard and Guidance for an archaeological watching brief* (IfA 2008), except where they are superseded by statements made below.

7.5.3 Excavated surfaces and up-cast material will be inspected by the Archaeological Contractor. Any finds will be collected and allocated a record number and their position will be logged.

7.5.4 Archaeological features or structures will be examined and/or excavated. A sufficient sample of each layer/feature type will be investigated in order to elucidate the date, character, relationships and function of the feature/structure.

7.5.5 Development activities will include provision for sampling of features and deposits in order to recover artefacts, ecofacts and dating evidence, and in order to determine stratigraphic relationships. Recording will include written, drawn, and photographic elements as conditions allow.

7.5.6 If significant archaeological or palaeo-environmental deposits are encountered then the Developer, in consultation with the relevant Curator, will make provision for the Archaeological Contractor to undertake a programme of investigation commensurate with the evidence discovered.

7.5.7 A site plan at an appropriate scale will be annotated with the position of areas observed in relation to the construction footprint. The plan will show the location of features observed and recorded in the course of the investigations. The site plan should include a note of the position-fixing method and the accuracy achieved.

7.5.8 The basic record of each feature/structure identified during the watching brief should include:

- A full photographic record;

- Drawn record (plans and sections);
- Position in three dimensions; and
- A written description including initial interpretation and contextual relationships.

7.5.9 Details of the watching brief will be compiled as a report (see **Section 7.6**).

7.6 General Archaeological Practices

Survey and Recording

7.6.1 Where construction work exposes sites of potential archaeological importance these sites will be reported to DONG Energy and the Archaeological Curator by the Retained Archaeologist and a suitable level of recording will be determined. This may require that DONG Energy includes contingencies within the construction programme for such archaeological investigation and recording as is advised by the Archaeological Curator.

7.6.2 All finds and seabed archaeological deposits will be recorded using a *pro forma* recording system, and a running matrix of assigned contexts will be maintained for each site.

7.6.3 A full photographic record of all investigations will be maintained using video and digital stills photography. The photographic record will illustrate both the detail and the general context of the principal features, finds excavated, and the site as a whole.

Positioning

7.6.4 Surveys should be carried out to a single datum and co-ordinate system, preferably WGS84 UTM (zone 31N) for the offshore elements of the scheme and OSGB36 in 12 figure National Grid reference for the inter-tidal elements.

Finds

7.6.5 Objects relating to human exploitation of the area that are exposed in the course of scheme works will be recovered by the Archaeological Contractor or, where recovery is impracticable, recorded. All finds will be recorded by context and significant objects ('special finds') in three dimensions using a sequence of unique numbers.

7.6.6 Subject to the agreement reached with the Museum regarding selection, retention and disposal of material, the Archaeological Contractor will retain all recovered objects unless they are undoubtedly of modern or recent origin. The presence of modern objects will, however be noted on context records. In these circumstances sufficient material will be retained to elucidate the date and function of the deposit from which it was recovered.

7.6.7 In the case of finds that fall under the Treasure Act 1996 (as amended), refer to **Section 6.1** above. In the event of the discovery of items that may be eligible for legal protection, the Archaeological Contractor will immediately

notify the Retained Archaeologist, who will notify the relevant legal authority as soon as possible. The Developer and the Archaeological Curators will be notified as soon as possible.

7.6.8 The Retained Archaeologist will prepare and implement a finds monitoring and maintenance programme, which will cross-refer to finds management/monitoring systems maintained by the Archaeological Contractor(s)/Developer.

7.6.9 Finds will be treated in accordance with the relevant guidance given in the Institute for Archaeologist's *Standard and Guidance for field evaluations* (IfA 2001b, revised October 2008), excepting where they are superseded by statements made below.

7.6.10 Finds will be primarily conserved, bagged and boxed in accordance with guidelines set out in the United Kingdom's Institute for Conservation's Conservation *Guidelines No 2* (UKIC 1984).

7.6.11 All retained finds will then be processed in accordance with the Institute for Archaeologists' *Standard and guidance for the collection, documentation, conservation and research of archaeological material* (IfA 2005, revised October 2008).

7.6.12 Specialist work approved by DONG Energy and the Archaeological Curator on metalwork, bone (including worked bone, human remains and other organic remains), industrial waste, ceramic material, glass and lithic material will be carried out by suitable Archaeological Contractors, monitored by the Retained Archaeologist.

7.6.13 In consultation with DONG Energy and the Archaeological Curator, the Retained Archaeologist will advise on the implementation of passive conservation for smaller objects pending more detailed conservation strategies. DONG Energy will make provision for a professional conservator to undertake a conservation assessment of assemblages.

7.6.14 In the event of the discovery of unexpected, unusual or extremely fragile and delicate objects and deposits, such as waterlogged wood, the Retained Archaeologist, DONG Energy and the Archaeological Curator will be notified immediately. Additional work required to recover, record, analyse, conserve and archive such objects and deposits will be agreed with the Archaeological Curator.

Human Remains

7.6.15 In the event of the discovery of any human remains, the Construction Contractor will, in addition to notifying the police and DONG Energy, in terms of DONG Energy's Health and Safety procedures, will also immediately inform the Archaeological Contractor/Retained Archaeologist. The Retained Archaeologist will inform the Archaeological Curator and the Coroner, if this had not already been done.

7.6.16 For human remains in the intertidal zone, applications should be made to the Ministry of Justice for an exhumation licence under the Burial Act 1857.

7.6.17 For human remains within territorial waters where the remains have been intentionally buried, applications should be made to the Ministry of Justice for an exhumation licence;

7.6.18 In all other cases, the Retained Archaeologist will immediately inform the Coroner and the Police. If neither the Coroner nor the Police propose to investigate the remains, they may be dealt with as set out below.

7.6.19 It is proposed that the remains are left *in situ* until DONG Energy, the Coroner and the Archaeological Curator have been informed. Where development will unavoidably disturb them they will be fully recorded, excavated and removed from the site subject to compliance with the relevant Ministry of Justice Licence which will be obtained by the Retained Archaeologist. Whether such a licence is required or not, all excavation and post-excavation processes will be in accordance with the standards set out in IfA *Technical Paper No. 7 Guidelines to the Standards for Recording Human Remains* (IfA 2004).

7.6.20 The final placing of human remains following analysis will be subject to the requirements of the Ministry of Justice Licence.

Reporting

7.6.21 All archaeological reports will also be prepared in accordance with the guidance given in the relevant Institute for Archaeologist's Standards and Guidance. Reports will typically include:

- A non-technical summary;
- The aims and methods of the work;
- The results of the work including finds and environmental remains;
- A statement of the potential of the results;
- Proposals for further analysis and publication; and
- Illustrations and Appendices to support the report.

7.6.22 Each report, including figures will be submitted to the DONG Energy ECM as two (2) hard copies and in electronic format (PDF).

7.6.23 Where comments are received from the Archaeological Curators, Archaeological Reports will be returned by the Developer to the report originator to undertake such amendments as might be required.

7.6.24 Subject to the assessment report the Archaeological Contractor will publish the results of fieldwork, at least to summary level, within one year of completion of the work. Publication will be in an appropriate local or national journal. Other forms of publication (e.g. 'popular publication', electronic media/Internet) may be employed where appropriate.

7.6.25 An overarching final report on the archaeology of the scheme area will be produced by the Retained Archaeologist after the completion of the archaeological works relating to the scheme and to a timetable agreed with DONG Energy and the Archaeological Curator.

7.6.26 Publication media and all publication matters will be discussed and agreed in advance with the Archaeological Curator.

Archiving

7.6.27 Project archives, including written, drawn, photographic and material elements (together with a summary of the contents of the archive) will be prepared and deposited by the Retained Archaeologist in accordance with the requirements of the receiving Museum. Best practice will be adhered to in line with Archaeology Archives Forum, *Archaeological Archives: A guide to best practice in creation, compilation, transfer and curation.* (2007) and IfA, *Standard and Guidance for the creation, compilation, transfer and deposition of archaeological archives* (2009).

7.6.28 Written, drawn and photographic archives will be compiled to a standard that allows for the publication of a summary report. Written archives will be on clean, stable materials, and will be suitable for photocopying. The materials used will be of the standard recommended in *Guidelines for the Preparation of Excavation Archives for Long-term Storage* (Walker 1990).

7.6.29 The timetable for depositing archives with the Museum after completion of the post-fieldwork programme will be agreed based on a Method Statement prepared for DONG Energy by the Retained Archaeologist following fieldwork.

7.6.30 The relevant receiving institution will be notified of any archaeological investigation in advance of fieldwork. Any specific requirements relating to the preparation and deposition of project archives raised by archaeological contractors will be accommodated as appropriate. The Archaeological Contractor, through the Developer, will inform the Archaeological Curators of arrangements for archiving.

Post-Fieldwork Assessment

7.6.31 Post-fieldwork assessment will address, where possible, the character and extent, date, integrity, state of preservation and relative quality of the archaeological features or remains of the recorded archaeology, and provide a costing for any further research, analysis, publication and archiving (including the costs of depositing the archive).

7.6.32 Decisions regarding the scope of post-fieldwork assessment will be made by agreement between the Developer and Archaeological Curators following submission of investigation reports, based on the possible importance of the results in terms of their contribution to archaeological knowledge, understanding or methodological development.

7.6.33 As a minimum, a single post-fieldwork assessment may be carried out in respect of the investigations associated with the scheme as a whole. Such an assessment may be carried out by expanding the overarching archaeological report to include proposals in respect of analysis, publication and archiving.

7.6.34 An assessment of the potential of the archive for further analysis will be undertaken. The assessment phase may include (but is not limited to) the following elements:

- The conservation of appropriate materials, including the X-raying of metalwork;
- The spot-dating of all pottery from any investigation. This will be corroborated by the scanning of other categories of material;
- The preparation of Site matrices with supporting lists of contexts by type, by spot-dated phase and by structural grouping supported by appropriate scaled plans;
- An assessment statement will be prepared for each category of material, including reference to quantity, provenance, range and variety, condition and existence of other primary sources; and
- A statement of potential for each material category and for the data set as a whole will be prepared, including specific questions that can be answered and the potential value of the data to local, regional and national investigation priorities.

7.6.35 Where warranted by – for example – the investigation of an important site, a discrete post-fieldwork assessment may be undertaken of the specific sites or investigations in advance of assessment of the investigations associated with the scheme as a whole.

7.6.36 Processing of any archaeological finds or recoveries shall be undertaken by the relevant Archaeological Contractor immediately following receipt of the material from the Construction Contractor, or on completion of the fieldwork.

7.6.37 Each category of recovered material shall be assessed by suitably experienced Archaeological Contractors or specialists, to a level commensurate with the aims and objectives of the fieldwork. This will normally comprise scanning and, where relevant, identification of potential for further analysis.

7.6.38 Post-excavation assessment reports shall be produced for/by the Retained Archaeologist, and submitted for approval to DONG Energy and the Archaeological Curator. Assessment reports will present the project information in sufficient detail to allow interpretation without recourse to the project archive.

7.6.39 Assessment reports will be prepared by the Archaeological Contractor/s in line with the principles set out in Appendices 4 and 5 of *Management of Archaeological Projects* (MAP2).

7.6.40 A draft publication report shall be submitted to DONG Energy and the Archaeological Curator by the Retained Archaeologist for approval within 6 months of approval of the post-excavation assessment report.

7.6.41 The Retained Archaeologist will submit bound copies and one unbound copy of the final report to the Archaeological Curator together with one disk copy. A copy of the published report will be submitted to DONG Energy and the Archaeological Curator by the Retained Archaeologist.

7.6.42 The project record will be logged on OASIS – *Online Access to the Index of Archaeological Investigations* (http://oasis.ac.uk/). OASIS is an online archive managed by the Archaeological Data Service, the aim of which is to provide information about archaeological investigations and so to facilitate access to and dissemination of 'grey literature' that is produced in the course of archaeological fieldwork of all kinds.

7.6.43 On completion of the publication report, the Retained Archaeologist will integrate report and assessment data into the project archive. The archive will be stored in a secure location until instructions are received from the receiving Museum for its deposition.

7.6.44 Any further analysis of finds and/or environmental samples will constitute a separate item(s) of work, for which an updated project design will be prepared by the Retained Archaeologist for approval by DONG Energy and the Archaeological Curator.

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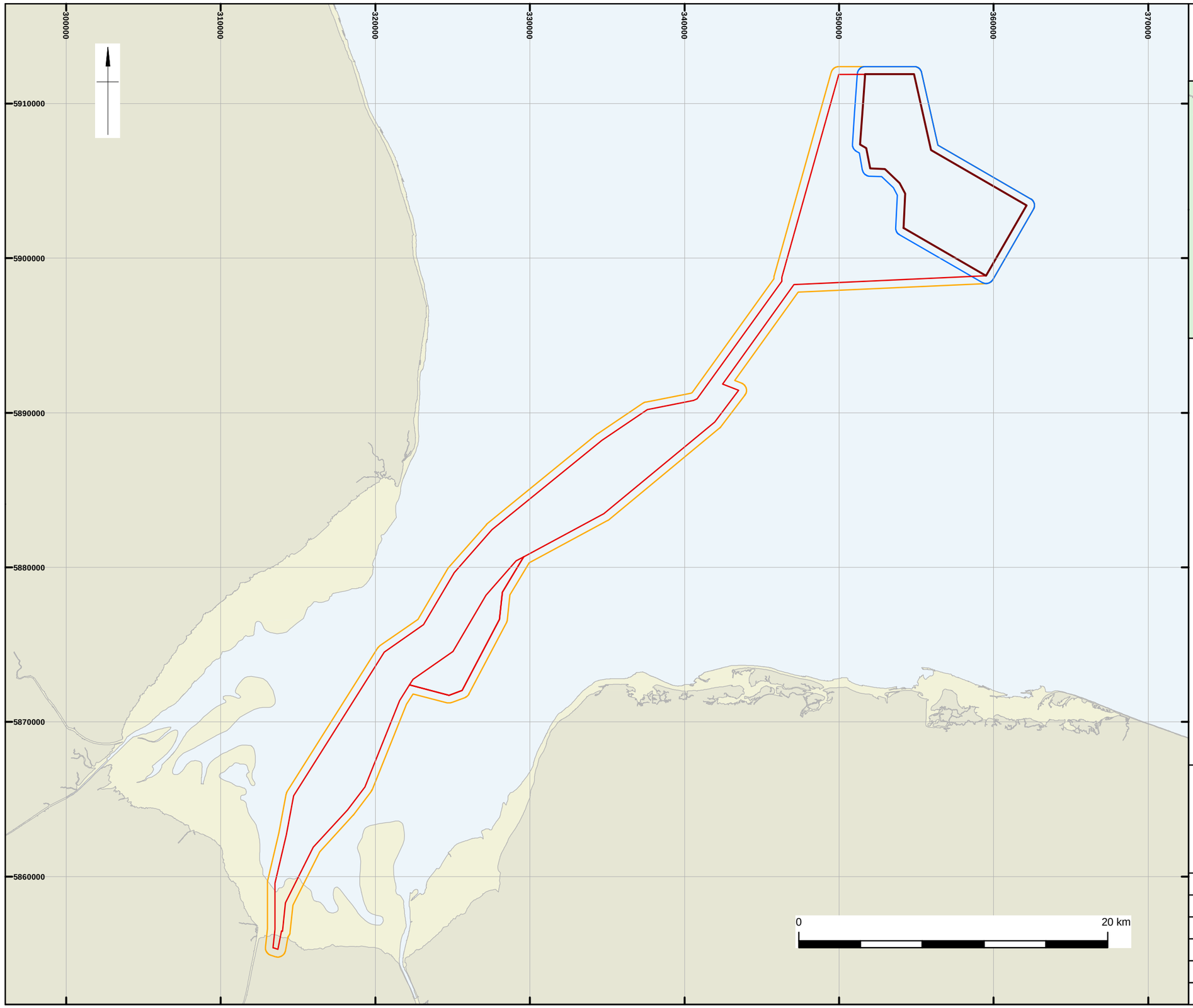
APPENDIX I: ARCHAEOLOGICAL WRECK RECORDING LEVELS

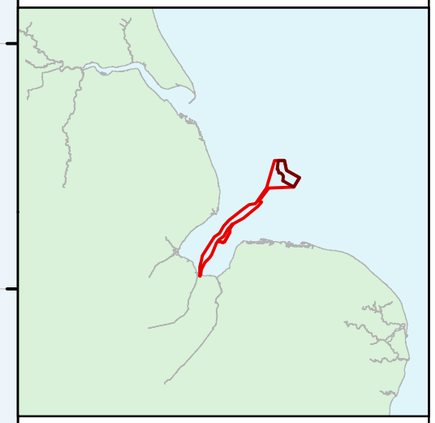
Level	Type	Objective	Sub-level	Character	Scope	Description
1	Assessment	A record sufficient to establish the presence, position and type of site.	1a	Indirect (desk-based)	A basic record based on documentary, cartographic or graphic sources, including photographic (incl. AP), geotechnical and geophysical surveys commissioned for purposes other than archaeology.	Documentary assessment / inventory of a site, compiled at the start of work on a site, and updated as work progresses.
			1b	Direct (field)	A basic record based on field observation, walkover survey, diving inspection etc., including surveys commissioned specifically for archaeological purposes.	Typically a 1 – 2 dive visit to the site (to assess a geophysical anomaly, etc.).
2	Evaluation	A record that provides sufficient data to establish the extent, character, date and importance of the site.	2a	Non-intrusive	A limited record based on investigations that might include light cleaning, probing and spot sampling, but without bulk removal of plant growth, soil, debris etc.	Typically a 2 – 4 dive visit to assess the site's archaeological potential, backed up by a sketch plan of the site with some key measurements included.
			2b	Intrusive	A limited record based on investigations including vigorous cleaning, test pits and/or trenches. May also include recovery (following recording) of elements at immediate risk, or disturbed by investigation.	Either an assessment of the buried remains present on a site; the recovery of surface artefacts; or cleaning to inform for example a 2a investigation.
3	In situ	A record that enables an Archaeologist who has not seen the site to comprehend its components, layout and Sequences.	3a	Diagnostic	A detailed record of selected elements of the site.	The first stage of a full record of the site. This would include a full measured sketch of the site and a database (or equivalent) entry for all surface artefacts.
			3b	Unexcavated	A detailed record of all elements of the site visible without excavation.	Full site plan (i.e. planning frame or equivalent accuracy) with individual object drawings, and full photo record (possibly including a mosaic).
			3c	Excavated	A detailed record of all elements of the site exposed by open excavation of part or whole of the site.	This may take the form of full or partial excavation of a site.

Level	Type	Objective	Sub-level	Character	Scope	Description
4	**Removal**	A record sufficient to enable analytical reconstruction and/or reinterpretation of the site, its components and its matrix.	-	-	A complete record of all elements of the site in the course of dismantling and/or excavation.	-
5	**Intra-site**	A record that places the site in the context of its landscape and other comparable sites.	-	-	A complete record of all elements of the site, combined with selective recording of comparable sites and investigation of the surrounding area.	-

Note: These levels represent guidance formulated by Wessex Archaeology for use during the archaeological investigation of wreck sites. They are currently used by English Heritage, but have not been formally accepted as a standard means of grading archaeological work.



Race Bank
Offshore Wind Farm



- Consented Boundary
- Consented Cable Corridor
- Consented Site Boundary with 500m buffer
- Consented Site and Cable Corridor with 500m buffer

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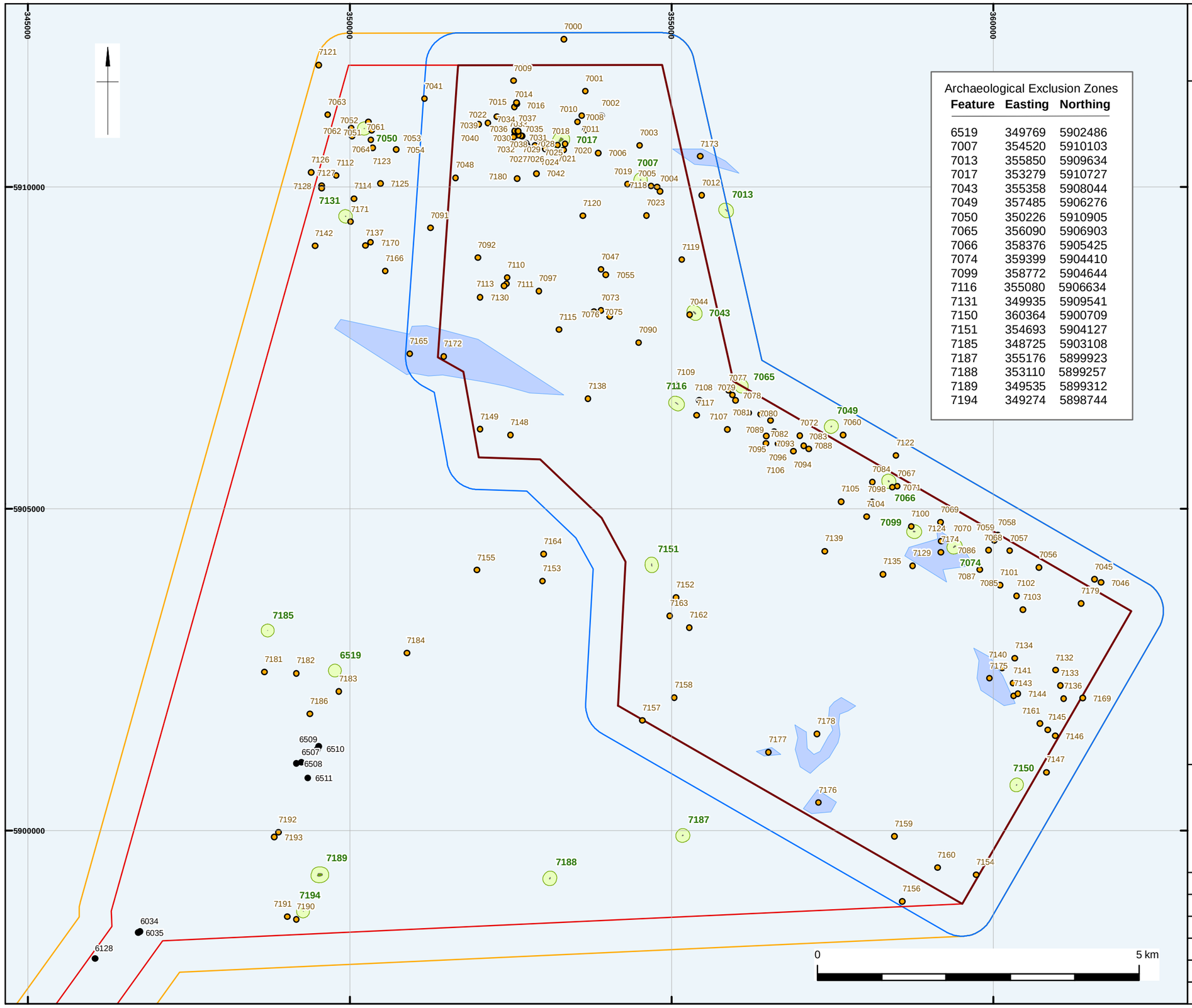
Race Bank OWF, Wash Cable Route & Adjacent Wind Farm Areas

Figure 1



Archaeological Exclusion Zones

Feature	Easting	Northing
6519	349769	5902486
7007	354520	5910103
7013	355850	5909634
7017	353279	5910727
7043	355358	5908044
7049	357485	5906276
7050	350226	5910905
7065	356090	5906903
7066	358376	5905425
7074	359399	5904410
7099	358772	5904644
7116	355080	5906634
7131	349935	5909541
7150	360364	5900709
7151	354693	5904127
7185	348725	5903108
7187	355176	5899923
7188	353110	5899257
7189	349535	5899312
7194	349274	5898744

Race Bank
Offshore Wind Farm

- Consented Boundary
- Consented Cable Corridor
- Consented Site Boundary with 500m buffer
- Consented Site and Cable Corridor with 500m buffer
- Sites subject to exclusion zones
- Archaeological Exclusion Zones

Anomalies requiring further investigation

- Data from WA ref 62550
- Data from WA ref 62254
- Palaeochannels

DONG energy
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Known Maritime Sites in the Consented Wind Farm Boundary

Figure 2

Archaeological Exclusion Zones

Feature	Easting	Northing
6026	344460	5895086
6127	344455	5894243
6158	342950	5892345
6196	343425	5893940
6211	343190	5893884
6519	349769	5902486
7007	354520	5910103
7013	355850	5909634
7017	353279	5910727
7043	355358	5908044
7049	357485	5906276
7050	350226	5910905
7065	356090	5906903
7066	358376	5905425
7074	359399	5904410
7099	358772	5904644
7116	355080	5906634
7131	349935	5909541
7150	360364	5900709
7151	354693	5904127
7185	348725	5903108
7187	355176	5899923
7188	353110	5899257
7189	349535	5899312
7194	349274	5898744

Race Bank
Offshore Wind Farm

Consented Boundary
Consented Cable Corridor
Consented Site Boundary with 500m buffer
Consented Site and Cable Corridor with 500m buffer
Sites subject to exclusion zones
Archaeological Exclusion Zones

Anomalies requiring further investigation

Data from WA ref 62550
Data from WA ref 62254

Palaeochannels

Drawing Projection: WGS84 UTM Z31N

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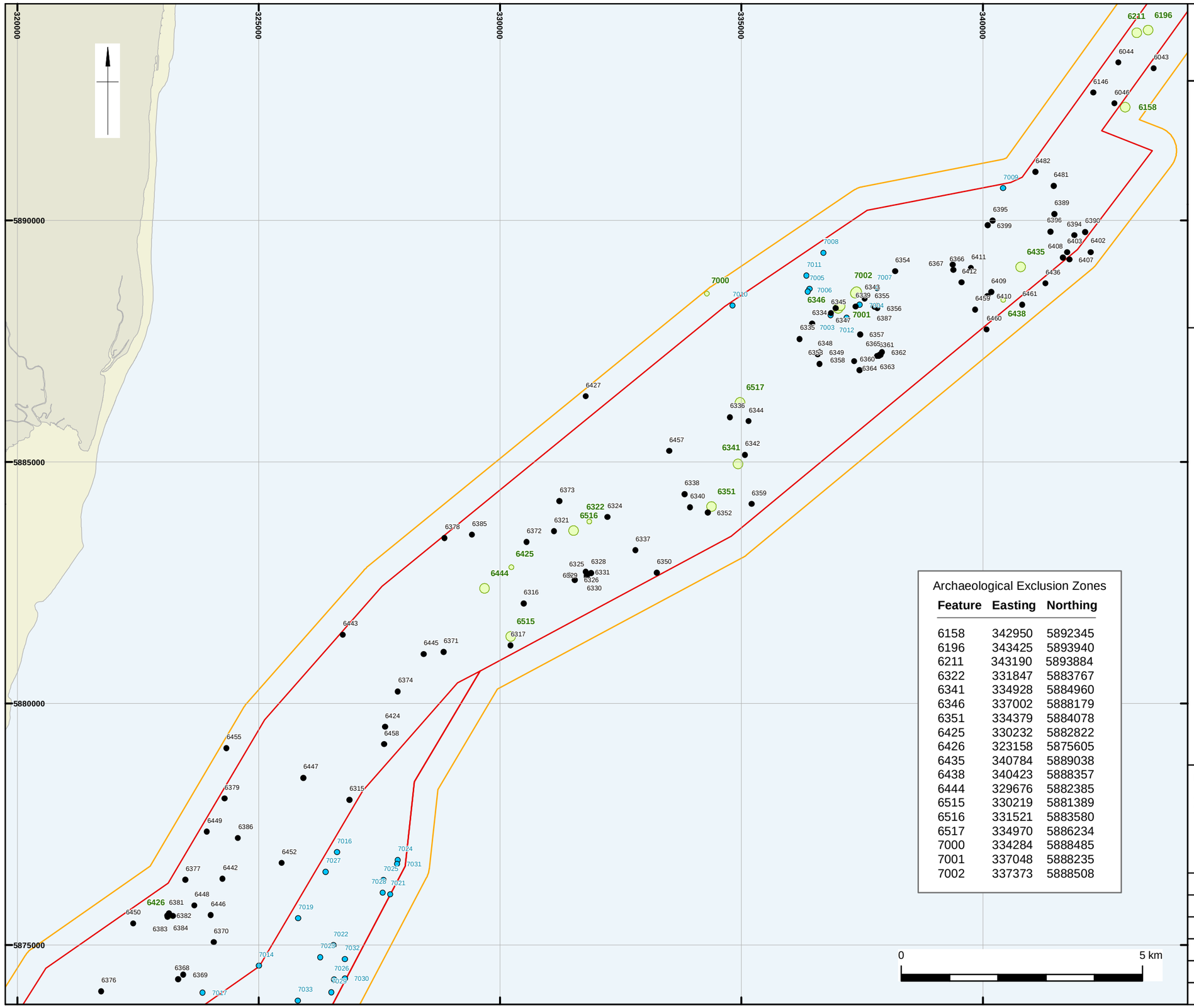
Known Sites and Geophysical Anomalies in the Consented Cable Route Corridor

Figure 3a



Archaeological Exclusion Zones

Feature	Easting	Northing
6158	342950	5892345
6196	343425	5893940
6211	343190	5893884
6322	331847	5883767
6341	334928	5884960
6346	337002	5888179
6351	334379	5884078
6425	330232	5882822
6426	323158	5875605
6435	340784	5889038
6438	340423	5888357
6444	329676	5882385
6515	330219	5881389
6516	331521	5883580
6517	334970	5886234
7000	334284	5888485
7001	337048	5888235
7002	337373	5888508

Race Bank
Offshore Wind Farm

Consented Cable Corridor

Consented Site and Cable Corridor with 500m buffer

Archaeological Exclusion Zones

Anomalies requiring further investigation

- Data from WA ref 62550
- Data from WA ref 62556

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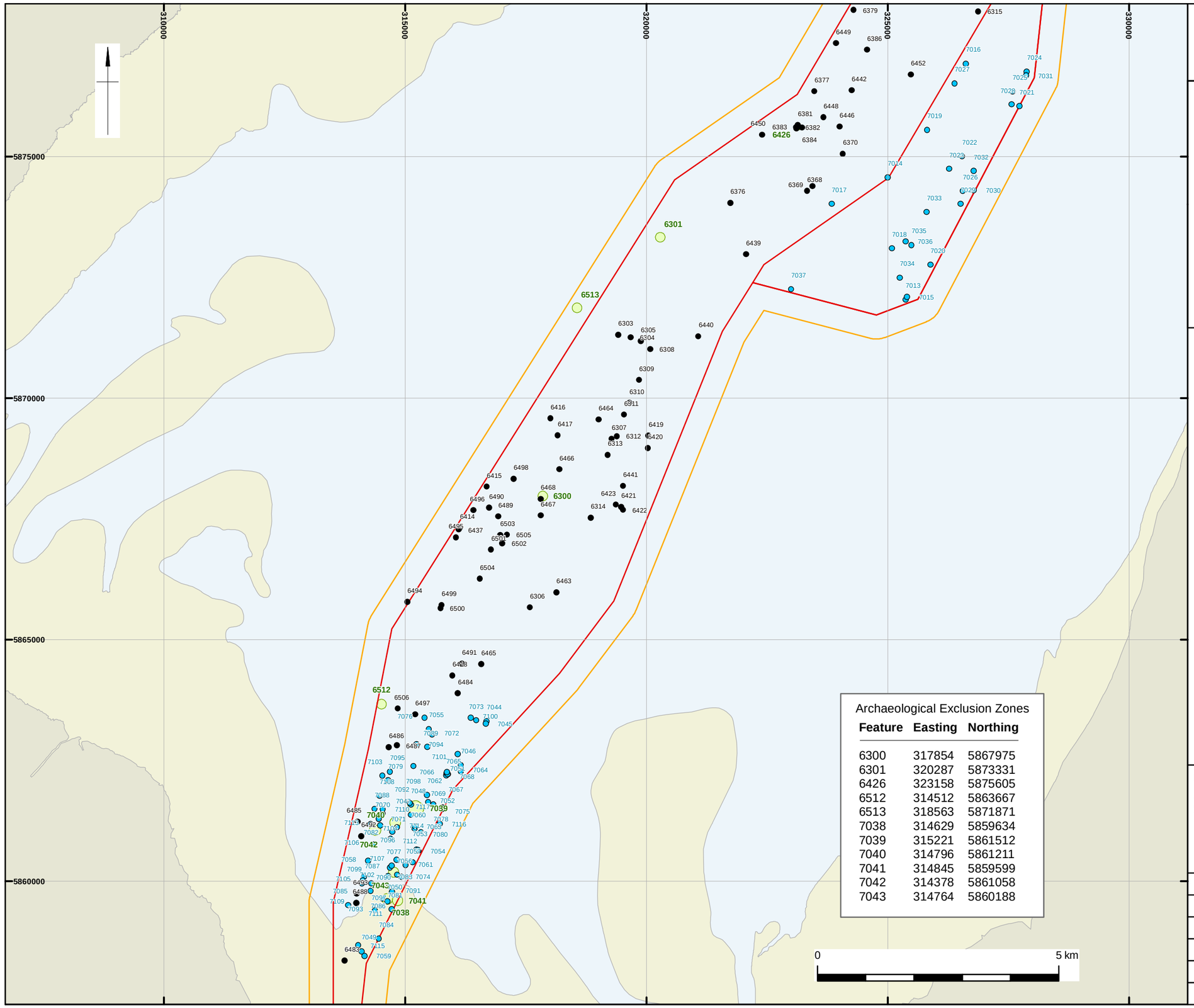
Known Sites and Geophysical Anomalies in the Consented Cable Route Corridor

Figure 3b



Archaeological Exclusion Zones

Feature	Easting	Northing
6300	317854	5867975
6301	320287	5873331
6426	323158	5875605
6512	314512	5863667
6513	318563	5871871
7038	314629	5859634
7039	315221	5861512
7040	314796	5861211
7041	314845	5859599
7042	314378	5861058
7043	314764	5860188

Race Bank
Offshore Wind Farm

Consented Cable Corridor

Consented Site and Cable Corridor with 500m buffer

Archaeological Exclusion Zones

Anomalies requiring further investigation

Data from WA ref 62550

Data from WA ref 62556

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Known Sites and Geophysical Anomalies in the Consented Cable Route Corridor

Figure 3c

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Wessex Archaeology Ltd registered office Portway House, Old Sarum Park, Salisbury, Wiltshire SP4 6EB
Tel: 01722 326867 Fax: 01722 337562 info@wessexarch.co.uk www.wessexarch.co.uk