



East Anglia ONE North Offshore Windfarm

Appendix 16.1

Marine Archaeology and Cultural Heritage Consultation Responses

Environmental Statement Volume 3

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Glossary of Acronyms

AEZ	Archaeological Exclusion Zone
AONB	Area of Outstanding Natural Beauty
CIfA	Chartered Institute for Archaeologists
COWRIE	Collaborative Offshore Wind Research into the Environment
DBA	Desk Based Assessment
DCO	Development Consent Order
DML	Deemed Marine Licence
EA1N	East Anglia ONE North
EA2	East Anglia TWO
ECR	Export Cable Route
EIA	Environmental Impact Assessment
ES	Environmental Statement
ETG	Expert Topic Group
HDD	Horizontal Directional Drilling
IPMP	In Principle Monitoring Plan
MBES	Multibeam Echosounder
MHWS	Mean High Water Springs
MMO	Marine Management Organisation
MPCP	Marine Pollution Contingency Plan
NPS	National Policy Statement
PEIR	Preliminary Environmental Information Report
PEMP	Project Environmental Management Plan
ROV	Remote Operated Vehicle
SBP	Sub-bottom profiler data
SCC	Suffolk County Council
SCCAS	Suffolk County Council's Archaeological Service
SCDC	Suffolk Coastal District Council
SPR	ScottishPower Renewables
SSS	Side-scan Sonar
WSI	Written Scheme of Investigation
ZEA	Zonal Environmental Appraisal

Glossary of Terminology

Applicant	East Anglia ONE North Limited.
Development area	The area comprising the Onshore Development Area and the Offshore Development Area
East Anglia ONE North project	The proposed project consisting of up to 67 wind turbines, up to four offshore electrical platforms, up to one offshore operation and maintenance platform, inter-array cables, platform link cables, up to one construction operational meteorological mast, up to two offshore export cables, fibre optic cables, landfall infrastructure, onshore cables and ducts, onshore substation, and National Grid infrastructure.
East Anglia ONE North windfarm site	The offshore area within which wind turbines and offshore platforms will be located.
Horizontal directional drilling (HDD)	A method of cable installation where the cable is drilled beneath a feature without the need for trenching.
Offshore cable corridor	This is the area which will contain the offshore export cable between offshore electrical platforms and landfall jointing bay.
Offshore development area	The East Anglia ONE North windfarm site and offshore cable corridor (up to Mean High Water Springs).
Scour protection	Protective materials to avoid sediment being eroded away from the base of the foundations as a result of the flow of water

16.1 Marine Archaeology and Cultural Heritage Consultation Responses

16.1.1 Introduction

1. This appendix covers those statutory consultation responses that have been received as a response to the Geophysical Survey Strategy (2017), Offshore Archaeology Assessment Method Statement (2017), Scoping Report (2017), the Preliminary Environmental Information Report (PEIR) (2018) and Expert Topic Group (ETG) Meetings.
2. The aforementioned consultation responses that are addressed in this appendix relate to ES Chapter 16 Marine Archaeology and Cultural Heritage.
3. As Section 42 consultation for the proposed East Anglia TWO project was conducted in parallel with the proposed East Anglia ONE North project, where appropriate, stakeholder comments which were specific to East Anglia ONE North, but may be of relevance East Anglia TWO, have also been included in the consultation responses for East Anglia TWO.
4. Responses from stakeholders and regard given by the Applicant have been captured in **Table A16.1.1**.

Table A16.1.1 Consultation Responses Related to Chapter 16 Marine Archaeology and Cultural Heritage and Offshore Written Scheme of Investigation (WSI) (document reference 8.6)

Consultee	Date/ Document	Comment	Response / where addressed in the ES
<p>The following comments were received prior to consultation on the PEIR and were in response to the Scoping Report or direct consultation with stakeholders. These comments were taken into account in the production of the PEIR.</p>			
Historic England	18/01/2017 East Anglia – SPR Future Projects: Geophysical Survey Strategy	Archaeological Assessment of Geophysical and Geotechnical Data used to support the East Anglia ONE windfarm application details that side scan sonar and sub-bottom profiling data was only considered to be of generally average quality, with some data “often affected by weather to a certain degree, increasing the difficulty of interpretation of some areas.” (para. 28). This therefore suggests that existing datasets should only be used where it is adequate and appropriate to do so, and that this geophysical strategy should consider where existing survey data needs to be supplemented by the acquisition of new survey data.	This ES chapter draws upon the archaeological assessment of existing geophysical survey data as well as the acquisition of new survey data as outlined in section 16.4.2 .
Historic England	18/01/2017 East Anglia – SPR Future Projects: Geophysical Survey Strategy	We note from section titled ‘Offshore Archaeology Assessment to inform EIA’ that “All areas of East Anglia ONE North and TWO which have not previously been surveyed, will be included within the 2017 geophysical survey (swath-bathymetric and side scan sonar).” In light of this statement we would suggest that you consider (with reference to your other windfarm projects), what necessary coverage and specification is required for magnetometer and sub-bottom profiling data acquisition in these areas to support an adequate assessment of impacts to the historic environment from the construction, operation and decommissioning from this proposed project.	No new magnetometer or sub-bottom profiler data have been acquired within the East Anglia ONE North windfarm site. This will be addressed as a requirement of consent secured through the DCO. An outline Written Scheme of Investigation (WSI) detailing the requirements for post-consent survey and archaeological assessment will be submitted with the DCO application.

Consultee	Date/ Document	Comment	Response / where addressed in the ES
Historic England	18/01/2017 East Anglia – SPR Future Projects: Geophysical Survey Strategy	We also recommend that you provide us with some further detail as to the specifications for all these surveys with regard to coverage (overlap) percentage and resolution, and the explanation for doing so.	Additional detail was provided through the Offshore Archaeology Assessment Method Statement (Appendix 2.6 of the East Anglia ONE North Offshore Windfarm Scoping Report, SPR 2017).
Historic England	18/01/2017 East Anglia – SPR Future Projects: Geophysical Survey Strategy	...we would like to have it clarified what measures will be taken to provide adequate and consistent levels of information for the Palaeogeographic assessment and deposit modelling, to address risks from the proposed project, without acquiring sub-bottom profiling data or geotechnical data the proposed project runs a great risk of not satisfying core principles of the EIA and consenting process as set out in section 5.8 of the Overarching National Policy Statement for Energy (EN-1) Planning (July 2011) document.	Additional detail was provided through the Offshore Archaeology Assessment Method Statement (ScottishPower Renewables 2017).
Historic England	10/03/2017 EA ONE North and TWO Offshore Archaeology Assessment Method Statement	HE recommended that further specific technical archaeological expertise is sought and review the guidance document Gribble, J. and Leather, S. for EMU Ltd. Offshore Geotechnical Investigations and Historic Environment Analysis: Guidance for the Renewable Energy Sector, COWRIE Ltd, in consideration of the level of information held and whether it is adequate to support a palaeographic impact assessment included within the planned Environmental Statement.	An assessment of the paleogeography of the study area, and the potential for sea bed prehistory based upon existing data is presented in section 16.5.1 . Further geotechnical data will be acquired post-consent and the approach to geoarchaeological assessment will be set out in the outline Offshore WSI to be submitted as part of the DCO application.
Historic England	08/12/2017 Scoping Response	All aspects of the historic environment are valued, however the particular remit of Historic England in relation to this project would be the impact upon the intertidal and fully marine historic environments and the terrestrial historic environment in regard to the highly graded designated heritage assets (scheduled monuments, grade I and II* listed buildings and registered park and gardens and Conservation Areas).	Details of consultation with the SCAAS and further consultation with regard to settings assessment is included in the onshore archaeology chapter (Chapter 24 Archaeology and Cultural Heritage).

Consultee	Date/ Document	Comment	Response / where addressed in the ES
		Above the Mean High Water mark, the undesignated terrestrial archaeology would more properly be the province of the Suffolk County Council's Archaeological Service (SCCAS). We recommend the applicant consult with them at the earliest opportunity. Similarly, the conservation and landscape officers in the local planning authorities and the county council would need to be consulted regarding impacts upon the setting of listed building and parks and gardens, including those listed at grade II, as well as conservation areas and other undesignated heritage assets within their remit. We are also aware of the landscape designation that makes this area an AONB.	
Historic England	08/12/2017 Scoping Response	Interestingly we note the proposed assessment of impacts (as detailed within table 1.8) against beneficial outcomes. As such (although it is not directly referenced) this would appear to accord the National Policy Statement EN-3 for Renewable Energy Infrastructure (2011) and we request that this matrix is more broadly considered in regard to the known and potential heritage assets situated within the proposed area of development, and the forthcoming schemes of investigation.	The approach to assessing beneficial effects is described in section 16.4.3 of this chapter.
Historic England	08/12/2017 Scoping Response	We note that the Scoping Report gives a number of options suggested for the wind turbine foundations, the platform foundations and the met mast and that a combination of the suggested options may be used depending on the site conditions. The impact that each option will have on any near surface or buried archaeological remains/deposits needs to be considered. The same comments also apply to the installation methods for the different foundation types,	A worst case scenario approach to impact assessment has been taken as described in section 16.3.2 of this chapter.

Consultee	Date/ Document	Comment	Response / where addressed in the ES
		cable installation methods, scour protection, cable protection, and cable crossings.	
Historic England	08/12/2017 Scoping Response	We note that the Scoping Report indicates a number of landfall installation methods which may be used. The impact that each of these options would have on the historic environment would also need to be determined in order to mitigate any damage. We are aware from previous schemes that there is the potential for the bentonite slurry used in the HDD process to breakout and spread into and coat archaeological deposits, features and materials under which the drill would pass. Information would therefore need to be provided regarding the chemistry, pH and composition of the drilling fluid used and any impacts defined and considered.	The potential impacts associated with bentonite slurry breakout are discussed in section 16.6.1.5 of Chapter 16 Marine Archaeology and Cultural Heritage .
Historic England	08/12/2017 Scoping Response	We accept that the future assessment of impacts will (in accordance with the 2017 EIA Regulations) describe the measures predicted to avoid, prevent, reduce or (where possible) offset any significant adverse effects on the historic environment. We therefore recommend where possible that embedded mitigation strategies, such as archaeological exclusion zones, are set out and established.	Embedded mitigation including the application of archaeological exclusion zones is set out in section 16.3.3 of Chapter 16 Marine Archaeology and Cultural Heritage .
Historic England	08/12/2017 Scoping Response	It is worth considering the issues of potential cumulative direct impacts. In particular, where cumulative impacts could exist and where the collective heritage value of many individual assets may be impacted, through “multiple impacts upon similar assets”. Furthermore it may be possible for multiple developments to affect the larger-scale archaeological features such as palaeo-landscapes and to affect the setting of heritage assets and historic landscapes/seascapes. Similarly, there is	Potential cumulative impacts are described in section 16.7 4 of Chapter 16 Marine Archaeology and Cultural Heritage .

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		often a connection between the sea bed area and the site of some First and Second World War shipping casualties. Therefore given the need to include extensive sea bed coverage using geophysical survey techniques and other more prescriptive methods it may be possible to illuminate special features within a wider battlefield context.	
Historic England	08/12/2017 Scoping Response	<p>We consider the following level of information to be appropriate to inform the archaeological desk based assessment for the application process:</p> <p>All existing and applicable survey data (as above).</p> <p>Sidescan sonar and swath bathymetry survey within the East Anglia ONE North windfarm site and area of the offshore export cable corridor Area of Search previously surveyed as part of the ZEA surveys. Completed to 100% coverage of the sea bed in summer 2017.</p> <p>Swath bathymetry, side scan sonar, magnetometer and sub-bottom profile data will be collected from all areas of the offshore export cable corridors not previously surveyed. The survey is scheduled for spring 2018.</p> <p>Use of available overlapping and relevant geotechnical data and core samples from East Anglia ONE and East Anglia THREE.</p>	Assessment has been undertaken in accordance with this approach as set out in the Offshore Archaeology Assessment Method Statement. The results are presented in Appendix 16.2 and summarised in section 16.5 of Chapter 16 Marine Archaeology and Cultural Heritage .
Historic England	08/12/2017 Scoping Response	It is important to consider the potential age of archaeological deposits present, and therefore how any deposits/remains would be scientifically dated. The choice of techniques may require cores to be collected and stored in a certain way, as is the case for the luminescence dating techniques, which will need to be considered as part of the sampling strategy.	Further geotechnical data will be acquired post-consent. The approach to geoarchaeological assessment including the approach to dating will be set out in the Outline WSI to be submitted as part of the DCO application.

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Historic England	08/12/2017 Scoping Response	Although the post-consent site investigation works currently being carried out will contribute to the understanding of the geological units of greatest archaeological potential, it may also be useful to discuss the development area with a North Sea landscape and/or Palaeolithic specialist. The specialist would potentially enhance the discussions and identification of areas of archaeological potential, as well as aid the development of strategies required to locate and investigate these areas where necessary.	Consultation with a North Sea landscape and/or Palaeolithic specialist will be included for consideration in the Outline WSI as part of the approach to post-consent assessment of geophysical and geotechnical data.
Historic England	08/12/2017 Scoping Response	It would be important to consider the percentage coverage, quality and resolution of geophysical surveys that will be carried out to ensure that features can be identified from the data and so that confidence can be held in any conclusions that are drawn about the presence/absence of features within a given area.	Additional data on the coverage, quality and resolution of existing geophysical data is included in Appendix 16.2 . This will be included for further consideration during the planning of post-consent surveys as part of the approach set out in the Outline WSI.
The Planning Inspectorate	20/12/2017 Scoping Response	The Inspectorate expects early communication and collaboration in respect of the need for and scope of geotechnical and geo-archaeological assessments.	Early communication with Historic England, and other specialists as necessary, during the planning of post-consent surveys will be included in the approach set out in the Outline WSI.
The Planning Inspectorate	20/12/2017 Scoping Response	The PEI should clearly identify the guidance used in the assessment.	The guidance used in the assessment is set out in section 16.4.1 of this chapter.
Historic England	27/02/2018 Development Area update	Historic England were provided with an update outlining minor updates made to the offshore cable corridor following consultation with The Crown Estate. Historic England provided no further comment.	Changes to the offshore cable corridor were incorporated into the geophysical survey and reported in Chapter 16 Marine Archaeology and Cultural Heritage .

Consultee	Date/ Document	Comment	Response / where addressed in the ES
The following comments were made in response to the PEIR and were taken into account in the production of this ES			
Historic England	26/03/2019 Section 42 Response (PEIR Chapter 16: Marine Archaeology)	Table 16.1 (EA1N & EA2) states that an outline WSI will be submitted with the Development Consent Order (DCO) application, detailing the requirements for post consent survey, archaeological assessments and geotechnical works. We would refer back to our letter sent on the 18th January 2017 regarding the need to consider carefully the coverage and specifications required for the survey work to ensure adequate assessment of the impacts to the historic environment. We would hope to see these factors discussed within the outline WSI, with reference to standard industry guidance and Chartered Institute for Archaeologists' Standard and Guidance for the Historic Environment.	In Section 1.5.1 of the Outline WSI (Offshore) (document reference 8.6), submitted as part of the DCO application, it is specified that objectives to inform the scope of pre-construction marine geophysical survey will be advised by the archaeological contractor following a data review of existing data. The WSI also confirms a commitment to consultation with Historic England on the scope of marine geophysical and marine geotechnical survey to be undertaken post-consent and includes reference to standard industry guidance including ClfA standard and guidance. The requirement to submit a final WSI for approval with MMO in consultation with Historic England is secured under the requirements of the draft DCO
Historic England	26/03/2019 Section 42 Response (PEIR Chapter 16: Marine Archaeology)	All impacts and archaeological mitigation needs to be captured in the marine WSI, which would also need to ensure there is adequate overlap in relation to the intertidal area. The applicant also needs to ensure the wording of DCO captures all works particularly if these works would lie outside of the main construction phases, or in the event that these are considered to be preliminary matters.	The study area for the Outline WSI (Offshore) (document reference 8.6) submitted as part of the DCO application, comprises the East Anglia ONE North windfarm site and the offshore cable corridor including the landfall up to mean high water springs (MHWS), A summary of the impacts identified in the ES is provided in Section 1.3 . Information on how mitigation will be delivered is provided in Section 1.6 . The requirement to submit a final WSI for approval with MMO in consultation with Historic England is secured under the requirements of the draft DCO.
Historic England	26/03/2019	Table 16.1 (EA1N & EA2) details that we requested that swath multi-beam bathymetry (MBES), side scan sonar (SSS), magnetometer and sub-bottom profile (SBP)	Noted. In Section 1.5.1 of the Outline WSI (Offshore) (document reference 8.6), submitted as part of the DCO application, it is specified that

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	Section 42 Response (PEIR Chapter 16: Marine Archaeology)	data to be collected from all areas of the site. Given the varied line spacing across the export cables and the array areas we consider the SBP technique should be utilised in the subsequent phases of geophysical survey where apparent survey line spacing gaps have been identified, especially in areas where potentially discreet but significant features (such as the dunes 780003 and 780004) were recorded. This point is also illustrated due to the fact two significant features (75404 and 75405) previously recorded were not identified during the more recent assessment of the geophysical data, likely due to differences in equipment, survey line spacing and orientation.	objectives to inform the scope of pre-construction marine geophysical survey will be advised by the archaeological contractor following a data review of existing data and that the scope will be consulted on with Historic England.
Historic England	26/03/2019 Section 42 Response (PEIR Chapter 16: Marine Archaeology)	We are pleased to see that the primary mitigation will focus on the avoidance of heritage assets, but note that AEZs have not been recommended at this time for features assigned an A2 archaeological discrimination (uncertain origin of possible archaeological interest): the A2 anomalies will be avoided where possible through micrositing, being further clarified through the additional archaeological assessments in order to clarify the nature and extent of these anomalies (Section 16.6.1.1, paragraph 149 (EA1N), paragraph 145 (EA2). All this work needs to be clearly programmed and supported through the WSI and detailed in the Construction Management Plan.	The Outline WSI (Offshore) (document reference 8.6), submitted as part of the DCO application, details the requirement for avoidance and micrositing in section 1.6.1 . The requirement to submit a final WSI for approval with MMO in consultation with Historic England is secured under the requirements of the draft DCO.
Historic England	26/03/2019 Section 42 Response (PEIR Chapter 16: Marine Archaeology)	Tables 16.2 (EA1N & EA2), Table 7.43 (EA1N) and Table 7.40 (EA2) also discuss the indirect impacts that could impact heritage assets, such as changes to the coastal processes, which we accept as appropriate.	Noted. Approach is retained for the ES.

Consultee	Date/ Document	Comment	Response / where addressed in the ES
Historic England	26/03/2019 Section 42 Response (PEIR Chapter 16: Marine Archaeology)	Table 16.3 (EA1N & EA2) summarises the embedded mitigation for offshore and intertidal archaeology and cultural heritage. It is noted that SSS and MBES have been mentioned, which produce images of the seabed, but SBP and magnetometer data have not been mentioned. Due to our comments made above and those provided below we consider the table should be updated.	This table (now Table 16.2) of the ES chapter has been amended as requested.
Historic England	26/03/2019 Section 42 Response (PEIR Chapter 16: Marine Archaeology)	We also consider it necessary for Table 16.4 'NPS Guidance for the Historic Environment' to detail paragraph 5.8.22 of the Overarching National Policy Statement for Energy (EN-1, DECC 2011) to highlight the need for appropriate procedures to be in place for the identification and treatment of as yet undiscovered heritage assets with archaeological interest, revealed during the preconstruction survey process and construction. In doing so this will link to the point we have already made, that whilst the primary mitigation approach for heritage assets located offshore will be avoidance through micrositing or the use of Archaeological Exclusion Zones (AEZs) if anomalies cannot be avoided, they will be subject to further investigations, as standard practice (paragraph 2.6.145 (EN-3, DECC 2011)).	This table (now Table 16.3) of the ES chapter has been amended as requested.
Historic England	26/03/2019 Section 42 Response (PEIR Chapter 16: Marine Archaeology)	As an initial request we think it will be important to take account of lessons learnt from the outcomes of previous developments, especially those that provided positive results, in order to make best use of ground-truthing survey opportunities, such as the added integration of archaeological expertise.	Section 1.5.3 of the Outline WSI (Offshore) (document reference 8.6) submitted as part of the DCO application, states that archaeological input will be sought at the planning stages of ground-truthing survey (diver and/or ROV). This will take account of any lessons learned from ground-truthing work undertaken for equivalent projects.

Consultee	Date/ Document	Comment	Response / where addressed in the ES
			The requirement to submit a final WSI for approval with MMO in consultation with Historic England is secured under the requirements of the draft DCO
Historic England	26/03/2019 Section 42 Response (PEIR Chapter 16: Marine Archaeology)	We however note from Section 16.4.3.1 (paragraph 49 (EA2) & paragraph 52 (EA1N)) that “In the majority of cases, statutory protection is only provided to a site or feature judged to be an above average example in regard to these factors”. Although in general terms we feel this is an accurate statement it is important to reflect that there is no specific statutory protection available beyond English territorial waters, toward the Exclusive Economic Zone. Furthermore the specific criteria for designation do not typically include archaeological features, without associated man-made structures.	Noted. The significance of heritage assets would be considered on a case by case basis as necessary to inform appropriate and proportionate mitigation strategies in the event of new discoveries.
Historic England	26/03/2019 Section 42 Response (PEIR Chapter 16: Marine Archaeology)	From the same section we welcome the comment in paragraph 50 (EA2) and paragraph 53 (EA1N) which outlines that due to the nature of the archaeological record, it is often the case that information regarding individual assets may be limited. As a consequence we acknowledge this means the categories and definitions of heritage importance are not a definitive level of importance of an asset, as they are based on information available to date and that further assessments may result in the amendment of the perceived heritage importance.	Noted. Approach is retained for the ES.
Historic England	26/03/2019 Section 42 Response (PEIR Chapter 16: Marine Archaeology)	We are also pleased to see that where any uncertainty occurs, the precautionary approach will be used that assigns a high importance to an asset to ensure that the potential for impacts are not under-estimated (paragraph 54 (EA1N) & paragraph 51 (EA2)). A similar approach is being taken when uncertainty occurs in the	Noted. Approach is retained for the ES.

Consultee	Date/ Document	Comment	Response / where addressed in the ES
		assessment of the impacts of the proposed development on heritage assets: where uncertainty exists, the magnitude of the impact will be assumed to be major (Section 16.4.3.2, paragraph 65 (EA1N) and paragraph 62 (EA2)).	
Historic England	26/03/2019 Section 42 Response (PEIR Chapter 16: Marine Archaeology)	We welcome the recommendations for geotechnical cores to be subject to geoarchaeological assessments as well, and that the need for cores for specific archaeological purposes will be discussed with an archaeological contractor	A commitment to geoarchaeological assessment is further set out in section 1.5.2 of the Outline WSI (Offshore) (document reference 8.6), submitted as part of the DCO application. The requirement to submit a final WSI for approval with MMO in consultation with Historic England is secured under the requirements of the draft DCO.
Historic England	26/03/2019 Section 42 Response (PEIR Chapter 16: Marine Archaeology)	It should be noted that the line spacing used is generally much larger than is recommended in the Historic England Marine Geophysics guidance (2013). Given our concerns that the coverage of the resulting surveys would not be able to identify feature/deposits of archaeological interest (see above) it is worthy of note that is the recommended specification for the effective acquisition of Sub-bottom profiler data – is based upon a 30m line spacing with cross lines of 1-10 times the principal line spacing (2013: Section 6.4.2, p25). We do however accept the geophysical surveys carried out to date were intended to be preliminary surveys only, with further higher resolution and full coverage surveys planned for later on in the development process. We would therefore consider it important to have further discussion with regards to the appropriate level of survey in relation to the above guidance, and to ensure that we receive method statements for all surveys undertaken.	Noted. In Section 1.5.1 of the Outline WSI (Offshore) (document reference 8.6), submitted as part of the DCO application, it is specified that objectives to inform the scope of pre-construction marine geophysical survey will be advised by the archaeological contractor following a data review of existing data and that the scope will be consulted on with Historic England. This includes commitment to the issuing of method statements by the Applicant in advance of any further geophysical survey campaigns that incorporate archaeological objectives. The requirement to submit a final WSI for approval with MMO in consultation with Historic England is secured under the requirements of the draft DCO.

Consultee	Date/ Document	Comment	Response / where addressed in the ES
Historic England	26/03/2019 Section 42 Response (PEIR Chapter 16: Marine Archaeology)	In reference to this point we request that in order to avoid confusion Table 16.3 'Embedded mitigation for offshore and intertidal archaeology and cultural heritage' should state that planned surveys of full coverage of the final wind farm layout and cable route will also include magnetometer data.	This table (now Table 16.2) of the ES chapter has been amended as requested
Historic England	26/03/2019 Section 42 Response (PEIR Chapter 16: Marine Archaeology)	The discussion of the potential complexity of these deposits and the presence of organic layers (Section 16.5.1, paragraphs 79-92 (EA1N) and paragraphs 76-87 (EA2)), as indicated by the existing geophysical survey and geoarchaeological evidence was good to see as this demonstrates the information that this project can add to our understanding of sea-level change and the changes to environments and landscapes over time.	Noted. Further geoarchaeological assessment of geophysical and geotechnical data post-consent will aim to further enhance this understanding.
Historic England	26/03/2019 Section 42 Response (PEIR Chapter 16: Marine Archaeology)	We also agree that the direct impacts that the proposed development may have upon potential heritage assets are generally considered to be of potentially high magnitude (Section 16.6.1.2, paragraph 154 (EA1N) and paragraph 150 (EA2)).	Noted. Approach is retained for the ES.
Historic England	26/03/2019 Section 42 Response (PEIR Chapter 16: Marine Archaeology)	It was noted that a significant number of the anomalies were classed as 'A2', being of uncertain origin of possible archaeological interest, and that a large number of these related to magnetic only anomalies. We therefore accept that the limitations of the existing information are recognised and that additional works are planned to fill in any gaps in our understanding.	Noted. The approach to the additional works are set out in the Outline WSI (Offshore) (document reference 8.6).
Historic England	26/03/2019 Section 42 Response (PEIR Chapter 16: Marine Archaeology)	In addition to the known wrecks and anomalies noted to date, it is acknowledged that there is also the potential for further maritime archaeological material to be present, dating from the Mesolithic up to the present day (Section 16.5.2 paragraph 107 (EA1N) and	Noted.

Consultee	Date/ Document	Comment	Response / where addressed in the ES
		paragraph 104 (EA2)). The visibility of the remains has also been discussed, which is beneficial, as wooden remains would not be identifiable when using some of the geophysics approaches cited in this chapter.	
Historic England	26/03/2019 Section 42 Response (PEIR Chapter 16: Marine Archaeology)	With reference to the number of anomalies already recorded and the further potential considered possible within the EA1N & EA2 windfarm site and cable corridor, we note from section 16.5.2 (paragraph 107 (EA1N) and 104 (EA2)) the statement that the greatest potential for previously undiscovered wreck material to be present is “most likely to be associated with areas of sand waves” have covered and buried archaeological remains. As such, this is an important factor to consider within the offshore WSI, given the limitations of geophysical equipment (conducive to the identity of wreck material), to penetrate the depth of mobile sediment likely to be impacted, such as cabling burial to a maximum depth of 5m. We would therefore like this point to be discussed within the forthcoming draft offshore WSI.	Section 1.5.1 of the Outline WSI (Offshore) (document reference 8.6) includes specific reference to the need to consider the limitations of geophysical equipment in identifying buried archaeological remains in any future survey campaign.
Historic England	26/03/2019 Section 42 Response (PEIR Chapter 16: Marine Archaeology)	We broadly agree with the classification of in situ remains as being of high significance, and isolated discoveries being of medium significance, and that the implication of mitigation measures reduce the impacts to ‘minor adverse’ (paragraph 159 (EA1N) and paragraph 155 (EA2)). The mitigation may include additional geophysical and geotechnical surveys, but it is important to note that some archaeological remains are not readily identifiable by some of the geophysical approaches cited within the document.	Section 1.5.1 of the Outline WSI (Offshore) (document reference 8.6) includes specific reference to the need to consider the limitations of geophysical equipment in identifying buried archaeological remains in any future survey campaign.
Historic England	26/03/2019	It is noted that it is likely that the construction of the development will result in an increased disturbance of	The effect of indirect impacts such as redeposited sediments and potential concealment has been

Consultee	Date/ Document	Comment	Response / where addressed in the ES
	Section 42 Response (PEIR Chapter 16: Marine Archaeology)	sediment that will be redeposited elsewhere. The redeposited sediments may therefore “conceal” any present archaeology present, which is classed as resulting in no impact. Should such a scenario occur we think that the redeposited sediments are unlikely to “conceal” known archaeological sites or features, but may form a protective anaerobic environment, thereby limiting the degrading effect. We therefore feel this issue needs further consideration.	considered further in Section 16.6.1.3 of the ES chapter. The magnitude of increased sediment cover on heritage assets as a result of construction activities is assessed as nil / none, therefore no additional consideration is required regarding how this may limit a degrading effect.
Historic England	26/03/2019 Section 42 Response (PEIR Chapter 16: Marine Archaeology)	The potential impact of a breakout of drilling fluid used in the HDD process has been discussed in Chapter 16.6.1.5 in terms of how this could impact buried archaeology (paragraphs 171-172 (EA1N) and paragraphs 166-167 (EA2)). We are pleased to see that this has been considered for this project, and that a strategy that will be employed to minimise the potential for breakout has been devised. Any mitigation required to manage fluid breakout would also need to take into consideration historic environment impacts.	Noted.
Historic England	26/03/2019 Section 42 Response (PEIR Chapter 16: Marine Archaeology)	We welcome the use of Firth, A. (2014) East Coast War Channels in the First and Second World War in addressing the nature and extent of the Historic Seascape Character for the two projects. We therefore feel it is important to consider this element of the historic environment through the production of the strategic overview (draft outline WSI) and its resulting outcomes - in terms of understanding spatially represented First and Second World War heritage assets.	Noted. Reporting and publication, if required, for information on World War I and II heritage assets generated as an outcome of this project would consider the understanding of the spatial representation of such assets.
Historic England	26/03/2019	We found the section relating to ‘Impacts to site preservation conditions from heat loss from installed cables’ an interesting inclusion which we may provide	Noted.

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	Section 42 Response (PEIR Chapter 16: Marine Archaeology)	additional comments on at the application stage after consultation with our expert marine conservator.	
Historic England	26/03/2019 Section 42 Response (PEIR Chapter 16: Marine Archaeology)	We consider the determination made in Chapter 16.7.1 'Cumulative direct impact to potential heritage assets' to be acceptable whereby the potential cumulative impact is considered to be minor adverse. Additionally section 16.7.3 Cumulative beneficial impact of accumulation of data includes welcome reference to European neighbours and their initiatives and frameworks for managing heritage within section, which is not an element of an assessment we have seen so detailed within an application before.	Noted.
Historic England	26/03/2019 Section 42 Response (PEIR Appendix 16.2 Archaeological Assessment of Geophysics data)	We accept the geophysical surveys carried out to date were intended to be preliminary surveys only, with further higher resolution and full coverage surveys planned for later on in the development process. It would therefore be appropriate to have further discussion with regards to the appropriate level of survey in relation to the above guidance and to ensure that we receive method statements for all surveys undertaken.	Noted. In Section 1.5.1 of the Outline WSI (Offshore) (document reference 8.6), submitted as part of the DCO application, it is specified that objectives to inform the scope of pre-construction marine geophysical survey will be advised by the archaeological contractor following a data review of existing data and that the scope will be consulted on with Historic England. The requirement to submit a final WSI for approval with MMO in consultation with Historic England is secured under the requirements of the draft DCO.
Historic England	26/03/2019 Section 42 Response (PEIR Appendix 16.2 Archaeological Assessment of Geophysics data)	Section 2.6 discusses the geotechnical work that has been completed to date as part of the EA1N project, stating that two boreholes have been collected and assessed for archaeological purposes. This has included a DBA of the core logs to establish the likely presence of horizons of archaeological potential. We welcome the use of geotechnical boreholes for archaeological purposes, but we would question if two	A commitment to further geoarchaeological assessment to be undertaken post-consent is outlined in section 1.5.2 of the Outline WSI (Offshore) (document reference 8.6), submitted as part of the DCO application.

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		boreholes are enough at this stage and certainly think more are needed to ground-truth the conclusions drawn from the geophysical survey work (summarised in Table 7 (EA1N)).	The requirement to submit a final WSI for approval with MMO in consultation with Historic England is secured under the requirements of the draft DCO.
Historic England	26/03/2019 Section 42 Response (PEIR Appendix 16.2 Archaeological Assessment of Geophysics data)	Section 3.2 summarises the findings of the palaeogeographic and geotechnical assessments that were carried out, highlighting the units of greatest archaeological potential and the possible features (channels, lagoons, former terrestrial landscapes etc.) that were identified. We accept the detail included concerning the complexity of some of the channel and lagoon deposits, especially within the Brown Bank Formation (e.g. Section 3.2.7 (EA2)), as this clearly highlights the value of this work and how it will add to our understanding of landscape and sea-level changes in this area over time.	Noted. Further geoarchaeological assessment of geophysical and geotechnical data post-consent will aim to further enhance this understanding.
Historic England	26/03/2019 Section 42 Response (PEIR Appendix 16.2 Archaeological Assessment of Geophysics data)	As such, we understand that a combination of the all the interpreted shallow geological units from across the three study areas (EA1N, EA2 and the related Export Cable Route (ECR)) is outlined within Table 6. And that the entire stratigraphy was not identified in any one single study area, with the exact number of units present differing depending on the area. We would however suggest that given the initial results of the Stage 3 geoarchaeological assessment of boreholes and vibrocores for the EA1 Offshore Windfarm project the possible reworked Saalian (Wolstonian) material (initially understood as Brown Bank Formation) should be considered for inclusion within the forthcoming application.	Reference to the geoarchaeological assessment undertaken for East Anglia ONE has been included in Section 16.5.1 of ES Chapter 16 Marine Archaeology and Cultural Heritage and section 1.5.2 of the Outline WSI (Offshore) (document reference 8.6). This deposit is difficult to identify using geophysics and the identification and examination of these deposits within East Anglia ONE North should form a key objective of the geoarchaeological assessment to be undertaken post-consent.

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Historic England	26/03/2019 Section 42 Response (PEIR Appendix 16.2 Archaeological Assessment of Geophysics data)	It is good to see that the A1 anomalies will be protected within an Archaeological Exclusion Zones (AEZ) but additional information may be required to support the size of some of the AEZs proposed: for some isolated features an AEZ of only 15m has been proposed (Export Cable route). However we understand that this decision is only based upon remote sensing techniques, and we consider it the possible heritage interest of such anomalies will need to be considered carefully where no wider surrounding buffer coverage exists, 700263 (ECR) as an example when compared to 700109 and associated wreck 70684 (EA2)).	Noted. It is specified in section 1.6.1 of the Outline WSI (Offshore) (document reference 8.6), submitted as part of the DCO application, that AEZs may be reduced, enlarged or removed in agreement with Historic England as further relevant information (e.g. pre-construction geophysical surveys, ROV / Diver investigations) becomes available post-consent. The requirement to submit a final WSI for approval with MMO in consultation with Historic England is secured under the requirements of the draft DCO.
Historic England	26/03/2019 Section 42 Response (PEIR Appendix 16.2 Archaeological Assessment of Geophysics data)	We are pleased to see that the P1 & P2 features are being classed as being of high and medium potential respectively (Section 5.1.2), but we note that AEZs have not been discussed with reference to A2, P1 or P2 anomalies (Section 5.2.2 & 5.2.3 (EA1N) and Section 5.2.4 (EA2)). These features will be avoided by micro-siting if they are to be impacted by the proposed development, but that a reporting protocol is also being developed to account for any objects that are recovered during the groundworks operations (Section 5.2.4 (EA1N) and Section 5.2.6 (EA2)).	Noted.
Historic England	26/03/2019 Section 42 Response (PEIR Appendix 16.2 Archaeological Assessment of Geophysics data)	We are pleased to see that the anomalies will be avoided where possible but it should be noted that the line spacing used in geophysical surveys completed to date exceed the limit recommended for archaeological work, and the limitations of the current data have been stated in Sections 4.2.22 and 4.2.23 (EA1N), and Sections 3.2.12 and 4.2.32 (EA2). It is therefore possible that the full extent of some features has not been fully defined, or that smaller anomalies have not been identified at all. This needs to be taken into	Noted. In Section 1.5.1 of the Outline WSI (Offshore) (document reference 8.6), submitted as part of the DCO application, it is specified that objectives to inform the scope of pre-construction marine geophysical survey will be advised by the archaeological contractor following a data review of existing data and that the scope will be consulted on with Historic England.

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		account and addressed when subsequent phases of geophysical and geoarchaeological survey work is carried out (Section 5.1.3 & 5.1.4 (EA1N & EA2)).	The requirement to submit a final WSI for approval with MMO in consultation with Historic England is secured under the requirements of the draft DCO.
Historic England	26/03/2019 Section 42 Response (PEIR Appendix 16.2 Archaeological Assessment of Geophysics data)	We do however also stress that wrecks assemblages can be spatially spread (sometimes buried) over much larger distances than the original centrally observed remains might suggest. Whilst it is therefore necessary to consider AEZs on a case by case basis, and in relation to the proximity and orientation of proposed development infrastructure, the developer should be aware that the perceived extent of AEZs (at this stage) – based upon the specifications for a characterisation survey, could change. Furthermore additional unrelated anomalies close to existing AEZs may also become apparent. Factoring in the unknown is always difficult, but the developer must be sufficiently prepared in budget for, and apply necessary expertise and resources to manage discoveries and associated AEZs in a timely fashion to attain and factor in curatorial advice.	Noted. It is specified in section 1.6.1 of the Outline WSI (Offshore) (document reference 8.6), submitted as part of the DCO application, that the archaeological assessment of pre-construction survey data, for example, will further clarify the nature and extent of AEZs and anomalies and that the scheme design would be modified to avoid heritage assets where possible. If features cannot be avoided, it is understood that additional work may be required manage discoveries effectively in accordance with curatorial advice.
Historic England	26/03/2019 Section 42 Response (PEIR Appendix 16.2 Archaeological Assessment of Geophysics data)	It is stated that the multibeam bathymetry (MBES) data were gridded at 0.5 m and analysed using QPS Fledermaus software by the archaeological team. As such, whilst we consider this acceptable for the characterisation stage of the project, we do however request all future MBES data be provided to the accredited archaeological contractor in a raw un-gridded form, such that they can adequately interpret and account for the potential range of discreet and ephemeral seabed anomalies likely to be encountered through the post-consent geophysical surveys.	The data was received by the archaeological contractor as ungridded, raw data and was gridded by them at 0.5m to achieve the highest resolution possible from the data.

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Historic England	26/03/2019 Section 42 Response (PEIR Appendix 16.3: Archaeological Assessment of Geophysical Data (Cable route))	It was also noted that the broad line spacing used for the 2010 magnetometer survey may mean that some smaller anomalies may have been missed (Sections 2.4.6). In addition, as no new SSS or MBES data was acquired for the northern section of the ECR, it cannot be guaranteed that all of the seabed features of archaeological potential have been identified within this area (Section 1.1.8). It is good that the limitations of the existing data are being discussed, and we would hope that they will be addressed in the subsequent phases of geophysical survey work.	Noted. In Section 1.5.1 of the Outline WSI (Offshore) (document reference 8.6), submitted as part of the DCO application, it is specified that objectives to inform the scope of pre-construction marine geophysical survey will be advised by the archaeological contractor following a data review of existing data and that the scope will be consulted on with Historic England. The requirement to submit a final WSI for approval with MMO in consultation with Historic England is secured under the requirements of the draft DCO.
Historic England	26/03/2019 Section 42 Response (PEIR Appendix 16.3: Archaeological Assessment of Geophysical Data (Cable route))	Section 3.2 summarises the findings of the palaeogeographic assessments, highlighting the units of greatest archaeological potential and the possible features (channels and dune features) that were identified. We are pleased to see that the complexity of some of the channel and dune features are discussed as this clearly highlights the value of this work and how it will add to our understanding of landscape and sea-level changes in this area over time.	Noted.
Historic England	26/03/2019 Section 42 Response (PEIR Appendix 16.3: Archaeological Assessment of Geophysical Data (Cable route))	We note the seven features (780036-42) were recorded on the SBP data from the nearshore Export Cable Route have been interpreted as acoustic blanking, either at, or just below, the seabed which have the potential to consist of Holocene in date (Unit 6). Furthermore we welcome the recommendation for geoarchaeological work to aid in refining the interpretation, and therefore help determine the archaeological potential of the area. As such we therefore request, with respect to the precautionary principle and our experience with other windfarm	Based upon the current interpretation, the archaeological contractor recommends retaining the P2 discrimination. Acoustic blanking is not a feature in itself, but rather an indication of the potential for archaeological deposits to be present and may equally be caused by coarse sediment layers as well as indicating the presence of shallow gas, and possible organic deposits. This will be clarified post-consent by a programme of geoarchaeological assessment.

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		projects, that a P1 discrimination be applied to these features in this instance.	
Historic England	26/03/2019 Section 42 Response (PEIR: Chapter 7 Marine Geology, Oceanography and Physical Processes))	It is stated that increased erosion that may be experienced in the area surrounding each turbine will be mitigated either through the implementation of AEZs for A1 anomalies, and micrositing for A2 and A3 anomalies (paragraphs 181 & 182 (EA1N) and paragraph 178 (EA2)). The latter approach will need to carefully consider the evidence obtained from the pre-construction surveys that are planned, as well as the limitations in the approaches used and the data that will be collected. In addition, the impact that changes to coastal processes may have on heritage assets needs to be discussed in more detail. Heritage assets are briefly mentioned in Table 7.43 (EA1N & EA2) in the Marine Geology, Oceanography and Physical Processes chapter (Ch7), but the details of the embedded mitigation strategy set out in this chapter needs to be discussed with heritage in mind (either in Chapter 7 or in Chapter 16), such as the use of scour protection (Chapter 7.6.2.4 (EA1N & EA2)). It is stated in Section 7.3.4 that monitoring will form a major part of the management strategy (paragraph 63 (EA1N) and paragraph 64 (EA2)), but again this would need to consider heritage assets.	The impact that changes to coastal processes may have on heritage assets are discussed in detail as part of the assessment of Chapter 16 Marine Archaeology and Cultural Heritage (Sections 16.6.1.3 and 16.6.3.3) . Similarly, embedded mitigation specific to Chapter 7 Marine Geology, Oceanography and Physical Processes also forms part of the considerations for heritage in Chapter 16, for example in terms of seabed preparation and scour protection, discussed as part of the worst case scenario in Section 16.3.2 which in turn informs the assessment of impacts for archaeology and cultural heritage.

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