Viking Link

Marine Archaeological Technical Report

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wessexarchaeology

Viking Link

Marine Archaeological Technical Report

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Summary

Wessex Archaeology was commissioned by Intertek on behalf of National Grid Viking Link Ltd (NGVL) and Energinet.dk to prepare a marine archaeological Technical Report including a high level Environmental Impact Assessment for the proposed Viking Link submarine cable corridor that will in turn inform an Environmental Report.

The proposed cable route would run from Bicker Fen in Lincolnshire in UK to Revsing in Jutland in Denmark. This Technical Report considers an area that is limited to the United Kingdom Exclusive Economic Zone which includes the proposed Route 4 selected for the development (Revision 11). This Technical Report will ultimately inform an Environmental Impact Assessment for the offshore element of the proposed Viking Link.

The Technical Report comprises: relevant legislation and guidance; a methodology, an archaeological baseline; an assessment of the value and sensitivity of the heritage assets identified within the assessed area; and a high level environmental appraisal.

The archaeological resource within the UK element of the submarine cable corridor is summarised as follows:

- *a total of 69 palaeogeographic features, comprising 20 features of probable archaeological interest (P1) including 17 channels and three cut and fill features, and 49 features of possible archaeological interest (P2);*
- *exploratory assessment of areas of high potential has clarified a Late Pleistocene – Early Holocene chronology and macrofossil, and malacological record for areas of the cable route corridor (in particular the area around Skate Hole and Block 13) enhancing the palaeogeographic baseline and honing the palaeoenvironmental interpretation;*
- *potential for discovery of sites and artefacts from the Palaeolithic and Mesolithic periods;*
- *three known shipwrecks (comprising one medium value wreck and two high value wrecks) in addition to the potential for the discovery of further shipwreck material from the late Mesolithic to the present;*
- *no known aircraft crash sites, however, there is the potential for the discovery of 20th century aircraft material, particularly from World War II;*
- *the Historic Seascape Character of the area comprises: fishing (including fishing grounds and fishing activities), military (military practice area), industry (aggregate dredging and hydrocarbon installation/pipelines), communications (submarine telecommunication cables), navigation (navigation routes), cultural topography (including sandbanks with sand waves) and enclosed land (comprising the reclamation from wetland).*

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Wessex Archaeology would like to thank the United Kingdom Hydrographic Office for supplying the known wreck and obstruction data and the National Record of the Historic Environment and the Lincolnshire Historic Environment Record for supplying records of heritage asset data.

The report was researched and compiled by Victoria Lambert with contributions from Diana Donohue, Megan Metcalf and Dr Stephanie Arnott. The geoarchaeological assessment was undertaken by Holly Rodgers, Jack Russell, Nicky Mulhall and Ines Doriga Lopez. The illustrations were prepared by Ken Lymer and Kitty Foster. QA was provided by Dr Louise Tizzard and Dr Andrew Bicket, who also managed the project on behalf of Wessex Archaeology.

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Marine Archaeological Technical Report

1 INTRODUCTION

1.1 Project background

1.1.1 Wessex Archaeology was commissioned by Intertek to prepare a marine archaeological Technical Report including a high level Environmental Impact Assessment (EIA) for the proposed Viking High Voltage Direct Current (HVDC) link submarine cable route (Viking Link, hereafter referred to as the 'submarine cable corridor') between Denmark and the United Kingdom (UK).

1.1.2 The proposed cable route would run from Bicker Fen in Lincolnshire in UK to Revsing in Jutland in Denmark. This Technical Report only considers the element of the submarine cable corridor that is located within the UK Exclusive Economic Zone (EEZ), which includes the proposed Route 4 selected for the development (Revision 11).

1.1.3 This marine archaeological Technical Report follows on from the high-level marine Archaeological Desk-Based Assessment (ADBA; Wessex Archaeology 2016a) and will support a planning application for the Viking Link. In particular, it will address the known and potential marine archaeological heritage assets that are located within the submarine cable corridor, using geophysical and geotechnical survey data, alongside archival records for the area. An assessment of the value and sensitivity of these heritage assets will subsequently be undertaken. The Technical Report will ultimately inform an Environmental Statement (ES) for the offshore element of the proposed Viking Link.

1.2 Development Proposal

1.2.1 The proposed project is a High Voltage Direct Current (HVDC) electrical interconnector with an approximate capacity of 1400 MW, which will allow transfer of power between the electricity transmission systems of Denmark and Great Britain, crossing through the Exclusive Economic Zones of UK, the Netherlands, Germany and Denmark. It is proposed that within the UK section of the route the two marine cables will be laid separately up to a distance of 50 m apart, depending on water depth and ground conditions (Intertek 2016: 19). The total length of the interconnector is 760 km, with 630 km of submarine cable and 55 km and 75 km of onshore cable in Great Britain and Denmark respectively, with an anticipated burial depth offshore of *c.* 1 - 2 m (*ibid.* 30-31).

1.3 Scope of document

1.3.1 This assessment was requested by Intertek in order to determine, as far as is possible from existing information and bespoke survey data, the nature, extent and significance of the known and potential marine archaeological resource within the submarine cable corridor.

1.3.2 For the purposes of this document, only the extent of the submarine cable corridor that lies within the UK EEZ has been assessed.

1.4 Aims

1.4.1 The specific aim of this marine archaeological Technical Report is to summarise the known and potential archaeological baseline within the submarine cable corridor within the UK EEZ in order to inform the production of the Environmental Statement for the project.

1.4.2 The objectives of the assessment are as follows:

- *to provide details of relevant legislation, national and local planning policy and best practice guidance;*
- *to outline the known and potential marine archaeological resource within the element of the submarine cable corridor present within the UK EEZ based on a review of existing archaeological records and secondary sources;*
- *to assess the geophysical survey data comprising sidescan sonar, multibeam echosounder and sub-bottom profiler acquired by Fugro GeoConsulting and the geotechnical data comprising vibrocores obtained by Fugro GeoConsulting in order to identify any material of archaeological and cultural heritage significance present within the element of the submarine cable corridor present within the UK EEZ;*
- *to compare the geophysical and geotechnical interpretation with desk-based assessments, historical data, known archaeological sites and previous investigations in the vicinity of the submarine cable corridor;*
- *to summarise the Historic Seascape Character for the area that the submarine cable corridor truncates; and,*
- *to assess the significance of the known and potential marine archaeological resource through weighted consideration of their valued components.*

1.5 Copyright

1.5.1 This report may contain material that is non-Wessex Archaeology copyright (e.g. Ordnance Survey, British Geological Survey (BGS), Crown Copyright), or the intellectual property of third parties, which Wessex Archaeology are able to provide for limited reproduction under the terms of our own copyright licences, but for which copyright itself is non-transferable by Wessex Archaeology. Users remain bound by the conditions of the Copyright, Designs and Patents Act 1988 with regard to multiple copying and electronic dissemination of the report.

2 LEGISLATION, GUIDANCE AND POLICY

2.1.1 Historic England is responsible for the archaeological resource within England's Territorial Waters (to the 12 nautical miles (nm) limit) and is consultee for the resource in the UK EEZ. The Marine Management Organisation (MMO) is responsible for licencing, regulating and planning marine activities in the seas around England to ensure they are carried out in a sustainable way.

2.1.2 The following section provides a summary of the national, regional and local planning and legislative framework which governs the treatment of archaeological remains in the planning process. More comprehensive details are provided in **Appendix I**.

2.2 Marine Policy

2.2.1 The Marine and Coastal Access Act 2009 (MCAA) is the primary legislation relevant to marine development plans. Under this legislation, marine plans must be consistent with the Marine Policy Statement (MPS; Department for Environment, Food and Rural Affairs 2011) and fully reflect the requirements of the MPS at a local level. Marine plans must also be in accordance with other UK national policy, including the *National Planning Policy Framework* (NPPF; Department for Communities and Local Government 2012).

2.2.2 Under the MCAA, the UK was divided into marine planning regions, with an associated authority responsible for preparing a Marine Plan for that area. The MPS sets out the framework for preparing Marine Plans and making decisions affecting the marine environment. The MPS also states that Marine Plans must ensure a sustainable marine environment that will protect heritage assets.

2.2.3 In England, the MMO have divided the inshore and offshore waters into 11 plan areas for which marine plans are to be produced. The UK element of the submarine cable corridor is within the East Inshore and East Offshore Plan Areas. The East Inshore and East Offshore Marine Plans were released in April 2014 (East Marine Plans, Planning and development page of the gov.uk website, accessed 19/10/2016).

2.3 National Planning Policy Framework

2.3.1 The NPPF was published by the Department for Communities and Local Government (DCLG) in March 2012, replacing Planning Policy Statement 5.

2.3.2 Section 12 of the NPPF entitled 'Conserving and enhancing the historic environment' sets out the principal national guidance on the importance, management and safeguarding of heritage assets within the planning process. The aim of NPPF Section 12 is to ensure that Regional Planning Bodies and Local Planning Authorities, developers and owners of heritage assets adopt a consistent and holistic approach to their conservation and to reduce complexity in planning policy relating to proposals that affect them. The government guidance provides a framework that:

- *recognises that heritage assets are an irreplaceable resource;*
- *requires applicants to provide proportionate information on the significance of heritage assets affected by the proposals and an impact appraisal of the proposed development on that significance;*
- *takes into account the desirability of sustaining and enhancing the significance of heritage assets and their setting;*
- *places weight on the conservation of designated heritage assets;*

- *requires developers to record and advance understanding of the significance of any heritage assets to be lost (wholly or in part) in a manner proportionate to their importance and impact, and to make this evidence (and any archive generated) publicly accessible; and*
- *promotes the conservation of heritage assets in a manner appropriate to their significance, so that they can be enjoyed for their contribution to the quality of life for this and future generations.*

2.4 Marine Legislation

2.4.1 The submarine cable corridor is located within the UK EEZ, including the English Territorial Sea (up to 12 nautical miles (nm)) from the coast. The following legislation applies within the 12 nm limit of English territorial waters:

- *Protection of Wrecks Act 1973: Section One and Two;*
- *Ancient Monuments and Archaeological Areas Act 1979 (as amended);*
- *Protection of Military Remains Act 1986; and*
- *Merchant Shipping Act 1995.*

2.4.2 There are no known archaeological sites that are designated under the legislation outlined above present within the submarine cable corridor within the UK EEZ. However, it is possible that as yet undiscovered archaeological features may be present within the submarine cable corridor. The above legislation provides protection for wrecks of high historical, archaeological or artistic value, as well as allowing military wrecks to be protected. Ownership of any wreck remains is determined in accordance with the Merchant Shipping Act 1995.

2.4.3 More information regarding the details of each piece of legislation is presented in **Appendix I**.

2.5 Marine Guidance

2.5.1 This assessment was carried out in a manner consistent with available guidance as described below in chronological order of issue:

- *Identifying and Protecting Palaeolithic Remains: Archaeological Guidance for Planning Authorities and Developers (English Heritage (now Historic England) (1998);*
- *Managing Lithic Scatters: Archaeological Guidance for planning authorities and developers (English Heritage (now Historic England) 2000);*
- *Military Aircraft Crash Sites: Guidance on their significance and future management (English Heritage (now Historic England) 2002);*
- *The Code of Practice for Seabed Developers (Joint Nautical Archaeology Policy Committee and The Crown Estate 2006);*
- *Historic Environment Guidance for the Offshore Renewable Energy Sector (COWRIE 2007);*
- *Conservation Principles, Policies and Guidance for the Sustainable Management of the Historic Environment (English Heritage (now Historic England) 2008);*
- *Our Seas – A shared resource: High level marine objectives (DEFRA 2009);*

- *Ships and Boats: Prehistory to Present: Designation Selection Guide (English Heritage (now Historic England) 2012); and,*
- *Marine Geophysics Data Acquisition, Processing and Interpretation Guidance Notes (Bates, R. Dix, J. K., Plets, R. 2013).*

3 METHODOLOGY

3.1 Assessment area

3.1.1 For the purposes of this report, the area that has been assessed is defined by the extent of the submarine cable corridor located within the UK EEZ (Route 4, Revision 11), KP 474 to KP 618.8. The submarine cable corridor comprises a 450 m survey corridor that widens in three places with a maximum width of 1.1 km. This corridor is delimited by the High Water Mark (HWM) at the landward extent to the west and the offshore boundary of the UK EEZ to the east (**Figure 1**).

3.1.2 An additional 2 nm buffer area around the extent of the submarine cable corridor (based on the initial five proposed cables, Revision 5) was used as the search area for obtaining records from relevant archive databases. This buffer allows for a greater understanding of the wider archaeological baseline environment, with the dual purpose of enabling any archaeological trends within the area recognised and to allow any assets within the submarine cable corridor to be represented in a broader archaeological context.

3.1.3 All data for heritage assets located within this buffer are stored on the Wessex Archaeology archive network and can be made available on request.

3.2 Archaeological Desk-Based Assessment

3.2.1 The methodology employed during this assessment reflects the requirements of Environmental Impact Assessment as set out in European Council Directive 85/337/EEC as named by Directive 97/11/EC. This follows best practice professional guidance outlined by the Chartered Institute for Archaeologists' (CIfA) *Standard and Guidance for Historic Environment Desk-Based Assessment* (2014).

3.2.2 The marine themes relevant to marine archaeological baseline as assessed in this report are:

- *seabed prehistory;*
- *seabed features, including maritime sites and aviation sites; and*
- *historic seascape character.*

Data Sources

3.2.3 A number of sources of primary and synthesised information were consulted in order to compile this Technical Report. Data generated from marine geophysical and geotechnical surveys were also a main component of the data.

3.2.4 The following data sources were consulted in order to compile the desk-based element of the assessment:

- *the United Kingdom Hydrographic Office (UKHO) data for charted wrecks and obstructions (obtained 07.04.16);*
- *the National Record of the Historic Environment (NRHE) maintained by Historic England, comprising data for terrestrial and marine archaeological sites, find spots and archaeological events (obtained 06.04.16);*
- *the National Heritage List for England maintained by Historic England, comprising data of designated heritage assets including sites protected under the Protection of Military Remains Act 1986 and the Protection of Wrecks Act 1973;*

- *the Lincolnshire Historic Environment Record (LHER), comprising data for terrestrial and marine archaeological sites, find spots and archaeological events (obtained 12.04.16);*
- *historical maps and Ordnance Survey maps;*
- *Admiralty Charts; and*
- *relevant primary and secondary documentary sources and grey literature held by Wessex Archaeology, and those available through the Archaeology Data Service and other websites. Both published and unpublished archaeological reports relating to excavations and observations in the area around the submarine cable corridor were reviewed.*

3.2.5 A bibliography of documentary sources consulted is presented in the References section of this report (section 9).

Data Handling

3.2.6 This report is based on a Geographic Information System (GIS) using ArcGIS 10.2, incorporating the positional information of the various data sources listed in above, allowing the data to be spatially analysed. The data were subsequently compiled into gazetteers of the prehistoric, maritime and aviation resources within the submarine cable corridor, and were used to inform the assessment of geophysical data.

3.2.7 For the purposes of this Technical Report, the gazetteers are compiled and illustrated in Universal Transverse Mercator (UTM) zone 31 north projected from an ETRS89 datum.

3.2.8 Information relating to the archaeological and cultural heritage that did not include location or positional information were used to inform the marine archaeological baseline assessment where relevant.

Chronology

3.2.9 Archaeological material is generally studied within a framework of 'periods' or 'ages' that reflect the activities and cultural changes taking place over time. All dates are referred to as BC (before Christ), BP (before present) or AD (*anno domini*) within the text. BC refers to calibrated radiocarbon chronology that can be considered equivalent to calendar years. BP dates are used for periods of time older than *c*. 10,000 years ago.

3.2.10 A list of the main archaeological periods in Britain referred to in the text, along with their broadly defined dates are presented in **Appendix II**.

Seabed Prehistory

3.2.1 The baseline summary for Seabed Prehistory was based on a review of geological mapping of seabed sediments, solid geology and bathymetry from published BGS sources. This has been enhanced by the geoarchaeological review of geotechnical and geophysical datasets and core samples gathered for the project to produce a stratigraphic framework for understanding the archaeological potential of the Quaternary geology within the area investigated. This assessment was further supported by the examination of models of past sea level, palaeoshorelines and submerged prehistoric landscapes. This palaeogeographic review, alongside the known archaeological record, formed the basis upon which the potential for submerged prehistory could be developed and discussed in support of the subsequent ES.

3.2.2 The data obtained were compiled to form a gazetteer as part of the seabed prehistory baseline. These records were each given a unique identifier beginning with 7500 and continuing sequentially (**Appendix IX**).

Maritime and Aviation Archaeology

3.2.3 The baseline summary for maritime and aviation archaeology was assessed by means of summarising the records of wrecks, casualties and seabed features obtained from the UKHO, NRHE and LHER. Sites with known locations were added to the project GIS.

3.2.4 The spatial analysis of the records through the GIS identified positional discrepancies between datasets. This could be due to a coordinate conversion error. For the purposes of this assessment, records with duplicate positions between datasets were amalgamated and their coordinates are taken from the UKHO dataset as the raw data therein is based on hydrographic survey data expressed in the WGS84 datum. These coordinates were converted from WGS84 into UTMz31N eastings and northings based on the ETRS89 datum using the Quest Geodetic Calculator version 2.9.5. The NRHE and LHER datasets are primary terrestrial datasets expressed in British National Grid, and are considered to be less accurate offshore.

3.2.5 The data provided by the above sources were reviewed and those within the submarine cable corridor located within the UK EEZ were extracted and compiled to form a gazetteer as part of the known maritime and aviation baseline (**Appendix X**). These records were each given a numerical sequence beginning with **7000**. In addition to those sites within the area assessed, one additional known site (**7003**) whose recorded location was beyond the limit of the submarine cable corridor was also included in the baseline assessment due to the wreck extent extending into the submarine cable corridor. Records for wrecks beyond the submarine cable corridor but present within the search area are held by Wessex Archaeology and can be provided on request.

3.2.6 The research for maritime and aviation history was then combined with the archaeological assessment of geophysical survey data.

3.2.7 Data relating to Recorded Losses were also extracted from the above sources. Recorded Losses are records for ships or aircraft that are known to have wrecked or crashed offshore, but for which the exact locations are not known. For example, a Recorded Loss within this dataset may be based on the loss of a vessel ‘near the Inner Dowsing Light Vessel’ or ’30 miles south-east of Spurn Head’. The positional data of these records is unreliable and serve only to provide an indication on the types of vessels which passed through the area and the wrecking incidents that are known to have occurred in the general area. Whilst the remains of these vessels are expected to exist somewhere on the seafloor, their location is unknown. As such, they signify the potential marine and aviation resource.

3.2.8 Recorded Losses are held by the NRHE and are therefore confined to an area 12 nm from the coast. In some cases, records held by the LHER are also more appropriately considered to represent Recorded Losses. For example, the remains of a sailing vessel on the foreshore at Sutton on Sea is recorded by the LHER (ML197884), based on oral evidence. This record is therefore also considered to represent a Recorded Loss.

3.2.9 Details regarding Recorded Losses are presented in a gazetteer format in **Appendices XII** and **XIII**. These records have retained their original identification assigned by the NRHE or LHER for ease of cross-referencing. The gazetteer does not include positional data due to the inaccuracies therein. All Recorded Losses listed by the NRHE and LHER within the wider search area are included within the gazetteer.

3.2.10 The baseline assessment of maritime and aviation archaeology was further supplemented by a review of relevant primary and secondary source material in order to provide an indication on the nature of maritime and aviation activity across the region. As well as summarising the known archaeological resource, the baseline assessment underlines the potential for encountering unknown shipwreck and aircraft crash sites within the submarine cable corridor (English Heritage (now Historic England) 2002; Wessex Archaeology 2008b).

Assumptions and Limitations

3.2.11 Data used to compile this report consists of primary geophysical and geotechnical survey data and secondary information derived from a variety of sources, only some of which have been directly examined for the purposes of this assessment. The assumption is made that the secondary data, as well as that derived from other secondary sources, is reasonably accurate.

3.2.12 The records held by the UKHO, NRHE, LHER and the other sources used in this assessment are not a record of all surviving cultural heritage assets, rather a record of the discovery of a wide range of archaeological and historical components of the marine historic environment. The information held within these is not complete and does not preclude the subsequent discovery of further elements of the historic environment that are, at present, unknown. In particular, this relates to buried archaeological features.

3.3 Geophysical Assessment Methodology

3.3.1 An archaeological assessment was undertaken of geophysical survey data acquired within the submarine cable corridor between the MHW mark and the extent of the UK EEZ.

Data Sources

3.3.2 A number of data sources were consulted during the archaeological assessment of the proposed route including:

- *geophysical survey datasets acquired by Fugro GeoConsulting;*
- *preliminary geotechnical logs from vibrocores and seabed cone penetration tests acquired by Fugro GeoConsulting;*
- *known radiocarbon dates from selected vibrocores of high potential;*
- *records of shipwrecks and navigational hazards, based on the UKHO's wreck and obstructions database taken from historic and modern charts;*
- *written sources, including academic papers, previous Wessex Archaeology reports and other offshore wind farm environmental statements that are in the public domain (e.g. Cameron* et al. *1992, Fitch* et al. *2005, Gaffney* et al. *2007); and*
- *modern Admiralty Charts and geological charts relevant to the proposed submarine cable corridor.*

3.3.3 The geophysical data comprised sidescan sonar, magnetometer, sub-bottom profiler (pinger) and multibeam bathymetry datasets. The data were acquired by Fugro GeoConsulting during 2016. It should be noted that there are two areas that do not have full data coverage (**Figure 9 a - h**). The first of these is an area approximately half way along the submarine cable corridor where the cable route was re-routed. It was not possible to acquire geophysical data in this area using towed equipment owing to the presence of fishing gear (B. Rainbow (Fugro GeoConsulting), pers. comm.). Magnetometer and sidescan sonar data were not acquired in this area but multibeam

bathymetry and sub-bottom profiler data were collected. In place of the sidescan sonar data backscatter data using the multibeam echosounder were acquired. The second area lies approximately 20 km from the landward end of the cable corridor. This area was widened and in the extension area to the west only sub-bottom profiler, multibeam bathymetry and backscatter data were again acquired.

Technical Specifications

3.3.4 Geophysical data comprising sidescan sonar, magnetometer, sub-bottom profiler and multibeam bathymetry and a small amount of backscatter data were acquired by Fugro GeoConsulting. The survey area was in general a corridor measuring 450 m in width, centred on the proposed cable route. The main exception to this width is the section at approximately 20 km from the landward end, which was widened to a width of 900 m for a distance of approximately 12 km.

3.3.5 The offshore and near inshore data were acquired by the vessel *Discovery* and the inshore data by the *Valkyrie*. Some additional small sections of data were acquired by the *Pioneer*.

3.3.6 The survey equipment used for the assessment are summarised in **Table 1** below.

Table 1: Summary of survey equipment

Vessel	Multibeam echosounder	Sidescan sonar	Sub-bottom profiler	Magnetometer	USBL positioning system
RV *Discovery*	Dual-head Kongsberg EM2040	Edgetech 4200	Pole Mounted Pinger 2 x 2 Array	Geometrics G-882 Magnetometer	Nexus Easytrak
Pioneer	Dual-head Kongsberg EM2040	Edgetech 4200	Hull Mounted Pinger 4 x 4 Array	Geometrics G-882 Magnetometer	Konsberg HiPap 501
Valkyrie	Dual-head Teledyne RESON 7125	Klein 3000	Pole Mounted Pinger 2 x 1 Array	Geometrics G-882 Magnetometer	Nexus Easytrak

3.3.7 All sidescan sonar data were provided to Wessex Archaeology as .xtf files, the magnetometer data were provided as .csv files and the multibeam bathymetry data were provided as 1 m gridded .xyz files referenced to lowest astronomical tide (LAT). The sub-bottom profiler data were provided to Wessex Archaeology as processed .seg files. Trackplots for the sidescan sonar data were provided as .shp files.

3.3.8 For the offshore sections of the survey six to eight lines of data were acquired along the length of the corridor, with an average line spacing of approximately 65 m. However, the line spacing is irregular and spacings of 20 m to 110 m have been used in places. For the near inshore areas, the line spacings were reduced to 10 m to 50 m. For the inshore areas the lines were run perpendicular to the length of the corridor, with a spacing of approximately 20 m.

3.3.9 The magnetometer data and sub-bottom profiler data were acquired along the same lines as the sidescan sonar data. The multibeam bathymetry data cover the full width of the corridor. Where backscatter data were acquired they cover the entirety of the two areas over which they were collected.

Geophysical Data Quality

3.3.10 Each geophysical dataset was assessed for quality and rated using the criteria listed in **Table 2** below.

Table 2: Criteria for assigning data quality rating

Data Quality	Description
Good	Data which are clear and unaffected by weather conditions or sea state. The dataset is suitable for the interpretation of standing and partially buried metal wrecks and their character and associated debris field. These data also provide the highest chance of identifying wooden wrecks and debris.
Average	Data which are affected by weather conditions and sea state to a slight or moderate degree. The dataset is suitable for the identification and partial interpretation of standing and partially buried metal wrecks, and the larger elements of their debris fields. Wooden wrecks may be visible in the data, but their identification as such is likely to be difficult.
Variable	This category contains datasets with the quality of individual lines ranging from good to average to below average. The dataset is suitable for the identification of standing and some partially buried metal wrecks. Detailed interpretation of the wrecks and debris field is likely to be problematic. Wooden wrecks are unlikely to be identified.

3.3.11 The sidescan sonar data were rated as 'Variable'. The data were acquired with 100 m range for the majority of the submarine cable corridor with 75 m used for the near inshore sections and 30 m range for the inshore sections. The 100 m data were only suitable for detecting larger objects and the data often did not extend to the full extent of the range. Many lines of data throughout the assessment area also had some electrical noise, generally minor. Many lines were slightly affected by weather, resulting in some stretching or other distortion of the data.

3.3.12 The multibeam bathymetry data were rated as 'Average'. They were provided gridded at a cell size of 1 m and so were suitable for the interpretation of larger seabed objects and debris.

3.3.13 The magnetometer data have been rated as 'Variable' from an archaeological perspective. A number of the files have been affected by noise such as weather and sea swell and geological background variation is visible throughout the assessed area. Spiking was also seen throughout the data files and edited out.

3.3.14 The quality of the backscatter dataset was rated as 'Average' for the area approximately half way along the submarine cable corridor. It was suitable for the detection of wrecks and large objects only, owing to the low resolution of the geotiffs at 0.1 m. The quality of the backscatter for the area near the landward end of the cable corridor was rated as 'below Average'. The very low resolution of the geotiff at 0.25 m made it only suitable for identifying large, mostly intact and upstanding wrecks.

3.3.15 The sub-bottom profiler data collected has been rated as 'Variable' using the above criteria, with shallow reflectors being clearly visible on a majority of lines. However, some data are affected by weather noise and slight noise interference. It appears that different settings may have been used on different sections of the route, making certain features more clearly visible on some lines compared to others, which in turn made following and mapping some features challenging.

3.3.16 The data collected during the nearshore survey have been rated as 'Variable', as shallow water depths along this section of the route has created multiples which obscure the data.

Geophysical Data - Processing

3.3.17 The *.xtf* sidescan sonar files were processed by Wessex Archaeology using Coda Geosurvey software. This allowed the data to be replayed with various gain settings in order to optimise the quality of the images. The data were initially scanned to give an understanding of the geological nature of the site and were then interpreted for any objects of possible anthropogenic origin. This involves creating a database of anomalies within Coda by tagging individual features of possible archaeological potential, recording their positions and dimensions and acquiring an image of each anomaly for future reference.

3.3.18 A mosaic of the sidescan sonar data is produced during this process to assess the quality of the sonar towfish positioning. The survey lines are smoothed and the navigation corrected. This process allows the positioning of anomalies to be checked between different survey lines and for the layback values to be further refined if necessary.

3.3.19 The form, size and/or extent of an anomaly is a guide to its potential to be an anthropogenic feature and therefore of archaeological interest. A single small but prominent anomaly may be part of a much more extensive feature that is largely buried. Similarly, a scatter of minor anomalies may define the edge of a buried but intact feature, or it may be all that remains as a result of past impacts from, for example, dredging or fishing.

3.3.20 The magnetometer data files were processed in Geometrics MagPick software. The assessment was carried out in order to identify any discrete magnetic contacts that could represent buried debris or structures such as wrecks.

3.3.21 The software enables both the visualisation of individual lines of data and the gridding of data to produce a magnetic anomaly map. The data were smoothed to try to eliminate any observed noise, a trend was then fitted to the resulting data and the trend values subtracted from the smoothed values. This was carried out in an attempt to remove natural variations in the data (such as diurnal variations in magnetic field strength and changes in geology). The processed data were then gridded to produce a map of magnetic anomalies. Individual anomalies were tagged and images taken in a similar process to that undertaken for the sidescan sonar data.

3.3.22 The multibeam bathymetry data were analysed to identify any unusual seabed structures that could be shipwrecks or other anthropogenic debris. The data were gridded at the appropriate resolution and analysed using Fledermaus software, which enables a 3-D visualisation of the acquired data and geo-picking of seabed anomalies.

3.3.23 The multibeam backscatter data, in the form of processed data geotiffs, were viewed in ArcGIS. Any anomalous features were noted and length and width measurements were made. It is not possible to measure the height of features in geotiffs.

3.3.24 The sub-bottom profiler data were studied in order to detect any in-filled palaeochannels, ravinement surfaces and peat/fine-grained sediment horizons that may have archaeological potential. An initial interpretation comprising the cable route centre line plus two wing lines was initially undertaken, with additional lines interpreted around any identified features of possible archaeological potential.

3.3.25 The sub-bottom profiler .segy data were converted to .COD format, before being processed by Wessex Archaeology using Coda Seismic+ software. This software allows the data to be visualised with user selected filters and gain settings in order to optimise the appearance of the data for interpretation. The software then allows an interpretation to be applied to the data by identifying and selecting a sedimentary boundary that might be of archaeological interest.

3.3.26 The data were interpreted with a two-way travel time (TWTT) along the z-axis. In order to convert from TWTT to depth, the velocity of the seismic waves was estimated to be 1,600ms-1. This is a standard estimate for shallow, unconsolidated sediments.

3.3.27 Any small reflectors which appear to be buried material such as a wreck site covered by sediment were also recorded, the position and dimensions of any such objects noted in a gazetteer, and an image of each anomaly acquired. It should be noted that anomalies of this type are rare, as the sensors must pass directly over such an object in order to produce an anomaly.

Geophysical Data - Anomaly Grouping and Discrimination

3.3.28 The previous section describes the initial interpretation of all available geophysical datasets which were conducted independently of one another. This inevitably leads to the possibility of any one object being the cause of numerous anomalies in different datasets and apparently overstating the number of archaeological features in the submarine cable corridor.

3.3.29 To address this fact, the anomalies were grouped together along with any UKHO records of wrecks and obstructions that fall within the assessed area. This allows one ID number to be assigned to a single object for which there may be, for example, a UKHO record, a magnetic anomaly and multiple sidescan sonar anomalies.

3.3.30 Once all geophysical anomalies and desk-based information have been grouped, a discrimination flag is added to the record in order to discriminate against those which are not thought to be of an archaeological concern. These flags are as follows:

Table 3: Criteria discriminating relevance of seabed features

Non-archaeological	U1	Not of anthropogenic origin
	U2	Known non-archaeological feature
	U3	Non-archaeological hazard
Archaeological	A1	Anthropogenic origin of archaeological interest
	A2	Uncertain origin of possible archaeological interest
	A3	Historic record of possible archaeological interest with no corresponding geophysical anomaly

3.3.31 Similarly, the discrimination flags applied to shallow geological features of possible archaeological potential are ascribed in **Table 4**.

Table 4: Criteria for discriminating relevance of palaeogeographic features

Non-Archaeological	U2	Feature of non-archaeological interest
Archaeological	P1	Feature of probable archaeological interest, either because of its palaeogeography or likelihood for producing palaeoenvironmental material
	P2	Feature of possible archaeological interest

3.3.32 The grouping and discrimination of information at this stage is based on all available information and is not definitive. It allows for all features of potential archaeological interest to be highlighted, while retaining all the information produced during the course of the geophysical interpretation and desk-based assessment for further evaluation should more information become available.

Coordinate System

3.3.33 The datasets were provided in ETRS89 UTM31N projected coordinates. All outputs to the client will be in ETRS89 UTM31N as required by them.

3.4 Geotechnical Assessment Methodology

Geoarchaeological Framework

3.4.1 Alongside the archaeological assessment of the sub-bottom profiler data, a geoarchaeological assessment of provided geotechnical logs was also undertaken along the submarine cable corridor. To help frame geoarchaeological investigations of this nature, Wessex Archaeology has developed a five stage approach, encompassing different levels of investigation appropriate to the results obtained, accompanied by formal reporting of the results at the level achieved.

3.4.2 The stages are summarised in Table 5. The geoarchaeological assessment within this report comprises Stages 1 and 2 within the framework as described in Table 5, and serves to support the archaeological assessment of the sub-bottom profiler data.

3.4.3 In addition, where areas of higher potential were identified investigatory Stage 3 and Stage 4 works were undertaken on selected samples to enhance the baseline geoarchaeological assessment and identify potential of the UK EEZ datasets in support of the EIA and to enhance the assessment of transboundary geoarchaeological potential across the other assessed jurisdictions (i.e Dutch and Danish sectors).

Table 5: Stages of geoarchaeological assessment

Stage	Method	Description
1	Assessment	A desk-based archaeological assessment of the trial pit, borehole and CPT logs generated by geotechnical contractors aims to establish the likely presence of horizons of archaeological interest and broadly characterise them, as a basis for deciding whether and what Stage 2 archaeological recording is required. The Stage 1 report will state the scale of Stage 2 work proposed.
2	Geoarchaeological recording	Archaeological recording of selected retained or new core samples will be undertaken. This will entail the splitting of the cores, with half of each core being cleaned and recorded. The Stage 2 report will state the results of the archaeological recording and will indicate whether any Stage 3 work is warranted.
3	Sampling and assessment	Dependent upon the results of Stage 2, sub-sampling and palaeoenvironmental assessment (pollen, diatoms and foraminifera) may be required. Subsamples will be taken from one core-half, with the other core-half retained intact for further sub-sampling, should it be required. Assessment will comprise laboratory analysis of the samples to a level sufficient to enable the value of the palaeoenvironmental material surviving within the cores to be identified. Subsamples will also be taken and retained at this stage in case radiocarbon dating is required during Stage 4. The Stage 3 report will set out the results of each laboratory assessment together with an outline of the archaeological implications of the combined results, and will indicate whether any Stage 4 work is warranted.
4	Analysis and dating	Full analysis of pollen, diatoms and/or foraminifera assessed during Stage 3 will be undertaken. Typically, Stage 4 will be supported by radiocarbon dating of suitable subsamples. Stage 4 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.
5	Final report	If required Stage 5 will comprise the production of a final report of the results of the previous phases of work for publication in an appropriate journal. This report will be compiled after the final phase of archaeological work, whichever phase that is.

Stage 1 Assessment Methodology

3.4.4 Along the entire proposed cable corridor, a total of 420 targets were selected for vibrocore (VC) sampling and seabed cone penetration (CPTs) tests (**Figure 2**). During the selection phase Wessex Archaeology provided feedback on the locations of these cores. The cores and CPTs were acquired by Fugro on board the MV *Markab*, the *Voe Earl* and the *JIF Challenger* between April and July 2016. Within the UK landfall at the Lincolnshire coast and the UK EEZ a total of 149 locations were selected for sampling. Two of these (B13-03-ARCH and B-13-04-ARCH) were selected specifically for their geoarchaeological potential, based on preliminary assessment of the geophysical data down the centre line of the corridor.

3.4.5 Furthermore, additional geotechnical investigation of the landfall beach provided further logs bringing the overall total to 151 locations below MHWS and the UK EEZ (**Figure 2**).

3.4.6 The geotechnical logs were subject to a desk-based assessment by Wessex Archaeology in order to identify any samples that may contain deposits of archaeological and palaeoenvironmental potential. Of greatest interest are sediments from former terrestrial depositional environments, as well as certain features or inclusions of possible archaeological and palaeoenvironmental interest, specifically:

- *peat layers;*
- *deposits containing other organic material such as wood fragments, roots, dark organic staining etc.;*
- *clay or silt deposits, especially those containing laminated features such as lacustrine varves or tidal rhythmites;*
- *inorganic fossils (such as molluscs);*
- *concentrations of charcoal; and*
- *individual artefacts such as pieces of flint or pottery (although finding these within core samples is unusual); and any other feature thought to indicate a terrestrial depositional environment.*

3.4.7 In addition to this individual assessment, the geotechnical logs were also assessed alongside the sub-bottom profiler data to aid in determining the shallow geological sequence along the marine cable corridor and identify any palaeolandscape features of archaeological potential.

Stage 2 Geoarchaeological Recording

3.4.8 Based on the initial geophysical interpretation of the sub-bottom profile, a number of channel, bank and infilled depression features, considered likely to have a high potential for the preservation of archaeological remains and/or palaeoenvironmental deposits, were identified.

3.4.9 Located within or close to these features, based on professional judgement and best practice, eight ‘high priority’ and forty-two ‘medium priority’ vibrocores were identified to target these high potential areas (**Appendix III**).

3.4.10 All eight of the priority vibrocore cores and six of the medium priority cores were retrieved from the geotechnical laboratory in Wallingford and taken back to the Wessex Archaeology laboratory in Salisbury for further investigation (**Figure 2** and **Appendix IV**).

3.4.11 Due to the nature of the geotechnical testing process, many of the cores were only partially present or in bag samples removed from their *in situ* context. Fortunately, duplicate vibrocores taken during the drilling process provided extra material; so where possible these undisturbed duplicate vibrocores were collected and stored.

3.4.12 Due to their location within potential palaeochannels of high interest, vibrocores B13-03-ARCH and B13-04-ARCH were acquired specifically for geoarchaeological assessment and therefore were not scheduled for geotechnical testing. Listed as ‘high priority’ vibrocores, both were retrieved and stored.

3.4.13 Two Optically Stimulated Luminescence (OSL) samples were taken from vibrocores B13-06-VC (a possible palaeochannel) and B14-02-VC (sediments in base of Silver Pit) prior to geotechnical testing (**Appendix IV**).

3.4.14 Ensuring a central portion of the core was kept intact whilst the remainder of the core was split for testing, opaque plastic caps were placed on both ends of the sample to prevent light exposure.

3.4.15 Working alongside the engineers at the geotechnical laboratory, it was also possible to describe some of the undisturbed vibrocores prior to testing. The remainder of the cores were assessed in Salisbury.

3.4.16 Once opened, a suitably experienced geoarchaeologist interpreted the lithology of the sediments following Hodgson (1997), to include information such as:

- *depth;*
- *texture;*
- *composition;*
- *colour;*
- *inclusions;*
- *structure (bedding, ped characteristics, etc); and*
- *contacts between deposits.*

3.4.17 In order to create the detailed core logs for the route, the lithological sediment descriptions were entered into a digital database (RockWorks17) to form part of a 151 vibrocore dataset.

3.4.18 Based on geoarchaeological interpretation of the lithological data, a set of stratigraphical units were created to group key sets of deposits along the route. Interpretations were made regarding the probable depositional environments and formation processes of the sampled deposits.

3.4.19 The results of the Stage 2 assessment were integrated into the palaeogeographic assessment of the sub-bottom profiler data.

3.4.20 Examining both the lithological and stratigraphical data, detailed core logs were created to identify significant deposits with a high potential for the preservation of archaeological and/or palaeoenvironmental remains; the main aim being to pinpoint cores with high sub-sampling potential for Stage 3 and 4 assessments.

3.4.21 Based on geoarchaeological interpretation of the lithological and stratigraphical data entered into RockWorks17, detailed core logs of the five high interest cores were produced (**Figure 2**).

Stage 3 Sampling and Assessment

3.4.22 Focussing on the high interest vibrocores, sub-samples were taken from a range of deposits considered to have a high potential for the preservation of archaeological and/or palaeoenvironmental remains (**Appendix V**). This was followed by assessment and radiocarbon dating, where appropriate. The locations of the sub-sampled vibrocores (from Blocks 11 – 15) are shown on **Figure 2** and are discussed further within the palaeogeographic assessment (sections 4.3 and 4.4).

3.4.23 Nine sub-samples from Blocks 1-10 were also sent to Wessex Archaeology for assessment and submission for radiocarbon dating (shown in **Appendix V**) in support of

the assessment in Danish waters, and a further three samples were submitted in support of the Dutch sector assessment (Blocks 08 - 09). The assessment and radiocarbon results for the samples from the Danish and Dutch sectors are shown in **Appendix V-VII** but are not discussed within this report.

3.4.24 From the five high interest vibrocores (detailed on **Figure 2** and **Appendix V**), a total of fifteen sub-samples of various volume were taken (**Appendix V**).

3.4.25 These samples comprised; one wood sample, eight macros samples and six marine mollusc samples. **Figure 2**, shows the locations of the sub-sampled vibrocores.

3.4.26 Of the fifteen sub-samples, eight were taken to assessment to determine the preservation and nature of the plant, wood and mollusc remains (**Appendix VI**); five of which were found to contain material suitable for radiocarbon dating (**Appendix VII**).

3.4.27 The sub-samples were processed using standard flotation techniques; the flot retained on a 0.25mm mesh for the recovery of charred plant remains, molluscs and charcoal.

3.4.28 The flots were then scanned using a stereo incident light microscopy at magnifications of up to x40 using a Leica MS5 microscope to determine the preservation and nature of the charred plant, mollusc and wood charcoal remains (**Appendix VI**).

3.4.29 Preliminary identifications of dominant or important taxa were noted, following the nomenclature of Stace (1997) for wild plants, and traditional nomenclature, as provided by (Zohary and Hopf 2000) for cereals.

3.4.30 The abundance of remains was qualitatively quantified (A*** = exceptional, A** = 100+, A* = 30-99, A = >10, B = 9-5, C = <5) as an estimation of the minimum number of individuals and not the number of remains per taxa.

3.4.31 Material suitable for radiocarbon dating was also selected at this stage (**Appendix VI**).

Stage 4 Analysis and Dating

3.4.32 Five samples from Blocks 11-15, nine samples from Blocks 1 – 10 were taken for AMS radiocarbon dating and sent to the ^{14}CHRONO Centre at Queens University Belfast (**Appendix VII**).

3.4.33 From Blocks 11-15, four of the samples comprised waterlogged wood (UBA-32701 to UBA-32704) and one was a marine bivalve *Cerastoderma edule* (UBA-32705). The calibrated results are shown in **Appendix VIII** and discussed within the results section of this report.

3.4.34 From Blocks 1-10 (Danish Sector), three of the samples were comprised of waterlogged wood and six were marine bivalves.

3.4.35 From Blocks 8-9 (Dutch Sector), two samples comprised of waterlogged wood and one comprised of a *Corylus avellana* shell fragment.

3.5 Determining Value and Sensitivity

3.5.1 This Technical Report will ultimately inform an environmental impact assessment (EIA) for the offshore element of the proposed Viking Link that will be presented within the Environmental Statement. In order to assess the potential impacts of a development upon the marine environment, EIAs typically adopt the conceptual approach known as the

'source-pathway-receptor' model. This approach is based on the identification of the source (i.e. the origin of a potential impact), the pathway (i.e. the means by which the effect of the activity could impact a receptor) and the receptor that may be impacted (e.g. known/potential heritage assets). In order for the significance of any given impact to be fully understood, the sensitivity of any receptors that may be impacted need to be considered. This section outlines the means by which the sensitivity of marine heritage assets is ascertained.

3.5.2 The capability of a receptor to accommodate change and its ability to recover if affected is a function of its sensitivity. Receptor sensitivity is typically assessed via the following factors:

- *Adaptability – the degree to which a receptor can avoid or adapt to an effect;*
- *Tolerance – the ability of a receptor to accommodate temporary or permanent change without significant adverse impact;*
- *Recoverability – the temporal scale over and extent to which a receptor will recover following an effect; and*
- *Value – a measure of the receptor's importance, rarity and worth.*

3.5.3 Since archaeological receptors cannot adapt, tolerate or recover from physical impacts caused by a proposed development then for the purpose of this assessment, the sensitivity of each asset will be quantified only by its value. The *UK Marine Policy Statement* (Department for Environment, Food and Rural Affairs 2011: 90) describes a heritage asset as holding a degree of significance. Significance is the value of a heritage asset to this and future generations because of its heritage interest, which may be archaeological, architectural, artistic or historic.

3.5.4 The value of known archaeological and cultural heritage assets were assessed on a five-point scale using professional judgement informed by the criteria provided in **Table 6**.

Table 6: Criteria to assess the archaeological value of offshore assets

Value	Definition
Very High	· Best known or only example and/or significant potential to contribute to knowledge and understanding and/or outreach. Receptors with a demonstrable international dimension to their importance are likely to fall within this category. · Wrecked ships and aircraft that are protected under the Protection of Wrecks Act 1973, Ancient Monuments and Archaeological Areas Act 1979 or Protection of Military Remains Act 1986 with an international dimension to their importance, plus as-yet undesignated sites that are demonstrably of equivalent archaeological value. · Known submerged prehistoric sites and landscapes with the confirmed presence of largely *in situ* artefactual material.
High	· Above average example and/or high potential to contribute to knowledge and understanding and/or outreach. Receptors with a demonstrable national dimension to their importance are likely to fall within this category. · All other wrecked ships and aircraft with statutory protection under the Protection of Wrecks Act 1973, Ancient Monuments and Archaeological Areas Act 1979 or Protection of Military Remains Act 1986, plus as-yet undesignated sites that are demonstrably of equivalent archaeological value. · Palaeogeographic features with demonstrable potential to include artefactual and/or palaeoenvironmental material, possibly as part of a prehistoric site or landscape.

Value	Definition
Medium	· Average example and/or moderate potential to contribute to knowledge and understanding and/or outreach. · Includes wrecks of ships and aircraft that do not have statutory protection or equivalent significance, but have moderate potential based on a formal assessment of their importance in terms of build, use, loss, survival and investigation. · Prehistoric deposits with moderate potential to contribute to an understanding of the palaeoenvironment.
Low	· Below average example and/or low potential to contribute to knowledge and understanding and/or outreach. · Includes wrecks of ships and aircraft that do not have statutory protection or equivalent significance, but have low potential based on a formal assessment of their importance in terms of build, use, loss, survival and investigation. · Prehistoric deposits with low potential to contribute to an understanding of the palaeoenvironment.
Negligible	· Poor example and/or little or no potential to contribute to knowledge and understanding and/or outreach. Assets with little or no surviving archaeological interest.

3.5.5 Value in terms of wreck sites, which are often the most commonly encountered marine archaeological receptor for offshore developments, can be further refined by the following criteria. In relation to Historic England's *Designation Selection Guide for Ships and Boats* (2012), the criteria used to assess an asset in terms of its value are:

- *period;*
- *rarity;*
- *documentation;*
- *group value;*
- *survival/condition; and*
- *potential.*

3.5.6 These aspects help to characterise each asset whilst also comparing them to other similar assets. The criteria also enable the potential to contribute to knowledge, understanding and outreach to be assessed.

3.5.7 *On the Importance of Shipwrecks* (Wessex Archaeology 2006) suggests another avenue of enquiry, based on the notion that the importance of a wreck site can be assessed through the 'BULSI' system (Build, Use, Loss, Survival and Investigation). To further supplement this approach, the ALSF-funded *Marine Class Description and principles of selection for aggregate producing areas project (ALSF 5383)*, undertaken by Wessex Archaeology (2008a), proposed a composite timeline that considers wrecks in five distinct date ranges. The timeline takes into account the broad chronology of shipbuilding, thus drawing out generalisations regarding the age and special value of sites. The timeline is summarised as follows:

- ***Pre-1508 AD****: this covers the period from the earliest Prehistoric evidence for human maritime activity to the end of the medieval period,* c. *1508. Little is known of watercraft or vessels from this period and archaeological evidence of them is so rare that all examples of craft are likely to be of special value;*
- ***1509-1815****: this encompasses the Tudor and Stuart periods, the English Civil War, the Anglo-Dutch Wars and later the American Independence and French*

Revolutionary Wars. Wrecks and vessel remains from this date are also quite rare, and can be expected to be of special value;

- ***1816-1913**: this period witnessed great changes in the way in which vessels were built and used, corresponding with the introduction of metal to shipbuilding, and steam to propulsion technology. Examples of watercraft from this period are more numerous and as such, it is those that specifically contribute to an understanding of these changes that should be regarded as having special value;*
- ***1914-1945**: this period encompasses the World War I (WWI), the Interwar years and the World War II (WWII). This date range contains Britain's highest volume of recorded boat and ships losses. Those which might be regarded as having special interest are likely to relate to technological changes and to local and global activities during this period; and*
- ***Post 1945**: the final period extends from 1946 through the post-war years to the present day. Vessels from this date range would have to present a strong case if they are to be considered of special interest.*

3.5.8 According to this composite timeline, vessels that pre-date 1816 are likely to be considered of special value on the basis of their rarity and subsequent national and international value in our understanding of maritime activity and shipping movements during these periods.

3.5.9 Wrecks dating from 1816 to the present day are more plentiful amongst known wrecks. The *Marine Class Description and Principles of Selection* project (ALSF 5383) further revealed that a total of 96% of known and dated wrecks were lost in the period between 1860 and 1950. Due to their predominance in the known marine archaeological record, the special value of wrecks of this period thus depends upon their ability to exhibit both integral and relative factors based on attributes relating to the Wessex Archaeology 'BULSI' system of wreck assessment. The ALSF-funded project *Assessing Boats and Ships 1860-1950* (Wessex Archaeology 2011c-f) explored this further by providing a national stock-take of known wrecks in territorial waters off England and review it in the light of the framework for assessing special interest prepared in the *Marine Class Description and Principles of Selection* project (ALSF 5383) and historical thematic studies. Through undertaking a national stock-take of wrecks dating to this period within English territorial waters, this project provides supplementary guidance on the key themes and interests represented by such wrecks, in order to inform decisions regarding importance and mitigation.

3.5.10 For a wreck dating from the mid-19th century to be of special interest, it is likely to have to make a distinctive contribution in respect of one or more of the following:

- *illustrate a key narrative of the period;*
- *represent a distinct and tangible link to significant persons or events;*
- *be representative of significant loss of life or related responses in seafaring safety;*
- *have made a distinct cultural contribution; and*
- *have current relevance or parallels.*

3.5.11 In addition, in order to have special interest a wreck must be considered to have relative merit in comparison to other wrecks or surviving vessels of the period. The factors used to express relative merit are likely to include the following:

- *rarity;*
- *representation;*
- *diversity;*
- *survival; and*
- *setting and context.*

3.5.12 The perceived value of each marine archaeological asset is generally assessed and assigned on a site-by-site basis, depending on the criteria listed in **Table 6** and in accordance with the additional wreck-assessment methods outlined above, where relevant.

3.5.13 Furthermore, the nature of the archaeological resource is such that there is a high level of uncertainty concerning the distribution of potential, unknown archaeological remains on the seabed. It is often the case that data concerning the nature and extent of sites is out of date, extremely limited or entirely lacking. As a precautionary measure, unknown potential cultural heritage receptors are therefore considered to be of high sensitivity and high value.

3.6 Assessment of Historic Seascape Character

3.6.1 In accordance with the European Landscape Convention, 'landscape' can be defined as *'an area, as perceived by people, whose character is the result of the action and interaction of natural and/or human factors'* (Council of Europe 2000: Article 1). The term 'seascape' can be defined as a subset of 'landscape', and has *'an area of sea, coastline and land, as perceived by people, whose character results from the actions and interactions of land and sea, by natural and/or human factors'* (*ibid*.).

3.6.2 Seascape assessment reflects the holistic approach to landscape of the European Landscape Convention, extending it to the sea. Seascape Character Areas include coastal land, intertidal and marine environments and cover the offshore environment to the territorial limit (12 nm). Historic Seascape Characterisation (HSC) assessment is the identification and interpretation of the historic dimension of the present day coastal and marine environment (Natural England 2012: 33).

4 ARCHAEOLOGICAL ASSESSMENT: SEABED PREHISTORY

4.1 Designated Sites

4.1.1 There are no designated archaeological sites in the submarine cable corridor within the EEZ.

4.2 Geological Baseline

4.2.1 The proposed Viking Link cable route extents approximately ENE from the Lincolnshire coast, and across the southern North Sea to western Jutland, Denmark. From a geological perspective this places the proposed route within the southern North Sea Basin and, despite the length of the cable route, the geological history of the submarine cable corridor is relatively consistent within the UK sector.

4.2.2 The basement geology of the proposed area generally comprises the Chalk Group, an extensive deposit of chalk present throughout much of the North Sea and southern England, which was laid down in shallow marine conditions during the Upper Cretaceous period.

4.2.3 The boundary between this basement geology and the overlying sediments represents a significant hiatus and regional unconformity. No sediments of Tertiary Age are recorded as being present in the area, and the basement geology is directly overlain by a sequence of Quaternary (Pleistocene and later) deposits (Cameron *et al.* 1992).

4.2.4 The Quaternary history of the North Sea is dominated by repeated glacial/interglacial cycles which are reflected in the shallow geology of the region. Episodes of lodgement and ablation till deposition are punctuated by episodes of erosion by glacial outwash and deposition of shallow marine sediments (Cameron *et al.* 1992, Tappin *et al.* 2011). These sequences are generally separated by marked erosion surfaces created by repeated ice sheet advance, including deep, infilled glacial channels and valleys.

4.2.5 The most recent (Devensian) glaciation is likely to be the origin of three large bathymetric features known to exist in the area (BGS 1991, Cameron *et al.* 1992). These, the Silver Pit, Sole Pit and Well Hole, are NNE-SSW to NNW-SSE trending elongate deeps which possibly originated as sub-glacial tunnel valleys or glacial outwash channels and were later modified by marine action during the Holocene transgression (Cameron et al. 1992), although it is likely that the exact formation process differed for each feature (Tappin *et al.* 2011). The proposed cable route travels just north of the Silver Pit.

4.2.6 A fourth and much larger bathymetric feature, the Outer Silver Pit, is present in the NE of the UK element of the submarine cable corridor, and the proposed route descends into and follows this feature to the edge of the UK sector. Although much larger than the previously described deeps, and of a different orientation (east-west), the Outer Silver Pit is also interpreted to have originated as a glacial outwash channel with later modification by Holocene transgression processes.

4.2.7 After the retreat of the ice sheet following the last glacial maximum (LGM) the survey area is expected to have been a terrestrial landscape, situated in the central and western areas of ‘Doggerland’, an extensive terrestrial plain that covered a large section of the southern North Sea between south and east England and the continent (Coles 1998, Gaffney et al. 2009, Sturt et al. 2013, Bicket and Tizzard 2015). During this period, it is likely that terrestrial sediments, such as fluvial deposits, would have been deposited within the area (Cameron *et al.* 1992). It has been interpreted that the Outer Silver Pit may have been a tidal estuary (with associated smaller tributaries) during the Early Holocene, and a large,

significant geographic feature within the landscape of the area (Gaffney *et al.* 2007, Bicket and Tizzard 2015).

4.2.8 A number of studies have been undertaken surrounding the proposed interconnector route that have provided an insight into the palaeogeography of the region, specifically relating to the terrestrial landscape that would have existed between the LGM and the Holocene transgression.

4.2.9 The *North Sea Palaeolandscapes Project* (NSPP) headed by Professor Vince Gaffney at the University of Birmingham (Fitch *et al.* 2005, Gaffney *et al.* 2007), was undertaken in order to map and assess the potential of submerged landscapes in the southern North Sea using offshore industry seismic data. A significant portion of the proposed route is located within the NSPP study area, and a number of palaeolandscape features were identified within this area.

4.2.10 These features generally comprise fluvial channels cut into the underlying geology, although also include the identification of possible relict, tidally created features within the Outer Silver Pit (Gaffney *et al.* 2007).

4.2.11 More recent studies, undertaken as part of assessments associated with proposed offshore wind farm developments, have identified similar features. A complex of shallow palaeochannels, generally correlating with those identified during the NSPP, has been identified with the proposed Hornsea Round 3 Zone, through which the proposed route passes (Wessex Archaeology 2013a, 2013b). These features, likely to have originally been sub-glacial channels later re-activated as terrestrial river systems after the LGM, appear to flow northwards and drain into the Outer Silver Pit.

4.2.12 Similar results have been obtained to the north, where the NSPP identified a complex channel system potentially draining south into the Outer Silver Pit. Assessments undertaken associated with the Dogger Bank Round 3 Zone included radiocarbon dating of palaeochannel features potentially directly related to this system, which returned a date range of *c.* 10,750-10,580 cal. BP (Wessex Archaeology 2012, 2013c).

4.2.13 Closer to the shore, assessments associated with the proposed Triton Knoll Offshore Wind Farm, which is situated approximately 6km south of the proposed cable route, have also identified complex shallow palaeochannel systems, a number of which are potentially associated with the channel systems identified during the NSPP (Wessex Archaeology 2011a, 2016b).

4.2.14 Gradual and continued sea level rise since the LGM eventually inundated the assessment area. Reconstructed sea level curves indicate that most of the proposed will have been inundated by 7,000 BP, and the current approximate coastline will have been achieved by 5,000 BP (Bradley et al. 2011, Tappin *et al.* 2011, Sturt et al., 2013). However, the potential remains for a preserved palaeolandscape to be present within the submarine cable corridor. The radiocarbon dates acquired during work on the Dogger Bank Round 3 Zone (Wessex Archaeology 2010) place the palaeochannel system identified during the NSPP within the Early Mesolithic period (Early Holocene), during which time the route of the submarine cable corridor would have corresponded to an attractive terrestrial landscape suitable for human habitation.

4.2.15 The erosive power of this most recent marine transgression will have been much less than following previous glaciations, so the potential remains for the preservation of relict post-LGM land surfaces along the proposed route. However, previously assessed data

sources from the area suggest these surviving terrestrial features are likely to be restricted to incised features such as palaeochannels (Tappin *et al.* 2011).

4.2.16 At present, the proposed route is located within a fully marine environment. The modern sediment input is likely to have been variable, with the nearshore section of the route receiving significantly more sediment input (e.g. from the Humber Estuary) than the more offshore sections. As a result, there is potentially a difference in bedforms within the area, with currently active bedforms likely to be located closer to the coast, and the offshore area possibly including more relict features.

4.3 Palaeogeographic Assessment

4.3.1 The following section details the results of the palaeogeographic assessment of the geophysical data. There are no designated prehistoric archaeological sites located in the UK element of the submarine cable corridor. To aid in the archaeological assessment of the sub-bottom profiler data, a basic stratigraphy of the marine cable corridor was devised from both the assessed data and the geotechnical logs. A total of eight broad geological units were identified (**Table 7**):

Table 7: Generalised stratigraphy of the submarine cable corridor

Unit	Formation Unit	Description[(1)]	Environment	Archaeological Potential
8	Modern marine sediments	Shelly sand with occasional gravel and occasional organics	Marine	Considered of low potential in itself, but possibly contains re-worked artefacts and can cover wreck sites and other cultural heritage.
7	**Niew Zeeland Gronden Formation/ Well Hole Formation** (Early Holocene and younger)	Well-laminated soft clays and fine sands	Open marine	Considered of low potential in itself.
6	Possible early Holocene transgression Unit.	Bank deposits above Yarmouth Roads Formation and overlain by Unit 7	Shallow marine	Potential to contain re-worked material of archaeological interest and to protect underlying surfaces.
5	Channel infill units (Early Holocene)	Shallow cut and fill/channel features	Fluvial, estuarine or possibly terrestrial	Potential to contain *in situ* and derived archaeological material, and palaeoenvironmental material.
4	Late Devensian/Early Holocene **Botney Cut Formation**	Gravelly sandy clay and laminated mud	Sub-glacial associated with Outer Silver Pit	Potential to contain palaeoenvironmental data
3	Devensian **Bolders Bank Formation**	sandy gravelly till	Glacial	Unlikely to contain archaeological material.
2	Anglian (Elsterian) to Hoxnian **Swarte Bank Formation**	gravelly sandy clay, clay and sand	Sub-glacial	Unlikely to contain archaeological material.
1	Cromerian **Yarmouth Roads Formation**	sand with layers of mud	Delta top	Possible archaeological and palaeoenvironmental interest in upper unit if not eroded.

[(1)]Description based on project vibrocore data, geophysical characteristics and secondary sources

4.3.2 A full table of the results of the Stage 2 geoarchaeological assessment are provided in **Appendix IV** and a full list of palaeogeographic features are presented in **Appendix V**.

4.3.3 Not all of these units are present along the entire submarine cable corridor and the route has been divided into three broad sections based on the general shallow stratigraphy characteristics. The stratigraphy and archaeological potential for each of these sections is described below.

4.4 Radiocarbon dating results

4.4.1 The radiocarbon results are shown on **Appendix VIII**. Four of the five samples from the UK sector were successful; sample UBA-32701 failed to successfully convert to graphite and the sample material was used up during the sample preparation process.

4.4.2 A marine reservoir correction factor was applied to UBA-32705 (**Figure 3**) using data held in the ^{14}CHRONO Marine Reservoir Database (http://calib.qub.ac.uk/marine/).

4.4.3 The Weighted Mean ΔR (-200) and uncertainty (262) for UBA-32705 was calculated on the average of only two available data points on from the North Sea (Witbard *et al*. 1994, Weidman 1995), both from species of the marine bivalve *Artica Islandica*, also a suspension feeder like *C. edule*.

4.4.4 Some doubt must be cast on the suitability of this date given the limited number of available data points. However, a search of more recent published literature (e.g. *Radiocarbon* journal) may yield additional suitable data points from the southern North Sea on which to produce a more precise marine correction.

4.4.5 The results also show inversions between samples UBA-32704 and UBA-32702.

Section 1

4.4.6 Between the UK EEZ and the edge of the Outer Silver Pit (approximately 62 km), the shallow stratigraphy typically comprises **Unit 1**, interpreted as the Yarmouth Roads Formation (YM**)** (**Figure 4 g - i**).

4.4.7 On the sub-bottom profiler data, the top of the YM is characterised by a complicated arrangement of stacked, sometimes intersecting reflectors interpreted as channel and cut and fill features. This Unit is documented to comprise sands with occasional gravel, and is interpreted as a delta top deposit with fluvial, estuarine and shallow marine components and is extensive throughout the southern North Sea (Cameron *et al.* 1992).

4.4.8 The upper layers of Yarmouth Roads are contemporaneous with the Cromer Forest Beds of North Norfolk and the Palaeolithic sites at Pakefield and Happisburgh (some of the very first archaeological sites in Britain highlighting the southern North Sea basin as a globally significant region for the earliest prehistory and palaeolandscapes; summarised in Bicket and Tizzard 2015). This indicates that the upper layers of YM, which have been known to contain wood and peat remains, are of potential archaeological and palaeoenvironmental interest. However, due to the erosion caused by the subsequent Anglian glaciation, it is likely that few of these layers survive offshore.

4.4.9 Throughout most of this section, **Unit 1** is directly overlain by **Units 7** and **8**. **Unit 7** is a thick (up to 28 m in places) sequence of laminated soft clays, which belong to the Niew Zeeland Gronden Formation/ Well Hole Formation, which were deposited in open marine conditions (Cameron et al. 1992). **Unit 8** is identified in the vibrocores as predominantly

shelly sands with occasional gravel and organic matter and is interpreted as modern seabed sediments. As the **Unit 7** thins to the west, the vibrocores indicate the presence of **Unit 8** only.

4.4.10 Within this section, there are a number of features (simple cut and fills, complex cut and fills and bank features), which have been interpreted cutting into the top of **Unit 1** or resting on **Unit 1**. Based on the nature of the cut and the geophysical characteristics of the fill, these can be divided into two groups.

4.4.11 Features **7507**, **7511**-**7513**, **7518**-**7523** and **7526**-**7528** are distinct cut and fill features with a strong basal reflector and strong top reflector indicating a possible subsequent erosion surface. Typically, the geophysics indicates a single fill, which is variable in nature from chaotic indicating a mix of coarse sediments to transparent indicating homogenous fine-grained sediments. Although feature **7526** is more complex with two phases of fill. The nature and age of these features are unknown but are interpreted as possible **Unit 2** (Swarte Bank Formation) or the later **Unit 4** (Botney Cut Unit 4) Formation. Both these formations were deposited in sub-glacial conditions relating to the Anglian and Late Devensian, respectively.

4.4.12 Throughout this section, **Unit 7** can extend to depths of up to 28 m and the majority of the features are situated greater than 5 m sub-seabed. As a result, any deposits of archaeological potential associated with these features are beyond the expected vertical footprint of an electrical export cable. However, simple cut and fill feature **7528** is situated between 3.2 and 5.6 m below seabed and vibrocore B12-12 indicates a sedimentary change to reddish brown silty, gravelly sands between 3.2 - 3.5 m and below that up to 5.1 m of sands with some possible organic material.

4.4.13 Further features are observed as either simple cut and fills/depressions with strong basal reflector marking the top of the Yarmouth Roads Formation. These features (**7502**, **7510**, **7514**-**7517** and **7524**) are infilled with transparent or faint sub-parallel reflectors (**Figure 4 a - i**). There is also sediment banked against the underlying Unit 1 topography and these bank deposits (**7500**, **7501**, **7503**-**7506**, **7508**-**7509** and **7525**) are also geophysically characterised by transparent or faint reflectors. These features are likely to have formed during the early Holocene transgression as the sea level rose and re-worked tidal sediments (**Unit 6**), but **Unit 4** (Botney Cut cannot be ruled out). There is some potential for these sediments to contain re-worked material of archaeological interest and to protect underlying surfaces.

4.4.14 Numerous similar, but smaller or isolated features were identified in the top of YM, however only the major features have been identified and mapped for this report. The potential remains for other shallow channels within YM to be present.

Section 2

4.4.15 Section 2, approximately 21 km between the Outer Silver Pit in the East and the edge of Skate Hole in the West (**Figure 3 f - g**), is a stratigraphically complex area which is characterised by Yarmouth Roads Formation (**Unit 1**) either directly beneath seabed or beneath a thin veneer of modern marine sediments (**Unit 8**).

4.4.16 Within this section, large infilled sub-glacial valleys are also identified. The infill is comprised of Swarte Bank Formation (**Unit 2**). This Formation is observed on the route as valleys with in excess of 20 m thickness of sedimentary fills. A number of fill types are observed, however, as there is no archaeological potential associated with this unit, these features are not described further.

4.4.17 There are a number of features of potential palaeogeographic interest in this complex area which cut into or deposited in depressions on top of **Unit 1** (to the east of feature **7540**), **Unit 3** between feature **7540** and the edge of Skate Hole where the borehole data indicates the presence of stiff sandy and gravelly clays, and cutting into **Unit 2** deposits in and around the Skate Hole Feature.

4.4.18 Simple cut and fill, or infilled depressions (**7529**-**7535**, **7537**, **7539**, **7542** and **7544**) are observed with a single phase of fill, transparent or layered, and are interpreted as possible **Unit 6** transgression deposits infilling topographic hollows of the underlying sediment units. These features are occasionally complex showing more than one phase of fill (**7543**, **7545** and **7546**). Vibrocore **B12-21** indicates that this fill unit comprises slightly sandy gravel and sand with pockets of clay.

4.4.19 Within the base of the Outer Silver Pit/Skate Hole, there are four complex features belonging to three probable channels (**7536**, **7538**, **7540** and **7541**). These features are notably larger and more complex than others in the area, with fill sediments interpreted as being possibly early Holocene (**Unit 5**).

4.4.20 Feature **7536** is by far the largest of these features extending approximately 1.5 km and, with a depth range of 0.5 - 7.9 m below seabed (BSB), cutting into the top of Unit 1. In general, the feature is relatively acoustically quiet however more than one phase of fill is identified on the sub-bottom profiler data and some of the phases of fill are characterised by sub-parallel reflectors, indicating some well-layered sediments. Vibrocore B12-24 records the unit comprises very loose silty fine sand between 0.0 - 1.0 m BSB, suggesting that that the fill of the feature sits beneath a veneer of modern marine sediments (**Unit 8**), and loose to very dense gravelly sand between 1.0 - 5.75 m BSB.

4.4.21 Features **7538** and **7540** probably both once belonged to the same feature prior to subsequent erosion. Both features appear to have more than one phase of fill with sub-parallel reflectors indicating some well-layered sediments. Feature **7538** was sampled by Vibrocore B12-27, which records the unit comprises loose slightly silty sand between 0.0 - 0.6 m, slightly silty, very gravelly sand with fine to medium gravel-sized shells and shell fragments between 0.6 - 2.44 m BSB, and medium dense to dense gravelly sand between 2.44 - 3.0 m BSB. This suggests again that the unit 5 feature sits below a veneer of **Unit 8**. The base of features **7540** and **7538** cut into **Unit 1** in the east and Unit 3 in the west.

4.4.22 The base of feature **7541**, with a depth range of 0.6 - 5.6 m BSB, is marked by a strong reflector cutting into the top of **Unit 3** and as such, the fill is likely to comprise early Holocene sediments (**Unit 5**). The feature fill is generally relatively acoustically quiet with some faint reflectors, and possibly more than one phase of fill. Vibrocore sample B12-30 found the unit comprises very loose sand between 0.0 - 0.85 m BSB (**Unit 8**), with medium dense gravelly coarse sand from 0.9 - 3.49 m BSB (**Unit 5**) with some traces of black, possibly organic, staining between 2.8 - 3.0 m BSB. A bed of very high strength silty sandy clay was identified between 2.95 - 3.0 m BSB.

Section 3

4.4.23 From the western edge of Skate Hole to the coast the submarine cable is dominated by **Unit 3**, a blanket deposit of Devensian glacial till, overlain by a thin unit of modern sediments (**Unit 8**). Vibrocore sampling found that **Unit 3** comprises very stiff, extremely high strength slightly sandy, slightly gravelly clay. This unit is considered of low archaeological potential, as it is unlikely to contain any archaeological artefacts or palaeoenvironmental material, and any underlying land surfaces are likely to have been removed prior to deposition.

4.4.24 **Unit 5** is present intermittently along the southwestern half of the proposed cable route, and is found infilling series of channel, or cut and fill features, cut into the surface of **Unit 3**.

4.4.25 A total of 15 of these features (see **Appendix IX** for full list) have been classified as buried palaeochannels (features **7549**-**7554**, **7557**-**7559** and **7562**-**7567)**. These features are generally characterised in the seismic data by numerous sub-parallel internal reflectors with a sometimes complex fill, suggesting more than one phase of cut and fill. These are interpreted as being fluvial features of Early Holocene age (**Unit 5**), and the complex fills suggest creation by migrating channels rather than single stable features. A number of these features were sampled during vibrocore sampling along the route (features **7549**, **7552**-**7554**, **7559**, **7561**, **7565**-**7567** and **7570**), which can provide a greater insight into the composition of these feature's fills.

4.4.26 Feature **7549** is a well-layered channel identified beneath the upper unit of modern marine sediments (**Unit 8**), cut into the interpreted Bolders Bank Formation (**Unit 3**). The feature appears to have multiple phases of fill and is characterised by numerous, sub-parallel reflectors. Based on vibrocore sample B12-45, the infill comprises very loose to loose silty sand between 0.0 - 0.26 m BSB, with very loose slightly silty fine sand with a few pockets of brown material and some shell and shell fragments between 0.26 - 1.75 m, which is thought to be the modern marine sediments (**Unit 8**), with the channel fill found to comprise loose to medium dense fine sand between 1.75 m - 2.65 m BSB (**Unit 5**).

4.4.27 Feature **7552** is interpreted as being another early Holocene channel feature; however the unit fill appears to be relatively acoustically quiet suggesting homogenous, fine-grained sediments. Vibrocore sample B13-03-ARCH comprises slightly silty sand between 0.0 - 0.7 m BSB, which is thought to represent **Unit 8**, with the **Unit 5** channel fill comprising loose to medium dense slightly silty sand between 0.7 - 3.99 m BSB. From 3.99 m to the end of the sample at 6.0 m BSB, the unit comprised very stiff slightly sandy slightly gravelly clay, which may represent the underlying Bolders Bank Formation (**Unit 3**), however the geophysical data appears to show the channel feature extending to a maximum depth of 6.2 m BSB.

4.4.28 Feature **7553** is a shallow channel feature beneath the upper unit of modern marine sediments (**Unit 8**), cut into the top of the interpreted Bolders Bank Formation (**Unit 3**). The feature fill appears to be slightly complex well-layered fill, based on the geophysical data, with a depth range of 1.3 - 3.9 m BSB. Vibrocore sample B13-04-ARCH records the fill comprises very loose to medium dense sand between 0.0 - 2.0 m, interpreted as being Unit 8, with the feature fill being represented by a change to a more gravelly sand between 2.0 - 2.58 m BSB (**Unit 5**). Below that (2.58 - 3.79 m BSB), stiff slightly sandy, slightly gravelly clay was identified, thought to represent the underlying Bolders Bank Formation (**Unit 3**).

4.4.29 Feature **7554** is interpreted to be a possible channel feature, with multiple phases of fill (**Unit 5**), identified beneath the upper unit of modern marine sediments (**Unit 8**). Vibrocore sample B13-06 found unit comprises very loose slightly silty sand with shell fragments between 0.0 - 0.2 m BSB, interpreted as being the modern marine sediments (**Unit 8**) with the feature fill being found as becoming loose to medium dense silty sand between 0.2 - 1.45 m BSB and dense to very dense slightly silty gravelly sand with some shall fragments 1.45 - 2.65 m BSB becoming very loose to medium dense between 2.65 - 3.0 m BSB. It may be that these different sediments represent different phases of fill within the channel feature.

4.4.30 Feature **7559** is also interpreted as being a complex channel feature with more than one phase of fill. Vibrocore sample B-13-R-01 indicates a veneer or modern marine sediments (**Unit 8**) comprising very loose slightly silty sand with gravel-sized shell fragments between 0.0 - 0.16 m BSB, with the unit fill comprising medium dense to dense slightly silty sand with gravel-sized shell fragments between 0.16 - 2.36 m BSB, becoming very soft slightly sandy clay between 2.36 - 4.87 m and loose to medium dense slightly gravelly silty fine sand between 4.87 - 5.89 m BSB. Again, these changes in sediment may represent the different phases of fill and indicate possible changes in the environment they were deposited in.

4.4.31 Feature **7559** is a possible channel characterised by faint, sub-parallel reflectors which indicates well-layered sediment. Vibrocore sample B14-26 supports this, with soft to firm slightly sandy silty clay being identified between 0.94 - 3.06 m, becoming interbedded with slightly silty sand between 2.0 - 2.75 m BSB.

4.4.32 It is interpreted that feature **7561**, a fine grained deposit identified above an interpreted palaeochannel, may represents overbank deposits associated with channel **7562** and simple cut and fill feature **7070**. Vibrocore location B13-29 intersects both features **7561** and **7070**. The geotechnical data shows these features to comprise very loose slightly silty very gravelly sand with some shell fragments between 0.0 - 0.2 m BSB (Modern marine sediments, **Unit 8**). Between 0.2 - 1.05 m BSB (the overbank deposit feature **7561**, **Unit 5**) medium dense to very dense slightly silty sand with closely spaced thin laminae of clay with gravel sized pockets of black silty, possibly organic, material was encountered.Low-strength clay with extremely closely spaced thin beds of fine sand with pockets of possibly organic black staining was recorded between 1.05 - 6.0 m BSB (Simple cut and fill feature **7070, Unit 5**). Though channel **7561** was not directly sampled, due to the proximity and the acoustic similarities between features **7561** and **7070**, it could be inferred that the feature fill of **7561** is similar to that of **7070**.

4.4.33 Feature **7567** is interpreted as a complex channel system with more than one phase of fill and a depth range of 0.8 - 8.9 m BSB. The feature is characterised by faint sub-horizontal reflectors, suggesting well-layered sediment, and appears to have high amplitude reflectors within the channel feature, accompanied by acoustic blanking of lower horizons (**Figure 7**). This suggests possible shallow gas, which is indicative of preserved organic palaeoenvironmental material. Vibrocore B15-02 appears to support this with pockets of black staining, interpreted as being possibly organic, being identified between 0.15 - 2.31 m BSB. As mentioned, well-preserved organic matter discovered within these features may be of palaeoenvironmental importance as preserved material within these sediments can be used to aid in the reconstruction and dating of buried landscapes.

4.4.34 Radiocarbon dating was carried out on fragments of waterlogged wood found in vibrocore sample **B13-03-ARCH**, taken from a **Unit 5** infilled channel (feature **7552**) (**Appendices VII** and **VIII**). A sample taken at a depth of 2.05 - 2.10 m BSB provided a ^{14}C age of 9,665 ± 55 BP, the calibrated date ranges (**Figure 3, Appendix VIII**) indicate the sample dates from the Mesolithic around 9000 BC. Two other samples, one taken at 3.00 - 3.02 m BSB with a C14 age of 11,533 ± 59 BP and a slightly deeper sample taken at 3.02 - 3.03 m BSB an age of 10,493 ± 60 BP, the calibrated dates indicate ranges during the Upper Palaeolithic (roughly 11,500 – 10,500 BC) (**Figure 3, Appendix VIII**). The apparent transposition of the ages of the two deeper samples suggests possible reworking of the channel infill sediments, or disturbance of the sample when being cored.

4.4.35 It is interpreted that **Unit 3,** Botney Cut sub-glacial infill, may be present with feature **7565**. This is a large, complex channel feature identified below seabed, cut into the top of the Bolders Bank Formation (**Unit 3**), with multiple phases of fill. Some of the phases of fill

have distinct, even reflectors suggesting well-layered sediment, whereas others a slightly more acoustically chaotic. Vibrocore sample B14-21 shows the feature comprises a thin layer of very loose silty very gravelly sand with shell and shell fragments between 0.0 - 0.15 m, which is interpreted as being the modern marine sediments (**Unit 8**), with soft to firm slightly sandy, slightly gravelly clay between 0.15 - 1.67 m with very closely spaced thin to thick laminae of very silty fine sand from 0.4 - 1.67 m, and high strength to very high strength slightly sandy silty clay with thin beds of silt and sand between 1.67 - 6.58 m. Some fine gravel sized bits of coal were identified at 4.5 m BSB. It may be that this interbedded high strength clay is the subglacial clays of the Botney Cut Formation (**Unit 4**). The SW end of the feature is sampled by Vibrocore B14-22 which shows a unit of dense to very dese very silty fine sand with some pockets of possibly organic black material between 0.25 - 1.95 m and high strength to very high strength silty clay between 1.95 - 3.0 m BSB. This sand unit may in turn represent early Holocene infill (**Unit 5**) cutting into the top of the interpreted Botney Cut fill (**Unit 4**).

4.4.36 Features **7555**, **7556**, **7560**, **7569** and **7570** are thought to be of the same age as the channels described above, but they are interpreted as cut and fill features. These features were only identified along a few survey lines and could not be traced any distance as coherent palaeochannels. It is possible that they are the remnants of eroded palaeochannel systems, but as their nature is less certain they are considered of lower archaeological potential.

4.4.37 A number of high amplitude reflectors were identified in the nearshore section of the proposed cable route, however only feature **7568** is located within the submarine cable corridor. These features are interpreted as being within the Bolders Bank formation and are largely identified at the depth of the seabed multiple. It is possible that these represent coarser sediments within **Unit 3** or may be indicative of shallow gas.

4.4.38 Although none of the features interpreted in the latest assessment of geophysical data have been directly linked with palaeochannels present within previous work (Gaffney et al 2007), it is likely that the interpreted Early Holocene age of these features correspond with the age of palaeochannels and other palaeolandscape features identified during the NSPP. This suggests that these channels have the potential to contain both *in situ* and derived artefacts, as well as preserved palaeoenvironmental material. They are also at a very shallow depth, often covered by only a veneer of modern seabed sediment, and therefore lie within the vertical footprint of an electrical cable.

4.4.39 **Unit 6** solely comprises the modern seabed sediment along this section of the cable route and typically varies between 2 and 3 m. Towards the inshore section of the proposed cable route, it is generally very thin, often less than 1 m thick, though in some areas it is thick enough to form sand waves.

4.5 Archaeological Potential

4.5.1 The archaeological history of the southern North Sea is directly linked to the previously described glacial/interglacial cycles and the associated changes of environment across the region. During periods of relatively low sea level, the exposed terrestrial landscape would have been an attractive environment for different Hominin species, including possibly *Homo antecessor*, but certainly *Homo heidelbergensis*, *Homo neanderthalensis*, and, eventually, modern humans (*Homo sapiens*).

4.5.2 The earliest direct evidence for Hominin activity in the UK was identified at the Lower Palaeolithic sites of Happisburgh, on the Norfolk coast, and Pakefield, on the Suffolk

coast, dating from *c.* 8000,000 and 700,000 BP respectively. These sites are both located within sediments of Cromerian age, and pre-date the earliest known glaciation of the UK.

4.5.3 The southern North Sea off the east coast of East Anglia is known to contain relatively well preserved palaeolandscape features such as fluvial channels, created during periods of sea level lowstand but while the landscape was still free of ice. The remains of this terrestrial landscape are frequently recovered by dredging and fishing in numerous areas around the Southern North Sea, generally in the form of the remains of extinct megafauna (e.g. mammoths).

4.5.4 The discovery of actual human artefacts, such as hand axes and worked bone, is a rarer occurrence, but artefacts have been recovered. The earliest direct offshore evidence of human occupation of this landscape has been identified in the form of Palaeolithic artefacts dating to the Saalian period (*c.* 380,000 - 130,000 BP) associated with probably Neanderthal activity in the Palaeo-Yare river within Area 240, offshore Great Yarmouth (Wessex Archaeology 2011b, Tizzard *et al.* 2014, 2015). Onshore the most northerly Neanderthal artefacts of a similar period (i.e. Levallois technique lithic material) are known from Holderness (Wymer 1999) suggesting regionally, there is potential for at least Early Middle Palaeolithic and more recent periods of early prehistory to be encountered.

4.5.5 Further isolated archaeological artefacts such as the Mesolithic Leman Bank worked bone (Godwin and Godwin 1933), as well as worked flints and faunal remains reported through the Marine Aggregate Industry *Protocol for Reporting Finds of Archaeological Interest* all indicate the potential for the presence of archaeological material.

4.5.6 Palaeolandscape features and associated evidence and artefacts survive off East Anglia as the area is thought to have only experienced one glacial advance during the Pleistocene. The region of the North Sea north of Norfolk has experienced a number of major glacial events, and, as such, evidence for past landscapes is likely to be have been adversely affect by the associated glacial erosion and extensive deposition of glacial till (Tappin *et al.* 2011). However, data assessed in support of marine development over the last 15 years has identified significant palaeogeographical records of international archaeological importance across the region indicating preservation does occur but records may be complex to interpret and reflect a range of archaeological and geological periods across significant time depths (Bicket and Tizzard 2015).

4.5.7 In summary, the potential exists for preserved palaeolandscape features to be present within the submarine cable corridor. Palaeochannel systems identified during the NSPP within the Early Mesolithic period (Early Holocene), during which time the route of the submarine cable corridor would have corresponded to an attractive terrestrial landscape suitable for human habitation

4.5.8 Fluvial features such as these are considered to be of high archaeological potential, as many known prehistoric sites, such as Star Carr in North Yorkshire (Tappin *et al.* 2011), are associated with waterways. Buried palaeochannels and their associated deposits, both on land and offshore, therefore have the potential to contain both *in situ* and derived archaeological artefacts (such as lithic objects).

4.5.9 Additionally, soft sediment infills associated with many buried palaeochannel features and overbank deposits can contain preserved organic material. This material, such as pollen, is also of potential importance to palaeoenvironmental studies and can aid in reconstructing and dating the identified buried landscape.

5 ARCHAEOLOGICAL ASSESSMENT: MARITIME AND AVIATION SITES

5.1.1 The following assessment of the maritime and aviation resource is based on records of known shipwrecks, aircraft crash sites and obstructions combined with recent archaeological assessment of geophysical data.

5.2 Designated Sites

5.2.1 There are currently no sites within the submarine cable corridor that are subject to statutory protection from the Protection of Wrecks Act 1973, the Protection of Military Remains Act 1986 or the Ancient Monuments and Archaeological Areas Act 1979; the three legislative acts that could be used to protect marine archaeological sites.

5.3 Known Maritime and Aviation Sites

5.3.1 There is one charted wreck located within this element of the submarine cable corridor (**7059**). There are no known aircraft crash sites located within this element of the submarine cable corridor. The potential for the discovery of previously unknown shipwreck sites and aircraft crash sites and material is discussed below and in **Appendix XI-XIII**.

5.4 Geophysical Seabed Features Assessment

5.4.1 A full gazetteer of all anomalies is supplied in **Appendix X** and the locations of these are illustrated in **Figures 9 a - h**. Examples of anomalies are shown in **Figure 10 a - b**. Wrecks are illustrated in detail in **Wreck Sheets 1 - 3**.

5.4.2 In total 257 features of archaeological potential have been identified within the UK element of the submarine cable corridor by Wessex Archaeology. These are discriminated as shown in **Table 8**.

Table 8: Features of archaeological potential within the UK EEZ section of the submarine cable corridor

Archaeological Discrimination	Quantity	Interpretation
A1	3	Anthropogenic origin of archaeological interest
A2	254	Uncertain origin of possible archaeological interest
A3	0	Historic record of possible archaeological interest with no corresponding geophysical anomaly
Total	**257**	

5.4.3 Furthermore, these anomalies can be classified by probable type, which can further aid in assigning archaeological potential and importance.

Table 9: Types of features identified within the UK EEZ section of the submarine cable corridor

Feature Classification	Quantity
Bright Reflector	8
Dark Reflector	25
Debris	21
Debris Field	6
Magnetic	178
Mound	8
Seafloor Disturbance	8
Wreck	3
Total	**257**

5.4.4 There are three wrecks identified within the submarine cable corridor in the UK EEZ, all of which have been discriminated as A1 (**7003**, **7004** and **7059**). Only one wreck, **7059**, has a UKHO record associated with it. The other two wrecks are unrecorded and unidentified.

5.4.5 Wreck **7003** has dimensions of 42.7 m x 10 m x 3.7 m. The wreck lies on the edge of the survey area and only approximately half has been covered by the bathymetry data although the whole wreck has been covered by the sidescan sonar data (**Wreck Sheet 1**). It is visible in the bathymetry data as an upright wreck aligned southeast to northwest and surrounded by scour. The deepest visible scour occurs around the southeast end of the wreck where it is a maximum of 1.9 m below the adjacent seabed in depth. In the sidescan sonar data the wreck appears somewhat broken up and is surrounded by a seafloor disturbance (51.4 m x 22.4 m x 0 m), which may contain debris. No outlying debris is observed in the bathymetry data. A large magnetic anomaly of 198 nT is observed associated with the wreck. The nearest line of magnetometer data lies 20 m away from the southeast end of the wreck and the wreck would have a larger magnetic anomaly directly over it.

5.4.6 An area of bright reflectors is observed in the sidescan sonar data extending to the east of the wreck. It is possible that this is caused by fishing nets or other such material snagged on the wreck.

5.4.7 Wreck **7004** appears upright and mostly intact (**Wreck Sheet 2**). It is situated at the bottom of a large scour and is oriented west to east although the scour itself extends principally to the northeast. The wreck has dimensions of 33.6 m x 10 m x 3.6 m and most of it lies below the level of the adjacent seabed. The deepest part of the scour occurs at the eastern end of the wreck, where it has a depth of 3.9 m below the adjacent seabed. In the sidescan sonar data an area of possible seafloor disturbance (44.5 m x 22.1 m x 0 m) is seen to surround the wreck. This corresponds to the scour observed in the bathymetry data. A small bright reflector (3 m x 1.5 m x 0 m) and four linear dark reflectors approximately 5 m long are visible in the sidescan data adjacent to the wreck and may be associated debris. No internal structure is clearly seen within the wreck. The highest points of the wreck occur at the ends and it therefore appears that much of the superstructure may be missing. A large magnetic anomaly of 425 nT is associated with the wreck, indicating significant ferrous content.

5.4.8 Wreck **7004** is also visible in the sub-bottom profiler data as an indistinct mound within a depression. Strong reflectors are observed below the seabed at this location and are indicative of buried wreck structure.

5.4.9 Wreck **7059** is a large wreck measuring 82.6 m x 20 m x 4.1 m and oriented northeast to southwest (**Wreck Sheet 3**). It is broken up and mostly buried in an area of sandwaves. The extents are very difficult to determine as in the sidescan sonar data contains a lot of shadows and the wreck is undefined in the bathymetry data except for a distinct high point at the centre. The wreck appears to have caused localised changes to the surrounding environment with sediment build-up occurring around the wreck. Some scouring may be present near the southwest end of the wreck or this may be just a naturally occurring depression between sandwaves. A medium magnetic anomaly of 122 nT is associated with the wreck, indicating some ferrous content. However, the nearest line of magnetometer data lies 40 m from the wreck and a much larger magnetic anomaly would be expected to occur directly over the wreck.

5.4.10 This wreck is recorded by the UKHO as a dangerous wreck, which is probably the *Rebono*, a British trawler mined and sunk on 23 September 1914. The vessel was built by Cook, Welton & Gemmel of Beverley. It was on passage to Grimsby for fishing and return when it struck the mine. The dimensions of the vessel as built were 32 m in length, a beam of 6.4 m, a draught of 3.3 m and a gross tonnage of 176 tonnes. The sinking position was originally given as 25 miles east, (north from the Spurn light vessel). A survey in 1982 described the wreck as well defined and apparently intact with sonar dimensions of 55 m x 8 m x 3.7 m and the highest point lying amidships. The length is substantially longer than the 32 m given for the *Rebono* and it is not known if the wreck is indeed that of the *Rebono*. The wreck was dived in 1992 and confirmed to be the wreck of a trawler of about 200 GRT but no further description is given. The much greater dimensions of the wreck in the current datasets and its appearance indicate that the vessel has become significantly broken up since 1983.

5.4.11 The remaining anomalies have all been classified as A2. There are 21 features identified as debris across the assessment area. These are features clearly anthropogenic in nature and vary widely in their appearance and dimensions. Some have magnetic anomalies associated with them, indicating that they are ferrous in nature. Three of these debris features (**7060**, **7061** and **7062**) lie adjacent to wreck **7059** and are likely to be associated with it. Feature **7060** is a small elongate feature with height measuring 1.8 m x 0.2 m x 0.4 m. Feature **7061** is a small rounded object with dimensions of 1.2 m x 0.7 m x 0.4 m. The third object, **7062**, has dimensions of 1.5 m x 0.4 m x 0.7 m and is a small blocky object.

5.4.12 Feature **7091** is a linear item of debris with dimensions of 6.4 m x 0.8 m x 0.3 m, and corresponds with a very large magnetic anomaly of 1782 nT (**Figure 10 a**). This feature appears to contain two parallel dark reflectors. As it is a fairly small object and the magnetic anomaly is so large it is possible that further ferrous material is buried nearby. Several other similar features are observed. Some of these also have magnetic anomalies associated with them but others do not. Features **7094**, **7095** and **7096** are those that have magnetic anomalies associated with them. Feature **7095** is an indistinct anomaly with dimensions of 8.2 m x 1 m x 0 m and a magnetic anomaly of 359 nT. Feature **7096** is a more distinct object consisting of two parallel dark reflectors and measuring 9.8 m x 1.1 m x 0.3 m with a magnetic anomaly of 182 nT. Feature **7094** is very similar, slightly larger at 10.8 m x 1.3 m x 0.3 m and with a magnetic anomaly of 66 nT.

5.4.13 Feature **7005** is an angular linear anomaly with dimensions of 10.1 m x 2.1 m x 2.0 m. This feature has an uneven shadow indicating part of it is much higher than the rest. It does not have a magnetic anomaly associated with it, indicating it is likely to be of non-ferrous material.

5.4.14 Ferrous debris **7209** is a small indistinct dark reflector with a large tapered shadow (**Figure 10 a**). It has dimensions of 3.4 m x 0.7 m x 0.9 m and a magnetic anomaly of 50 nT. Feature **7265** is also ferrous debris and comprises a linear feature with dimensions of 4.5 m x 0.8 m x 0.3 m and an extremely large associated magnetic anomaly of 18,357 nT. This object occurs approximately 1.4 km from the landward end of the corridor. There is nothing on the Admiralty charts to indicate that it is a navigation aid or other known modern feature.

5.4.15 The six debris fields occur toward the inshore end of the submarine cable corridor. The largest of these features, **7089**, has dimensions of 44.6 m x 18.7 m x 0.7 m, and comprises an area of dark reflectors with height, the largest of which measures 3.3 m x 1.7 m x 0.7 m. Feature **7090** is a smaller area of dark reflectors with height, some of which are linear. The largest object measures 5.9 m x 3.5 m x 0.9 m and the debris field as a whole has dimensions of 15.3 m x 12.1 m. A magnetic anomaly of 175 nT is associated with this feature, indicating it contains ferrous debris.

5.4.16 The smallest debris field, **7267**, has dimensions of 7.7 m x 3.2 m x 0.5 m and a small magnetic anomaly of 28 nT indicating it may have a small amount of ferrous content. The debris field consists of a group of thick linear and circular dark reflectors that have large and bright shadows. Another debris field, **7266**, lies approximately 100 m to the northeast of **7267**. Feature **7266**, has dimensions of 8.0 m x 4.9 m x 0.2 m and contains distinct linear dark reflectors forming a 'T' shape with indistinct shadows. Smaller dark reflectors surround the main objects. A large magnetic anomaly of 726 nT is associated with this feature and indicates substantial ferrous content.

5.4.17 Debris field, **7202**, measures 7.9 m x 4.4 m x 0 m. It consists of a group of four small narrow dark reflectors and is very distinct on an area of rippled seabed. The fourth debris field, **7105**, has dimensions of 11.6 m x 8.3 m x 1.1 m. It is a group of many small objects with height (**Figure 10 b**).

5.4.18 The dark reflectors are spread throughout the submarine cable corridor. Of the 25 dark reflectors all but one are less than 10 m in size. The exception is **7278**, a linear feature with dimensions of 12.7 m x 3.8 m x 0 m. Feature **7037** is an unusual outline oval feature, similar to a tyre in shape. The feature has dimensions of 5.9 m x 1.9 m and may be debris.

5.4.19 There are eight bright reflector features throughout the assessment area. These are areas of low reflectivity that could possibly represent a piece of debris composed of material that absorbs acoustic waves rather than reflecting them, such as saturated wood. Five of these features are linear in nature and range in size from 7.3 m (**7185**) to 15.4 m (**7114**) in length. Sometimes indistinct, these features may be anthropogenic debris or possibly natural in origin.

5.4.20 Eight features have been interpreted as mounds, represented by a distinct area of disturbance of unknown origin that could possibly contain buried archaeological material. Three mounds (**7001**, **7002** and **7035**) have been observed in both the sidescan sonar and multibeam bathymetry data. Feature **7001** is an elongate mound with dimensions of 6 m x 4.5 m x 0.6 m. It is aligned north to south and situated in an oval shaped depression of 33 m x 24 m x -1.5 m, as observed in the bathymetry data. In the sidescan

sonar data the feature appears as a dark reflector with height. Feature **7002** is similar in size, at 6 m x 5 m x 0.7 m. It is seen in the bathymetry data to be situated at the eastern end of an oval shaped depression measuring 34 m x 18 m x -0.7 m. In the sidescan sonar data the feature occurs as a dark reflector with height. A magnetic anomaly of 54 nT is associated with this feature, indicating that there may be some ferrous content.

5.4.21 The third of these mounds is **7035**, which is observed in the bathymetry data as an elongate low mound with dimensions of 12 m x 8 m x 0.2 m. In the sidescan sonar data this feature appears as an indistinct object containing two parallel dark reflectors but with a clear shadow.

5.4.22 A further five mounds (**7279** - **7283**) have been observed in the in the widened section of corridor approximately 20 km from the landward end. These mounds were only observed in multibeam bathymetry data as no magnetometer or sidescan sonar data were acquired in this area (**Figure 9 a - h**) and the backscatter data acquired in place of the sidescan data were of low resolution. All five of these mounds are isolated features which are approximately circular in shape with dimensions between 4 m (**7281** and **7282**) and 6 m (**7279**) across. They are low-lying features with heights of between 0.2 m (**7281** and **7283**) and 0.5 m (**7279**). It is possible that they are natural features but it is not possible to determine this from the available data.

5.4.23 The eight seafloor disturbances are areas of less than 15 m in size. Three seafloor disturbances have magnetic anomalies associated with them and hence may contain ferrous debris (**7006**, **7033** and **7034**). Of these, **7006** is the smallest at 3.3 m x 2.9 m x 0 m. It is an indistinct small area with a bright reflector in front of a dark reflector, possibly including a depression. It has a magnetic anomaly of 19 nT associated with it. Feature **7034** is larger at 11.2 m x 10.4 m x 0.8m and has a magnetic anomaly of 107 nT. It is a confused area of bright and dark reflectors including a linear bright reflector measuring 4.0 m x 0.8 m x 0 m and a small irregularly shaped object with dimensions of 1.6 m x 1.2 m x 0.8 m. The third seafloor disturbance with a magnetic anomaly is **7033**. This appears as two parallel scars with three very small possible items of debris in the sidescan sonar data and as an oval shaped shallow depression in the bathymetry data. The feature has dimensions of 10.3 m x 8 m x -0.2 m and a small magnetic anomaly of 20 nT.

5.4.24 There are 178 magnetic anomalies with no associated sidescan sonar feature identified across the submarine cable corridor. All of these have been given an archaeological potential rating of A2 (see **Appendix X**). These have been categorised as small magnetic anomalies of less than 50 nT; medium sized magnetic anomalies of 50 nT to 150 nT; large magnetic anomalies of greater than 150 nT; and very large magnetic anomalies of greater than 1,000 nT. Background magnetic variation caused by geology is approximately ±5 nT and as such smaller anomalies recorded across the assessment area may prove to be geological in origin and likewise small anomalies may also be masked by this geological variation. All of the magnetic anomalies classified as A2 have the possibility to be buried objects with ferrous content, or near surface objects with no surface expression, that are of archaeological potential.

5.4.25 There are 97 small magnetic only anomalies located across the submarine cable corridor ranging from 5 nT to 49 nT. Some of these may be natural geological variations as described above, however they cannot be discounted. There are 67 medium sized magnetic anomalies located across the area ranging in size from 50 nT to 138 nT, and 13 large magnetic anomalies ranging from 152 nT to 596 nT. A single very large anomaly with an amplitude of 2,155 nT (**7272**) is located approximately 330 m from the landward end of the cable corridor (**Figure 9 a - h**). These features, especially the large anomalies, have the potential to be substantial buried ferrous debris.

5.5 Maritime Archaeological Potential

5.5.1 The assessment of potential for the discovery of shipwreck and shipwreck-derived material within the submarine cable corridor draws on the results of the geophysical survey and desk-based research combined with further research of the wider area. Further information is presented in **Appendix XI.**

Navigational Hazards

5.5.2 A project entitled 'Enhancing our Understanding: Mapping Navigational Hazards as areas of Maritime Archaeological Potential', undertaken by Bournemouth University (Merritt *et al.* 2007) assessed historical records of navigational hazards to interpret and characterise the marine historic environment. Areas assessed to be hazardous were considered alongside a model of the preservation potential of marine sediments with the purpose of identifying areas where there was not only a high potential for ship losses, but where there was also a high potential for the preservation of archaeological remains. These areas were coined as Areas of Maritime Archaeological Potential (AMAPs).

5.5.3 An area extending some 15 km from the coast at the landward extent of the submarine cable corridor has been mapped as one of high potential for navigational hazards. Further eastwards, the submarine cable corridor is categorised as one of medium potential for navigational hazards covering an area between 15 and 26 km from the coast. The remaining seaward extent of the submarine cable corridor is categorised as one of low potential for navigational hazards.

5.5.4 This indicates the potential for wrecking incidents to have occurred in the submarine cable corridor, particular towards the landward extent of the proposed route. However, despite the areas of high and medium potential for navigational hazards for shipping, no AMAPs have been mapped in the proposed route for the Viking Link cable (Route 4, Revision 11). This means that whilst wrecking incidents are more than likely to have occurred, the seabed sediments present are not considered to favour the high preservation of wreck sites. This suggests that any such remains present within the submarine cable corridor are likely to be fragmented or dispersed. However, the potential for coherent wreck structure to exist should not be discounted. The *Rebono* (**7059**), which is recorded by the UKHO as being well-defined and intact, signifies the potential for coherent wreck remains to exist within the submarine cable corridor.

Recorded Losses

5.5.5 As discussed in section 3.2, Recorded Losses are records for ships or aircraft that are known to have wrecked or crashed offshore, but for which the exact locations are not known.

5.5.6 Recorded Losses can be considered as an indication of the potential for archaeological maritime remains to exist within the submarine cable corridor and the type and number of wrecks that could be present. These records relate to vessels reportedly lost, and **Table 10** shows the distribution of documented losses in the wider Search Area (2 nm surrounding the UK element of the submarine cable corridor) according to date.

Table 10: Recorded Losses – based on NRHE and LHER data

Date	Number of Losses
Pre-1539	0
1540 – 1800	1
1801 – 1913	16
1914 – 1945	0
1946 - present	0
Unknown	1
Total	**18**

5.5.7 The records are detailed in **Appendix XII** and discussed in context in **Appendix XI**.

Overview of Potential

There is potential for the presence of archaeological material of a maritime nature spanning from the Mesolithic period to the present day within the submarine cable corridor. The key areas of potential are summarised in **Table 11** below. The potential for further wrecks to be discovered within the submarine cable corridor is discussed in greater detail in **Appendix XI**.

Table 11: Summary of key areas of potential

Period	Summary
Pre-1508 AD	Potential for material associated with prehistoric maritime activities. Prehistoric maritime activities include coastal travel, fishing and the exploitation of other marine and coastal resources. Vessels of this period include rafts, hide covered watercraft and log boats.
	Potential for material associated with later prehistoric maritime activities, including seaworthy watercraft suitable for overseas voyages to facilitate trade and the exploitation of deep water resources. Such remains are likely to comprise larger boat types, including those representing new technologies such as the Bronze Age sewn plank boats which are associated with a growing scale of seafaring activities.
	Potential for material of Romano-British date, associated with the expansion and diversification of trade with the Continent. Watercraft of this period, where present, may be representative of a distinct shipbuilding tradition known as 'Romano-Celtic' shipbuilding, often considered to represent a fusion of Roman and northern European methods.
	Potential for material associated with coastal and seafaring activity in the 'Dark Ages', associated with the renewed expansion of trade routes and Germanic and Norse invasion and migration. Vessels of this period may be representative of new shipbuilding traditions such as the technique.
	Potential for material associated with medieval maritime activity, including that associated with increasing trade between the UK and Europe, the development of established ports around the southern North Sea and the expansion of fishing fleets and the herring industry. Vessels of this period are representative of a shipbuilding industry which encompassed a wide range of vessel types (comprising both larger ships and vernacular boats). Such wrecks may also be representative of new technologies (e.g. The use of flush-laid strakes in construction), developments in propulsion, the development of reliable navigation techniques and the use of ordnance.

Period	Summary
1509 to 1815	Increasing potential for post-Medieval shipwrecks representative of continuing technological advances in the construction, fitting and arming of ships, and in navigation, sailing and steering techniques. Vessels of this period continued to variously represent both the clinker techniques and construction utilising the flush-laid strakes technique.
	Increasing potential for post-Medieval shipwrecks associated with the expansion of transoceanic communications and the opening up of the New World.
	Increasing potential for post-Medieval shipwrecks associated with the establishment of the Royal Navy during the Tudor period and the increasing scale of battles at sea.
	Increasing potential for post-Medieval shipwrecks associated with continuing local trade and marine exploitation including the transport of goods associated with the agricultural revolution.
1816 to 1913	Increasing potential for the discovery of shipwrecks associated with the introduction of iron and later steel in shipbuilding techniques. Such vessels may also be representative of other fundamental changes associated with the industrial revolution, particularly with regards to propulsion and the emergence of steam propulsion and the increasing use of paddle and screw propelled vessels.
	Potential for the discovery of shipwrecks demonstrating a diverse array of vernacular boat types evolved for use in specific environments.
	Potential for wrecks associated with large scale worldwide trade, the fishing industry or coastal maritime activity including marine exploitation.
1914 to 1945	Potential for the discovery of shipwrecks associated with the two world wars including both naval vessels and merchant ships. Wrecks of this period may also be associated with the increased shipping responding to the demand to fulfil military requirements. A large number of vessels dating to this period were lost as a result of enemy action.
Post- 1946	Potential for wrecks associated with a wide range of maritime activities, including military, commerce, fishing and leisure. Although ships and boats of this period are more numerous, loses decline due to increased safety coupled with the absence of any major hostilities. Vessels dating to this period are predominantly lost as a result of any number of isolated or interrelated factors including human error, adverse weather conditions, collision with other vessels or navigational hazards or mechanical faults.

5.6 Aviation Archaeological Potential

5.6.1 The assessment of potential for the discovery of aircraft crash sites and aircraft derived material within the submarine cable corridor draws on the results of the geophysical survey and desk-based research combined with further research of the wider area.

5.6.2 There are no known aircraft crash sites or Recorded Losses recorded in the submarine cable corridor. However, there is potential for the discovery of previously unknown aircraft material.

5.6.3 A guidance note published by English Heritage (now Historic England) entitled *Military Aircraft Crash Sites* (2002) outlined a case for recognising the importance of aircraft crash sites, specifically with regard to existing and planned development proposals which may have an impact on such sites. The guidance note argues that aircraft crash sites not only have significance for remembrance and commemoration, but they also have an implicit cultural value as historic artefacts, providing information on the aircraft itself and also the

circumstances of its loss (*ibid.*: 2). All aircraft that crashed while in military service are automatically protected under the Protection of Military Remains Act 1986.

5.6.4 There is potential for aircraft crash sites dating from the early 1900s to the present day. Early aircraft construction was characterised by lightweight aircraft, constructed of canvas covered wooden frames. These aircraft were extremely fragile and were known to break up mid-flight. The fragility of these airframes alongside the relative scarcity of flights over water mean that any aircraft remains dating to this period are rare.

5.6.5 The regular use of aircraft over the battlefields of the Western Front by the end of WWI, however, prompted the mass-production of fixed wing aircraft in large numbers, spurring technological advances in aircraft design. A total of 28 fixed wing aircraft and 15 airships were lost by the German Imperial Air Service and Navy during raids on the UK mainland during WWI (Wessex Archaeology 2009: 65) and a further 34 aircraft from the British Home Defence Squadrons are also recorded to have been lost during this period (Holyoak 2002: 659). It is possible that some of these losses occurred at sea, particularly within regions that attracted intense aircraft hostility such as the East Coast. Over 30 RAF bases, air stations and landing grounds dating to WWI were established in the county of Lincolnshire. Examples include RAF Anwick, south-east of Lincoln, which opened in October 1916 as a Royal Flying Corps aerodrome and RAF College Cranwell, which opened in 1916 for the purpose of training naval officers to fly aircraft.

5.6.6 During the interwar period, civil aviation increased significantly, with overseas services established to a number of European and worldwide destinations (Wessex Archaeology 2009: 16). The Department of Transport's Air Accident Investigation Branch (AAIB) records 20 civil aircraft losses at sea between 1920 and 1939, though this is not regarded as being a comprehensive record (Wessex Archaeology 2009: 65). Technological advances in aircraft design during this period meant that the low-powered wood and cloth biplanes of the early 20th century had been replaced by high-powered monoplanes made of aluminium by 1939 (Wessex Archaeology 2009: 65).

5.6.7 During WWII, aircraft activity increased dramatically and the highest potential for aircraft material on the seafloor is from this period. By WWII, aircraft were more heavily built and therefore material from their crash sites is more likely to survive in the archaeological record.

5.6.8 During WWII airpower became increasingly important at a strategic and operational level. Forming the frontier between the Allies and Axis, the North Sea became a significant focus for a high volume of aviation activity in WWII with hostile aircraft activity particularly concentrated off the east and south coasts of England (Wessex Archaeology 2008b: 16). Numerous RAF airfields were established in Lincolnshire during WWII. One such example is RAF Strubby, located 2.9m north of Alford, Lincolnshire, and was the most easterly of Lincolnshire's airfields. Air-sea rescue missions undertaken by Coastal Command took place from RAF Strubby, although it also served as an offensive base. Many aircraft from this RAF station and others in the country are likely to have flown eastwards overseas as part of the war effort.

5.6.9 The *Aircraft Crash Sites at Sea* project (ALSF 5223; Wessex Archaeology 2008b) considered a selection of sources which may be considered to indicate the potential for aircraft remains of this period to exist within the submarine cable corridor. One of the most complete sources of information was provided by published aviation researcher Ross McNeill, who identified 11,090 RAF aircraft losses in the North Atlantic, North Sea, English Channel, Irish Sea and Biscay areas between 1939 and 1990, the majority of which occurred in WWII (Wessex Archaeology 2008b: 18). Of these, some 118 are

thought to have occurred off the coast of Lincolnshire. While Wessex Archaeology cannot verify the accuracy of the data supplied by McNeill, it was collated through a systematic study based on both primary and secondary sources and suggests a high volume of potential aircraft crash sites within the submarine cable corridor. A review of WWII Air/Sea Rescue Operations maps also suggest a high density of aircraft off Lincolnshire. Although the mapped locations of these operations are not necessarily reliable, the locations provide a useful guide to the general distribution and potential density of aircraft crash sites within the submarine cable corridor.

5.6.10 After WWII, there is still potential for aircraft to have been lost in the area, however any military losses during this period are more likely to have been lost due to training accidents rather than combat operations (Wessex Archaeology 2008b: 66), and civilian losses are likely to have been reported and recorded.

Recorded Losses

5.6.11 There are two Recorded Losses for aircraft casualties listed by the NRHE within 2 nm of the submarine cable corridor. These aircraft date to WWII and comprise one British and one German aircraft, summarised in **Table 12** and detailed in **Appendix VIII**.

Table 12: Documented aircraft losses – based on NRHE data

NRHE ID	Name	Year Lost	Nationality
1401347	Heinkel HE111H-5 (3554) A1+CH	1940	German
1356378	Lancaster Mk III JB229	1943	British

5.6.12 These aircraft are known to have crashed offshore and their records signify the potential for hitherto unknown aircraft remains to exist on the seafloor within the submarine cable corridor. Further Recorded Losses for aircraft casualties are recorded within the wider area, information on which is held by Wessex Archaeology and can be provided on request.

Overview of Potential

5.6.13 There is potential for the presence of aviation material dating from the early 20th century until more recent times, with a concentration dating to the World Wars and in particular WWII. Discoveries may occur anywhere within the submarine cable corridor, but potential may increase nearer the coastlines.

5.6.14 The key areas of aviation potential that may be uncovered within the submarine cable corridor are summarised in **Table 13**.

Table 13: Summary of key areas of aviation potential

Period	Summary
Pre-1939	Minimum potential for material associated with the early development of aircraft. Aircraft of this period may represent early construction techniques (e.g. those constructed of canvas covered wooden frames) or may be associated with the mass-production of fixed wing aircraft in large numbers during WWI.
	Minimum potential for material associated with the development of civil aviation during the 1920s and 1930s, associated with the expansion of civilian flight from the UK to a number of European and worldwide destinations.
1939 to 1945	Very high potential for WWII aviation remains, particularly as the east coast acted as a hub for hostile activity. Aircraft of this period are likely to be representative of technological innovations propelled by the necessities of war which extended the reliability and range of aircraft. This potential is signified by the two aircraft Recorded Losses outlined above.
Post-1945	Potential for aviation remains associated with military activities dominated by the Cold War, the evolution of commercial travel and recreational flying and the intensification of offshore industry (including helicopter remains). Aircraft of this period may be representative of advances in aerospace engineering and the development of the jet engine

6 ARCHAEOLOGICAL BASELINE: HISTORIC SEASCAPE CHARACTERISATION

6.1.1 As part of the National Heritage Protection Plan (NHPP), Historic England (formerly English Heritage), commissioned an Historic Seascape Characterisation (HSC) for the East Yorkshire to Norfolk, and the work was undertaken by Newcastle University (Newcastle University 2014). The project aimed to complete strategic-level HSC in accord with the national HSC Method that extends and applies the principles already in use for Historic Landscape Characterisation (HLC) to the coast and seas.

6.1.2 The method assesses and defines areas with HSC types that promote an understanding of historic trends and processes in order to inform the sustainable management of change over time. This is achieved by addressing the multi-level character of the sea by splitting the marine zone into four tiered levels; the sea surface, the water column, the sea floor and the sub-sea floor. The characterisation is GIS-based, enabling key characteristics within the submarine cable corridor to be identified, and are summarised below.

6.1.3 The known and potential prehistoric, maritime and aviation heritage assets that form part of the HSC have been discussed in the relevant baseline characterisations above. The character descriptions below refer only to the cultural processes which have shaped the historic seascape of the submarine cable corridor.

6.2 HSC assessment

6.2.1 The primary cultural processes which characterise the submarine cable corridor are shown in **Table 14**.

Table 14: HSC - primary cultural processes in the submarine cable corridor

Present Broad Character Types	Present Character Sub-Types
Fishing	Bottom trawling
	Drift netting
	Fishing ground
	Longlining
	Potting
	Seine netting
Military	Aggregate dredging
Industry	Hydrocarbon installation
	Hydrocrabon pipeline
	Military practice area
Communications	Submarine telecommunications cable
Navigation	Navigation route
Cultural topography	Sand banks with sand waves
Enclosed land	Reclamation from wetland

7 VALUE AND SENSITIVITY

7.1 Introduction

7.1.1 Based on information available to date, the marine archaeological baseline environment for the submarine cable corridor can be considered to comprise three wreck sites and the potential for discovering material relating to seabed prehistory, maritime archaeology and aviation archaeology. This section identifies the value and sensitivity of the known and potential heritage assets summarised in the baseline assessment above.

7.1.2 The nature of the marine archaeological resource is such that there is often a high level of uncertainty regarding the presence/absence, distribution, extent and nature of archaeological remains on the seafloor. As a precautionary measure, unknown potential cultural heritage assets are therefore considered to be of **high** sensitivity and **high** value.

7.2 Seabed Prehistory

Value

7.2.1 Although there are no records of any known prehistoric sites from offshore contexts within the submarine cable corridor, there is significant potential for the presence of as yet undiscovered *in situ* prehistoric sites and finds, and a high potential for isolated derived finds in a secondary context. The values assigned to these potential heritage assets are outlined in **Table 15**.

Table 15: Value of seabed prehistory heritage assets

Asset Type	Definition	Value
Potential *in situ* prehistoric sites	Primary context features and associated artefacts and their physical setting (if found)	High
	Known submerged prehistoric sites and landscape features with the demonstrable potential to include artefactual material	High
Potential submerged landscape features	Other known submerged palaeolandscape features and deposits likely to date to periods of prehistoric archaeological interest with the potential to contain *in situ* material	High
Potential derived Prehistoric finds	Isolated discoveries of prehistoric archaeological material discovered within secondary contexts	Medium
Potential palaeoenvironmental evidence	Isolated examples of palaeoenvironmental material	Low
	Palaeoenvironmental material associated with specific palaeolandscape features or archaeological material	High

7.2.2 On the basis of their age and rarity in a marine context, all *in situ* Palaeolithic and Mesolithic material will be of high archaeological value. The guidance for planning authorities and developers on *Identifying and Protecting Palaeolithic Remains* (English Heritage 1998) notes that sites containing certain forms of Palaeolithic material are so rare in Britain that they should, whenever possible, remain undisturbed.

7.2.3 In the event that prehistoric archaeological material discovered offshore is found *in situ* it should be considered of particularly high archaeological importance. As such, the features and deposits which have the potential to contain within them *in situ* material should be considered as **high** value assets.

7.2.4 Prehistoric archaeological material discovered within secondary contexts also has the potential to provide valuable information on patterns of human land use and demography in a field of study which is still little understood and rapidly evolving (Hosfield and Chambers 2004). They are, however, by their very nature derived and, as such, isolated prehistoric finds should be regarded as **medium** value assets.

7.2.5 Palaeoenvironmental evidence in the context of an *in situ* prehistoric site (if found) will be of **high** value. However, as there are no known prehistoric sites within the submarine cable corridor, isolated discoveries of palaeoenvironmental material should be considered of low value for the purpose of this assessment. Although the scientific potential of this material, in association with the assessment of palaeogeographic features and palaeolandscapes is high, particularly with regards to the submerged landscape of the Dogger Bank, its sensitivity as a heritage asset in itself is low.

7.3 Maritime

Value

7.3.1 The perceived value assigned to an individual wreck site is, to a large degree, site specific. A vessel may be considered of special interest on the basis of any number of interrelating integral and relative factors (see discussion on significance criteria methodology in section 3.5). Those regarded as being of special interest may further be designated under the Protection of Wrecks Act 1973 or the Protection of Military Remains Act 1986.

7.3.2 There are no wrecks with statutory designations within the UK element of the submarine cable corridor.

7.3.3 There are three wreck sites and the potential for further wrecks or maritime-related debris to exist within the submarine cable corridor. The values assigned to these heritage assets are outlined in **Table 16**.

Table 16: Value of maritime heritage assets

Asset Type	Definition		Value
Known wrecks	Named wrecks (A1)	*Rebono* (Probably) (**7059**) - well-preserved average vessel	Medium
	Unknown wrecks (A1; **7003** and **7004**)		High
Additional anomalies	Anomlaies identified by the geophysical assessment that could be of anthropogenic origin, totalling 254 (A2)		
Potential wrecks	Wrecks within the submarine cable corridor that are yet to be discovered		High
Potential derived maritime finds	Isolated artefacts lost from a boat or ship or moved from a wreck site		Medium

7.3.4 The *Rebono* (**7059**) is recorded in the UKHO as being well-defined and intact. It was a trawler on a 'fishing and return' trip from Grimsby at its time of loss, having been mined on the 23rd September 1914. The *Assessing Boats and Ships 1860-1950* project (Wessex Archaeology 2011c-f) revealed fishing vessels to be the third most represented vessel-type (after cargo and military vessels) in the known wreck resource in England's territorial waters for the period 1914 to 1938, with trawlers being the most represented fishing vessel therein. Despite this, local and offshore fishing industries are much less visible in

the archaeological record for the period 1914 to 1938. Many of the trawlers lost during this period were requisitioned by the Admiralty, performing minesweeping duties rather than the fishing activities that they were initially designed for. Many parts of the North Sea were closed to commercial fishing during WWI.

7.3.5 The *Assessing Boats and Ships 1860-1950* project revealed that of all known wrecks lost in England's territorial waters for the period 1914-1938, just six were on 'fishing and return' trips, three of which operated out of Grimsby or Kingston upon Hull (Wessex Archaeology 2011d: 54) (figures correct as of May 2009). Although more such vessels are likely to have been lost offshore and charted beyond England's 12 nm territorial waters, as signified by the *Rebono* itself, these statistics provide an indication which enables the wreck to be better regarded against the known wreck resource. On this basis, **7059** is regarded as a **medium** value wreck site as it is overall, considered to represent an average wreck example with moderate potential to contribute to knowledge and understanding. This value is also based on the ability of the wreck to make a distinctive contribution in terms of its integral special interest, as well as having relative merit in comparison to other wrecks of the period. The factors which have led to this wreck site being regarded of medium value are as follows:

- *Integral Factors:*
  - *Association: **7059** is a wreck site considered to be of regional importance through its association with a fishing port (Grimsby) whose development was largely founded on late 19th century prosperity produced by the increasing use of steam fishing boats and the exploitation of new trawling grounds around Dogger Bank.*
- *Relative Factors:*
  - ***Rarity**: **7059** is trawler used for fishing activities at its time of loss and is therefore a wreck type considered to be relatively rare in the known marine archaeological resource;*
  - ***Representativeness**: **7059** represents the fishing industries of WWI, an industry somewhat underrepresented in the known resource due to the paucity of information relating to the use of fishing vessels in fulfilling the roles for which they were intended;*
  - ***Diversity**: **7059** represents a vessel used for an activity typical of peace-time during a period dominated by vessels operating for the war effort and therefore can be considered to contribute towards reflecting a range of activities which occurred during WWI;*
  - ***Survival**: **7059** is recorded by the UKHO as being well-defined and intact; and*
  - ***Setting and Context**: **7059** may attain additional interest through its association with Grimsby whose development was largely based the increasing use of steam propelled fishing vessels, a technological innovation which changed the face of England's shipping in the 19th and 20th centuries and a theme central to an understanding of this period as a whole.*

7.3.6 For all unknown wrecks, there is insufficient data to assess the value of each individual wreck. As such, all wreck sites must be considered to have archaeological value, to a greater or lesser degree and, in accordance with the precautionary approach, must be considered as high value assets. Similarly, as the value of potential wrecks cannot be evaluated until they are discovered, potential wrecks of all periods should be expected to be of **high** value.

7.3.7 As there is insufficient information to assess the value of each individual unidentified anomaly identified in the geophysical assessment (A2), all of these additional anomalies must be considered to have **high** archaeological value until more information becomes available.

7.3.8 Derived artefacts are likely to be of limited archaeological interest as individual discoveries. However, a concentration of seemingly isolated finds within an area may signify the presence of a wreck site, historical shipping routes or maritime battlegrounds. On this basis, isolated maritime finds are considered to be of **medium** value.

7.4 Aviation

Value

7.4.1 There are no known aircraft crash sites in the UK element of the submarine cable corridor. Nonetheless, there is the potential for aircraft or aircraft-related debris to exist on the seafloor of submarine cable corridor. The values assigned to these heritage assets are outlined in **Table 17**.

Table 17: Value of aviation heritage assets

Asset Type	Definition	Value
Additional anomalies	Anomalies identified by geophysical assessment that could be of anthropogenic origin totalling 254 (A2).	High
Potential aircraft	Aircraft within the submarine cable corridor that are yet to be discovered.	High
Potential derived aviation finds	Isolated artefacts lost from an aircraft or moved from a crash site.	Medium

7.4.2 Aircraft are considered to have significance for remembrance and commemoration, but also have an implicit heritage value as historic artefacts, providing information on the aircraft itself and also the circumstances of its use and loss (English Heritage 2002: 2). Furthermore, all aircraft lost while in military service are automatically protected under the Protection of Military Remains Act 1986. On this basis, all potential aircraft sites are considered to be of **high** archaeological value.

7.4.3 It is also conceivable that any of the 254 unidentified geophysical anomalies could be identified as aircraft crash sites, and subsequently are presently considered of **high** archaeological value.

7.4.4 Isolated aircraft finds are considered as being of **medium** archaeological value as they may provide insight into patterns of historical aviation across the submarine cable corridor or indicate the presence of uncharted aircraft crash sites.

7.5 Historic Seascape Character

Value

7.5.1 The local seascape characters located around and within the UK element of the submarine cable corridor are considered to be of **medium** archaeological value due to the area's important and prolonged maritime history and its continued use today.

7.5.2 The HSC of the UK element of the submarine cable corridor will remain predominantly the same whilst the project is in operation, with the inclusion of a new element into this character; offshore submarine HVDC cable. Once the project is decommissioned, this character will no longer be part of the seascape of the area.

8 ENVIRONMENTAL APPRAISAL AND RECOMMENDATIONS

8.1 High Level Environmental Impact Assessment

8.1.1 This section presents a high level review of the EIA used to determine the significance of the effects of the preparation, installation, operation, maintenance and decommissioning elements of the project. There is no guidance that specifically refers to laying interconnector cables, however, as cable laying is a routine element of offshore wind farm construction, the impact assessment refers to guidance developed for the Offshore Renewable Energy sector (COWRIE 2007, 2008, 2011). The assessment has also been based on professional archaeological judgement and best practice that has been applied to other consented cable routes.

8.1.2 Offshore developments can affect heritage assets in two ways:

- *from the direct effect of the physical siting of the project; and*
- *from indirect changes to the physical marine environment.*

8.1.3 Impacts to heritage assets and their historic environment occur as a result of changes to their physical environment in terms of loss and/or degradation, which can subsequently reduce the significance of a heritage asset and its wider historic environment. The management and mitigation of such change is based on the principle that archaeological assets are finite, non-renewable and cannot adapt, tolerate or recover from direct impacts.

8.1.4 Heritage assets may be buried within seabed sediments or may rest upon the seafloor, either with or without height. As such, direct impacts to such assets can occur during any development or related activity that makes contact with the seafloor or cuts through seabed deposits. Heritage assets with height, such as wrecks, may also be impacted by development or activities that occur within the water column.

8.1.5 The implementation of the marine element of the project is anticipated to entail the following sources of ground disturbance:

- *clearance of boulders and large stones using a plough, creating a swathe up to 10 m wide;*
- *pre-lay grapnel run to remove debris on the surface of the seabed, penetrating to a depth of c. 1 m with a maximum width of 200 mm;*
- *pre-sweeping sandwaves to reduce their height using trailing suction hopper dredgers up to a maximum width of 20 m, with the spoil being redeposited in the vicinity;*
- *survey and clearance of UXO situated within the submarine cable corridor;*
- *laying marine cables using the following options dependent on seabed type – plough, jet trenching, and/or mechanical trenching;*
- *backfilling of cable trenches and protection/stabilisation of unburied marine cables using either rock placement (deployed using either side dumping, split hopper, or flexible fall pipe mechanisms), application of concrete mattresses, or installation of cast iron shells;*
- *scour associated with the disturbances listed above; and*
- *use of anchors on vessels associated with the installation, maintenance and decommissioning phases of the project.*

8.1.6 The activities listed above may result in impacts that have potential direct and/or indirect effects on marine archaeological heritage assets. The activities and anticipated effects are summarised in **Table 18**.

Table 18: Impact types and potential effects on marine archaeological heritage asset

Activity	Anticipated effects on archaeological asset	Impact type
Seabed preparation - clearance of boulders and large stones; pre-lay grapnel run; and pre-sweeping sandwaves	Direct damage/destruction to assets lying on the seafloor and buried within the shallower seabed sediments	Direct
UXO survey and clearance	Direct damage/destruction to assets located within close proximity to UXO	Direct
Cable burial using ploughing, jet trenching and/or mechanical trenching methods.	Direct damage/destruction to assets, and/or their physical setting, lying on the seafloor and buried within the seabed sediments.	Direct
Laying marine cables	Direct damage/destruction to assets lying on the seafloor.	Direct
Installation of cable protection (where burial is not possible) using cast-iron shells, concrete mattresses and/or rock-berms.	Direct damage/destruction to assets, and/or their physical setting, lying on the seafloor and buried within the seabed sediments.	Direct
	Potential scour and plume effects resulting in increased protection to, or deterioration of, assets in the vicinity.	Indirect
Use of anchors by vessels during installation, scheduled and unplanned maintenance works and decommissioning works.	Localised damage/destruction to assets, and/or their physical setting, lying on the seafloor and buried within the seabed sediments.	Direct
Deployment of large vessels during construction and decommissioning phases.	Potential displacement of sediment either affording increased protection to, or deterioration of, assets in the vicinity.	Indirect
Changes to the hydrodynamic and sedimentary regimes due to spoil removal and distribution caused by trenching operations.	Increased protection to, or deterioration of, assets resulting in a beneficial or adverse effect on assets in the vicinity.	Indirect
Changes to hydrodynamic and sedimentary regimes resulting from the removal of cables and associated scour protection as part of decommissioning works.	Increased protection to, or deterioration of, assets resulting in a beneficial or adverse effect on marine archaeological assets in the vicinity.	Indirect

8.2 Recommendations

8.2.1 There is the potential for the proposed Viking Link to impact as yet unknown heritage assets, including sites relating to seabed prehistory, wreck sites and aircraft remains situated within the UK element of the submarine cable corridor.

8.2.2 Mitigation is necessary to reduce, remove or offset the impacts on heritage assets and fall under three main categories: avoidance; reduction of impact; and remedying and offsetting. Prior to the project starting, any further planned archaeological work will be detailed within a Written Scheme of Investigation (WSI).

Avoidance

8.2.3 Avoidance is considered to represent the primary option with regards to mitigating impacts upon the marine archaeological resource. This is typically achieved through the implementation of Archaeological Exclusion Zones (AEZs) around known sites prohibiting any development activities to take place within its remit, or through the micrositing of the project design to avoid vulnerable heritage assets. It is recommended that the three recorded wreck sites (A1s) observed within the submarine cable corridor are subject to AEZs. The AEZs are recommended to be 50 m buffers around the extents of the wrecks as observed in the geophysical data. They are illustrated in **Figure 9 d** and **Figure 9 h**.

8.2.4 The remaining 254 anomalies were interpreted as A2s; uncertain origin of possible archaeological interest. Although no AEZs are recommended at this time, an avoidance strategy with respect to these anomalies is advised where possible. Further work may be necessary to ascertain the precise nature and archaeological potential of individual features should avoidance prove unfeasible. A protocol for reporting of archaeological discoveries may be implemented in the event of any material of archaeological potential being encountered during cable emplacement. Other similar protocols are already successfully undertaken for the offshore renewables and marine aggregates industries.

Reduction

8.2.5 Reduction of impact can be achieved by means of receiving prompt archaeological advice in the event of a discovery and by recording and conserving any objects that have been disturbed. In a marine environment, this is often achieved by means of implementing a protocol for reporting finds of archaeological interest. Such a protocol is designed to enable project staff to report any finds made in a manner that is convenient and effective. Should such finds be considered to indicate the presence of a site of archaeological interest, a temporary AEZ may be implemented until more data is available. Within an intertidal zone, this is typically achieved by means of a watching brief, which involves archaeological monitoring to take place during invasive groundworks to safeguard, to as great a degree as possible, any potential archaeological sites that may exist in this area.

8.2.6 Furthermore, a number of palaeogeographic features of archaeological potential have been identified along the marine cable corridor, and sediments of archaeological and palaeoenvironmental interest have been recovered within the geotechnical samples. Stage 1 and 2 assessments have been undertaken and are integrated into the geophysical interpretation. Based on the Stage 2 assessment results sub-samples were selected for palaeoenvironmental assessment, and dating (Stage 3 and 4). The Stage 3 and 4 investigatory assessments suggest that targeted palaeoenvironmental and geochronological assessment of high potential core material (retained in storage) could be undertaken. This would be aimed at enhancing the palaeoenvironmental and palaeogeographical understanding of landforms across the submarine cable corridor, especially with regards features such as Skate Hole and preserved organic deposits in Block 13 (**Figure 2** and **Figure 3**).

Remedying and Offsetting

8.2.7 Remedying and offsetting could include re-stabilising sites after they have been disturbed or recording sites that cannot be preserved.

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10 APPENDICES

Appendix I: Legislation, policy and guidance

Global policy and legislation

Legislation/Policy	Summary
The World Heritage Convention 1972	The Convention provides for the identification, protection, conservation and presentation of cultural and natural sites of 'outstanding universal value' for inscription on the World Heritage List. The Convention sets out the duties of States Parties in identifying potential sites and their role in protecting and preserving them. By signing the Convention, each country pledges to conserve not only the World Heritage sites situated on its territory, but also to protect its national heritage. The 1972 UNESCO World Heritage Convention was ratified by the UK in 1984 and the UK currently has 29 World Heritage Sites.
The United Nations Convention on the Law of the Sea 1982	UNCLOS 1982 was ratified by the UK in 1997. Article 149 applies only to those archaeological and historical objects that lie outside national jurisdiction and stipulates that 'all objects of an archaeological and historical nature found in the Area shall be preserved or disposed of for the benefit of mankind as a whole, particular regard being paid to the preferential rights of the State or country of origin, or the State of cultural origin, or the State of historical and archaeological origin'. Article 303 stipulates that 'states have the duty to protect objects of an archaeological and historical nature found at sea and shall co-operate for this purpose'. Article 303 also provides for coastal states to exert a degree of control over the archaeological heritage to 24 nm, though the UK has not introduced any measures to implement this right.
International Council of Monuments and Sites Charter on the Protection and Management of Underwater Cultural Heritage 1996 (the Sofia Charter)	The Charter upon which the Annex of the UNESCO Convention is largely based includes a series of statements regarding best practice, intending 'to ensure that all investigations are explicit in their aims, methodology and anticipated results so that the intention of each project is transparent to all'. The UK is a member of the International Council of Monuments and Sites.
UNESCO Convention on the Protection of the Underwater Cultural Heritage (2001)	The UNESCO Convention was concluded in 2001, and is a comprehensive attempt to codify the law internationally with regards to underwater archaeological heritage. The UK abstained in the vote on the final draft of the Convention, however, it has stated that it has adopted the Annex of the Convention, which governs the conduct of archaeological investigations, as best practice for archaeology. Although the UK is not a signatory, the convention entered into force on 2nd January 2009 having been signed or ratified by 20 member states.

European policy and legislation

Legislation/Policy	Summary
The European Convention on the Protection of the Archaeological Heritage (Revised) 1992 (The Valletta Convention)	The Articles of the Valletta Convention tackle various aspects. Article 1 deals with the inventorying and protection of sites and areas; Article 2 deals with the mandatory reporting of chance finds and providing for 'archaeological reserves' on land or underwater; Article 3 promotes high standards for all archaeological work undertaken by suitably qualified people; Article 4 requires the conservation of excavated sites and the safe-keeping of finds; and Article 5 is concerned with consultation that should take place between planning authorities and developers to avoid damage to archaeological remains. The Valletta Convention was ratified by the UK Government in 2000 and came into force in 2001. The convention binds the UK to implement protective measures for the archaeological heritage within the jurisdiction of each party, including sea areas. Insofar as the UK exerts jurisdiction over the Continental Shelf, then it would appear that the provisions of the Valletta Convention apply to that jurisdiction.
The European Landscape Convention 2000	The European Landscape Convention became binding on the UK from 1 March 2007. Its principal clauses require the Government to protect and manage landscapes and to integrate landscape into regional and town planning policies including its cultural, environmental, agricultural, social and economic policies. The Convention applies to the entire territory of the UK and includes land, inland water and marine areas. It is not regarded as applying to sea areas regulated by the UK that lie beyond territorial waters.
European Directives for Environmental Impact Assessments (2014/52/EU)	The EIA Directive entered into force on 15 May 2014 to simplify the rules for assessing the potential effects of projects on the environment. The newly amended directive replaces former directives (85/337/EEC; 97/11/EC; 2003/35/EC; 2009/31/EC; 2011/92/EU) and Member States must apply these from 16 May 2017 at the latest.

United Kingdom policy and legislation

Legislation/Policy	Summary
Ancient Monuments and Archaeological Areas Act 1979 (as amended)	Scheduled Monuments and Archaeological Areas of Importance (AAIs or their equivalent) are afforded statutory protection and the consent of Secretary of State (DCMS), as advised by Historic England, is required for any works. This Act is primarily used to protect terrestrial site, but has also been used to protect underwater sites.
NPPF: Conserving and enhancing the historic environment. Para. 128	In determining applications, local planning authorities should require an applicant to describe the significance of any heritage assets affected, including any contribution made by their setting. The level of detail should be proportionate to the assets' importance and no more than is sufficient to understand the potential impact of the proposal on their significance. As a minimum the relevant historic environment record should have been consulted and the heritage assets assessed using appropriate expertise where necessary. Where a site on which development is proposed includes or has the potential to include heritage assets with archaeological interest, local planning authorities should require developers to submit an appropriate desk-based assessment and, where necessary, a field evaluation.
NPPF: Conserving and enhancing the historic environment. Para. 129	Local planning authorities should identify and assess the particular significance of any heritage asset that may be affected by a proposal (including by development affecting the setting of a heritage asset) taking account of the available evidence and any necessary expertise. They should take this assessment into account when considering the impact of a proposal on a heritage asset, to avoid or minimise conflict between the heritage asset's conservation and any aspect of the proposal.
NPPF: Conserving and enhancing the historic environment. Para. 132	When considering the impact of a proposed development on the significance of a designated heritage asset, great weight should be given to the asset's conservation. The more important the asset, the greater the weight should be.
NPPF: Conserving and enhancing the historic environment. Para. 135	The effect of an application on the significance of a non-designated heritage asset should be taken into account in determining the application. In weighing applications that affect directly or indirectly non designated heritage assets, a balanced judgement will be required having regard to the scale of any harm or loss and the significance of the heritage asset.
NPPF: Conserving and enhancing the historic environment. Para. 137	Local planning authorities should look for opportunities for new development within Conservation Areas and World Heritage Sites and within the setting of heritage assets to enhance or better reveal their significance. Proposals that preserve those elements of the setting that make a positive contribution to or better reveal the significance of the asset should be treated favourably.
NPPF: Conserving and enhancing the historic environment. Para. 139	Non-designated heritage assets of archaeological interest that are demonstrably of equivalent significance to scheduled monuments, should be considered subject to the policies for designated heritage assets.
NPPF: Conserving and enhancing the historic environment. Para. 141	Local planning authorities should make information about the significance of the historic environment gathered as part of plan-making or development management publicly accessible. They should also require developers to record and

Legislation/Policy	Summary
	advance understanding of the significance of any heritage assets to be lost (wholly or in part) in a manner proportionate to their importance and the impact, and to make this evidence (and any archive generated) publicly accessible.
Protection of Wrecks Act 1973: Section One	Wrecks and wreckage assessed to be of historical, archaeological or artistic value can be protected by way of site specific designation. It is an offence to carry out certain activities within a defined area surrounding a designated wreck, unless a licence for those activities has been obtained through Historic England.
Protection of Wrecks Act 1973: Section Two	This provides protection for wrecks that have been designated as dangerous due to their contents and is administered by the Maritime and Coastguard Agency through the Receiver of Wreck.
Protection of Military Remains Act 1986	Under the Protection of Military Remains Act 1986, all aircraft that have crashed whilst in military service are automatically protected. Maritime vessels (e.g. ships and boats) lost during military service are not automatically protected, although the MoD has powers to protect any vessel that was in military service when lost. The MoD can designate wrecks whose position is known as 'controlled sites' and can designate named vessels whose location is unknown 'protected places'. It is not necessary to demonstrate the presence of human remains for wrecks to be designated as either 'controlled sites' or 'protected places'.
Merchant Shipping Act 1995	This Act sets out the procedures for determining the ownership of underwater finds classified as 'wreck'; defined as any flotsam, jetsam, derelict and lagan found in or on the shores of the sea or any tidal water. It includes ship, aircraft, hovercraft, parts of these, their cargo or equipment. If any such finds are brought ashore, the salvor is required to give notice to the Receiver of Wreck that he/she has found or taken possession of them and, as directed by the Receiver, either hold them pending the Receiver's order or deliver them to the Receiver. The Act is administered by the Maritime and Coastguard Agency. Beyond the 12 nm limit, the Merchant Shipping Act 1995 covers wreck found or taken into possession outside UK waters, and stipulates that if brought into UK waters, finds must be reported to the Receiver of Wreck. The provisions of the Protection of Military Remains Act 1986 regarding Controlled Sites are applicable in international waters, though they are only enforceable with respect to British-controlled ships, British citizens and British companies.
Marine and Coastal Access Act 2009	Under this Act the UK was divided into marine planning regions with an associated plan authority responsible for preparing a marine plan for that area.
Overarching National Policy Statement for Energy (EN-1) (Department of Energy and Climate Change 2011a)	This National Policy Statement (NPS) sets out national policy for energy infrastructure, and the importance of archaeological assessment in the development process.
National Policy Statement for Renewable Energy Infrastructure (EN-3) (Department of Energy and Climate	This NPS, taken together with the overarching NPS (EN-1), provides the primary basis for decisions by the Planning Inspectorate on renewable energy infrastructure development applications. It sets out the importance of the historic environment and the ways it can be impacted by development, outlines guidance for application assessments,

Legislation/Policy	Summary
Change 2011b)	Planning Inspectorate decision making and mitigation measures.
National Policy Statement for Electricity Networks Infrastructure (EN-5) (Department of Energy and Climate Change 2011c)	This NPS, taken together with the overarching NPS (EN-1) provides for decision making on above ground electricity lines of 132kV and over and other electricity networks associated with a Nationally Significant Infrastructure Project e.g. substations and converted stations.
Marine Policy Statement 2011	The Marine Policy Statement was jointly published by all UK Administrations in March 2011 as part of a new system of marine planning being introduced across UK seas.
Enterprise and Regulatory Reform Act 2013	This Act was given Royal Assent, and has implications for Listed Buildings and Conservation Areas. A provision for the reduction of legislative burdens, it includes heritage planning regulation (Schedule 17), with amendments to the National Heritage Act 1983, the Town and Country Planning Act 1990, and the Planning (Listed Buildings and Conservation Areas) Act 1990.

Guidance

Code of Practice for Seabed Developers, Joint Nautical Archaeology Policy Committee (Joint Nautical Archaeology Policy Committee 2006)	This voluntary Code provides a framework for seabed developers similar to the principles found in current policy and practice on land. The aim of the Code is to ensure a best practice model for seabed development. The Code offers guidance to developers on issues such as risk management and legislative implications.
Standard and guidance for historic environment desk-based assessment (Chartered Institute for Archaeologists 2014)	This guidance seeks to define good practice for the execution and reporting of desk-based assessment, in line with the by-laws of the Chartered Institute for Archaeologists. The standard and guidance was formally adopted as approved practice at the Annual General Meeting of the Institute held on 14 October 1994. This revision recognises the new Chartered status of the Institute.

Appendix II: Terminology

Glossary

The terminology used in this assessment follows definitions contained within the UK's *National Planning Policy Framework* (Department for Communities and Local Government 2012: 50-57):

Archaeological interest	There will be archaeological interest in a heritage asset if it holds, or potentially may hold, evidence of past human activity worthy of expert investigation at some point. Heritage assets with archaeological interest are the primary source of evidence about the substance and evolution of places, and of the people and cultures that made them.
Conservation (for heritage policy)	The process of maintaining and managing change to a heritage asset in a way that sustains and, where appropriate, enhances its significance.
Designated heritage asset	A World Heritage Site, Scheduled Monument, Listed Building, Protected Wreck Site, Registered Park and Garden, Registered Battlefield or Conservation Area designated under the relevant legislation.
Development Plan	This includes adopted Local Plans, neighbourhood plans and the London Plan, and is defined in section 38 of the Planning and Compulsory Purchase Act 2004.
Environmental Impact Assessment	A procedure to be followed for certain types of projects to ensure that decisions are made in full knowledge of any likely significant effects on the environment.
Heritage asset	A building, monument, site, place, area or landscape identified as having a degree of significance meriting consideration in planning decisions, because of its heritage interest. Heritage asset includes designated heritage assets and assets identified by the local planning authority (including local listing).
Heritage coast	Areas of undeveloped coastline which are managed to conserve their natural beauty and, where appropriate, to improve accessibility for visitors.
Historic environment	All aspects of the environment resulting from the interaction between people and places through time, including all surviving physical remains of past human activity, whether visible, buried or submerged, and landscaped and planted or managed flora.
Historic environment record	Information services that seek to provide access to comprehensive and dynamic resources relating to the historic environment of a defined geographic area for public benefit and use.
Setting of a heritage asset	The surroundings in which a heritage asset is experienced. Its extent is not fixed and may change as the asset and its surroundings evolve. Elements of a setting may make a positive or negative contribution to the significance of an asset, may affect the ability to appreciate that significance or may be neutral.
Significance (for heritage policy)	The value of a heritage asset to this and future generations because of its heritage interest. That interest may be archaeological, architectural, artistic or historic. Significance derives not only from a heritage asset's physical presence, but also from its setting.

Chronology

Where referred to in the text, the main archaeological periods in Britain are broadly defined by the following date ranges:

Period	**Date Range**
Palaeolithic	c. 900,000 BP– 9500 BC
Early Post-glacial	9500 – 8500 BC
Mesolithic	8500 – 4000 BC
Neolithic	4000 – 2200 BC
Bronze Age	2200 – 700 BC
Iron Age	700 BC – AD 43
Romano-British	AD 43 – 410
Early Medieval	410 – 1085
Medieval	1085 – 1500
Post-medieval	1500 – 1800
19th century	1800 – 1899
Modern	1900 – present day

Appendix III: Priority vibrocore samples

Borehole ID	Archaeological priority	Approx. target depth	Notes
B12-06	Medium	4 m - 6 m	Strong reflectors of possible interest.
B12-12	Medium	3 m - 5.5 m	Shallow strong reflector of possible interest.
B12-13	Medium	Seabed - 3 m	Shallow strong reflector of possible interest.
B12-17	Medium	Seabed - 2 m	Upper unit of possible interest.
B12-24	Medium	Seabed - 5.5 m	Palaeochannel of possible interest.
B12-27	Medium	Seabed - 5 m	Palaeochannel of possible interest.
B12-30	Medium	Seabed - 2 m	Upper units of possible interest.
B12-31	Medium	Seabed - 4 m	Upper units of possible interest.
B12-32	Medium	Seabed - 5.5 m	Palaeochannel of possible interest.
B12-33	Medium	Seabed - 2 m	Upper units of possible interest.
B12-36	Medium	Seabed - 5 m	Upper units of possible interest.
B12-37	Medium	Seabed - 5 m	Upper unit of possible interest.
B12-38	Medium	Seabed - 6 m	Upper unit of possible interest.
B12-39	Medium	Seabed - 2 m	Upper unit/strong reflector of possible interest.
B12-40	Medium	1 m - 5 m	Layered unit of possible interest.
B12-44	Medium	2 m - 9 m	Palaeochannel beneath top unit of possible interest.
B12-45	Medium	2 m - 7 m	Possible palaeochannel/layered unit beneath top unit.
B13-03	High	2 m - 5 m	Palaeochannel beneath top unit, potentially of high interest.
B13-04	High	1.5 m - 3.5 m	Small palaeochannel beneath top unit, potentially of high interest.
B13-05	Medium	Seabed - 2 m	Upper unit/strong reflector of possible archaeological interest.
B13-06	High	2 m - 5 m	Possible palaeochannel beneath top unit, potentially of high interest.
B13-08	Medium	Seabed - 2.5 m	Upper unit/strong reflector of possible archaeological interest.
B13-09	Medium	Seabed - 2.5 m	Upper unit/strong reflector of possible archaeological interest.
B13-10	Medium	Seabed - 2.5 m	Upper unit/strong reflector of possible archaeological interest.
B13-15	Medium	Seabed - 5 m	Upper unit possibly of interest.
B13-16	Medium	Seabed - 3.5 m	Upper unit possibly of interest.
B13-17	Medium	Seabed - 1 m	Shallow unit possibly of interest.
B13-18	Medium	Seabed - 3 m	Shallow and underlying unit possibly of interest.

Borehole ID	Archaeological priority	Approx. target depth	Notes
B13-19	Medium	Seabed - 2.5 m	Upper unit possibly of interest.
B13-29	Medium	Seabed - 12 m	Shallow unit of potential interest, and possible palaeochannel.
B13-R-01	Medium	2.5 m - 5 m	Upper unit beneath bedform of possible interest.
B13-R-02	High	Seabed - 4 m	Shallow palaeochannel of possible high interest.
B14-02	High	Seabed - 2 m	Sediments in base of Silver Pit, potentially of high interest.
B14-03	High	Seabed - 5 m	Sediments in base of Silver Pit, potentially of high interest.
B14-11	Medium	Seabed - 1.5 m	Shallow strong reflectors possibly of interest.
B14-12	Medium	1 m - 2.5 m	Shallow strong reflectors possibly of interest.
B14-15	Medium	Seabed - 2 m	Possible palaeochannel.
B14-17	Medium	Seabed - 2.5 m	Possible layered unit.
B14-21	Medium	Seabed - 7 m	Possible large palaeochannel.
B14-22	Medium	Seabed - 11 m	Possible large palaeochannel.
B14-26	Medium	Seabed - 4 m	Possible small palaeochannel/layered unit.
B14-34	Medium	Seabed - 5 m	Possible palaeochannel.
B15-01	Medium	Seabed - 2 m	Shallow sediments possibly of interest.
B15-02	High	Seabed - 3 m	Palaeochannel of potentially of high interest.
B15-04	Medium	Seabed - 2 m	Layered 'bank' sediments possibly of interest
B15-06	Medium	0.5 m - 2.5 m	Shallow sediments under sand possibly of interest.
B15-07	Medium	1 m - 2.5 m	Shallow sediments under sand possibly of interest.
B15-08	Medium	Seabed - 4 m	Shallow sediments possibly of interest.
B15-09	High	Seabed - 4.5 m	Palaeochannel of potentially of high interest.
B15-10	Medium	Seabed - 3 m	Shallow reflectors/possible palaeochannel of potential interest.

Appendix IV: Stage 2 Geoarchaeological Assessment Vibrocores

Co-ordinates are in ETRS89 UTM Zone 30N.

Borehole ID	Easting	Northing	Elevation (m LAT)	Archaeological priority	Approx. target depth	Samples in Storage	Depth to top (m)	Depth to base (m)	Notes
B12-31-VC	415018.15	5990338.4	-72.4	Medium	Seabed - 4 m	B12-31-VC, 2 Liner A	1.50	2.00	Upper units of possible interest. ***all available cores**
B12-32-VC	414117.09	5990108.98	-76.6	Medium	Seabed - 5.5 m	B12-32-VC, 2 Liner A	1.50	2.00	Palaeochannel of possible interest. ***all available cores**
B12-33-VC	413203.84	5990123.59	-75.5	Medium	Seabed - 2 m	B12-33-VC, 2 Liner B	1.50	2.00	Upper units of possible interest. ***all available cores**
B12-37-VC	410801.66	5989617.49	-77.1	Medium	Seabed - 5 m	B12-37-VC, 2 Liner A	1.00	1.50	Upper unit of possible interest. ***all available cores**
B12-38-VC	410214.14	5989500.46	-75.5	Medium	Seabed - 6 m	B12-38-VC, 2 Liner A	1.50	2.00	Upper unit of possible interest. ***all available cores**
B12-45-VC	400637.27	5987543.87	-45.9	Medium	2 m - 7 m	B12-45-VC, 3 Liner A	2.15	2.65	Possible palaeochannel/layered unit beneath top unit. ***all available cores**

Borehole ID	Easting	Northing	Elevation (m LAT)	Archaeological priority	Approx. target depth	Samples in Storage	Depth to top (m)	Depth to base (m)	Notes
B13-03-ARCH (duplicate cores: VCA, VC and VCB)	392863.41 392859.82 393750.26	5983314.94 5983316.43 5984073.41	-38.8 -38.7 -40.2	High	2m - 5m	B13-03-Arch-VCA, Liner 1	0.00	1.00	Palaeochannel beneath top unit, potentially of high interest. ***all available cores**
						B13-03-Arch-VCA, Liner 2	1.00	2.00	
						B13-03-Arch-VCA, Liner 3	2.00	3.00	
						B13-03-Arch-VCA, Liner 4	3.00	4.00	
						B13-03-Arch-VCA, 5 Bag A	4.08	4.20	
						B13-03-Arch-VC, Liner 1	0.00	0.35	
						B13-03-Arch-VCB, Liner 1	0.00	1.00	
						B13-03-Arch-VCB, Liner 2	1.00	1.95	
						B13-03-Arch-VCB, Liner 3	1.95	2.90	
						B13-03-Arch-VCB, Liner 4	2.90	3.15	
						B13-03-Arch-VCB, 5 Bag A	3.15	3.35	
B13-04-ARCH (duplicate cores: VC and VCA)	391010.62 391011.13	5981739.67 5981737.76	-38 -37.8	High	1.5m - 3.5m	B13-04-Arch-VC, Liner 1	0.00	1.00	Small palaeochannel beneath top unit, potentially of high interest. ***all available cores**
						B13-04-Arch-VC, Liner 2	1.00	1.90	
						B13-04-Arch-VCA, Liner 1	0.00	1.00	
						B13-04-Arch-VCA, Liner 2	1.00	2.00	
						B13-04-Arch-VCA, Liner 3	2.00	3.00	
						B13-04-Arch-VCA, Liner 4	3.00	3.79	
B13-06-VC	389538.56	5980483.85	-37.2	High	2m - 5m	B13-06-VC, Liner 2, 2 Arch A	1.00	1.50	Possible palaeochannel beneath top unit, potentially of high interest. ***core finishes @3m. OSL Sample taken (2.50-2.70m).**
						B13-06-VC, Liner 2, 2 Arch B	1.50	2.00	
						B13-06-VC, Liner 3, Arch 1	2.00	2.50	
						B13-06-VC, Liner 3, Arch 2	2.50	2.70	
						B13-06-VC, Liner 3, Arch 3	2.70	3.00	
B13-R-02-VC	366985.82	5964962.24	-35.1	High	Seabed - 4m	B13-R-02-VC, 2 Bag A	1.00	1.25	Shallow palaeochannel of possible high interest. ***all available cores - finishes @3m**
						B13-R-02-VC, 2 Bag C	1.50	1.75	
						B13-R-02-VC, 2 Bag D	1.75	2.00	
						B13-R-02-VC, Liner 3, 3 Arch A	2.00	2.50	

Borehole ID	Easting	Northing	Elevation (m LAT)	Archaeological priority	Approx. target depth	Samples in Storage	Depth to top (m)	Depth to base (m)	Notes
						B13-R-02-VC, Liner 3, 3 Arch B	2.50	3.00	
B14-02-VC	353864.2	5956587.83	-39.4	High	Seabed - 2m	B14-02-VC, 2 Bag A	1.00	1.30	Sediments in base of Silver Pit, potentially of high interest. ***all available cores. OSL Sample taken (1.30-1.50m)**
						B14-02-VC, 2 Liner A	1.30	1.50	
						B14-02-VC, Liner 3, 3 Arch A	2.00	2.50	
						B14-02-VC, Liner 3, 3 Arch B	2.50	3.00	
B14-03-VC	353680.23	5956412.1	-36.9	High	Seabed - 5m	B14-03-VC, 2 Bag B	1.35	1.70	Sediments in base of Silver Pit, potentially of high interest. ***all available cores**
						B14-03-VC, 2 Bag C	1.70	2.00	
						B14-03-VC, Liner 3	2.00	2.50	
B15-02-VC	325143.31	5924592.16	-8.4	High	Seabed - 3m	B15-02-VC, Liner 1	0.00	1.00	Palaeochannel of potentially of high interest. ***all available cores**
						B15-02-VC, Liner 2	1.00	2.00	
						B15-02-VC, Liner 3	2.00	3.00	
B15-09-R2-VCA	325630.21	5904991.45	-7.98	High	Seabed - 4.5m	B15-09-R2-VCA, Liner 1	0.00	1.00	Palaeochannel of potentially of high interest. ***cores available up to 6.00m, but require testing so unable to bring back on 10/08/16 visit**
						B15-09-R2-VCA, Liner 2	1.00	2.00	
						B15-09-R2-VCA, Liner 3	2.00	2.19	

Appendix V: Stage 2 Geoarchaeological Assessment Results

*high interest cores

Borehole	Depths (m)	Sediment description	Stratigraphical Interpretation
B13-06-VC	1.00-1.44	10YR 5/6 yellowish brown very fine – fine sand becoming slightly coarser down profile. Sharp lower boundary.	Holocene channel infill
	1.44-2.00	10YR 7/2 light brown medium-coarse sand. (15%) moderate bivalves <0.03m throughout, sand becomes coarser down profile. (10%) moderate sub-rounded stones <0.01m throughout. Sharp lower boundary.	
B13-R-02-VC	2.00-2.80	10YR 5/4 yellowish brown coarse sand-fine gravel. Clear lower boundary.	Holocene channel infill
	2.80-3.00	10YR 4/3 brown silty coarse sand with silt, fine gravel <0.03m and shell frags <0.03m throughout. Sharp lower boundary.	
B14-02-VC	2.00-3.00	10YR 7/1 light grey firm-stiff, massive + structureless clayey chalk.	Chalk
*** B13-03-ARCH VCA**	2-2.59	Fine to medium silty gravelly sand with occasional organics and burrows at 2.05-2.10 and occasional marine shell throughout. Clear lower boundary	Holocene channel infill
	2.59-3.00	Brown silty gravelly sand, sand is coarser than above. Fairly homogenous.	
***B13-03-ARCH VCA** (Mislabelled as ARCH VC)	3-3.04	Silty sand with occasional organics. Clear lower boundary.	Holocene channel infill
	3.04-3.17	Well sorted gravel with coarse to medium sand. Sharp lower boundary.	
	3.17-4.00	Very stiff sandy clay. Probable till.	Bolders Bank Fm. ?glacial till
***B13-03-ARCH VCB**	1.95-2.90	Silty gravelly sand with abundant marine shell. Gravel is rounded, no visible horizontal laminations. Occasional ?waterlogged rooty fragments.	Holocene channel infill
***B13-04-ARCH VC**	1-1.61	Fairly fine sand, occasional marine shell fragments. (Possible underwater sand dune) Clear lower boundary.	Modern marine sediments
	1.61-1.90	Fine to medium gravelly sand with occasional marine shell.	
***B13-04-ARCH VCA**	2-2.16	Medium to coarse rounded gravel. Sharp lower boundary.	Holocene channel infill
	2.16-2.31	Coarse to medium sand. Sharp lower boundary.	
	2.31-2.50	Shelly sand and gravel. Sharp lower boundary.	
	2.50-3.00	Very stiff sandy clay. Probable till.	Bolders Bank Fm. ?glacial till

Borehole	Depths (m)	Sediment description	Stratigraphical Interpretation
B13-04-ARCH VCA	3-3.79	Very stiff sandy clay, probable till.	Bolders Bank Fm. ?glacial till
***B15-02-VC**	2-2.30	Dark grey fine silty sand with occasional shell and rooty fragments (possibly not in situ) Clear lower boundary.	Holocene channel infill
	2.30-3.00	Very stiff sandy clay, probable till with some vertical roots at 2.29-2.50 ?Possible old soily layer.	Bolders Bank Fm. ?glacial till
B15-09-R2-VCA	1-1.70	Fine brown sand, coarsening slightly down profile. Clear lower boundary.	Modern marine sediments
	1.70-2.00	Gravelly sand, clast supported, fairly well sorted.	Bolders Bank Fm. ?glacial till

Appendix VI: Stage 3 Geoarchaeological Assessment – Plant macrofossil results

Key: A*** = exceptional, A** = 100+, A* = 30-99, A = >10, B = 9-5, C = <5; Sab/f = small animal/fish bones, Moll-t = terrestrial molluscs, Moll-f = aquatic molluscs; Analysis: C = charcoal, P = plant, M = molluscs, C14 = radiocarbon

Borehole/Sample	Depth (m)	Sample Vol. (L)	Uncharred vegetative plant parts	Uncharred other	Wood charcoal	Molluscs	Comments (material picked for c14)
B13-03-ARCH VCB	2.28-2.33	0.015	A*	C Ranunculus sp, indet ?seed	C	Marine	
B13-03-ARCH VCA	3.00-3.02	0.06	A** (Wood and broken down plant material)	B Cyperaceae + indet	C		Roundwood
B13-03-ARCH VCA	3.02-3.03	0.025	A** (Wood and broken down plant material)	B Cyperaceae + indet	C		Roundwood
B13-03-ARCH VCA	2.40-2.45	0.015	B (Broken down plant material)		C	Marine + Foramnifera	
B13-03-ARCH VCA	2.05-2.10	0.015	A** (Degraded wood and broken down plant material) *Geum* sp.	A Cyperaceae + indet	C	Marine	Roundwood
B15-02-VC	2.22-2.26	0.075	A* (Broken down plant materia and degraded wood frags)		C	Marine + Foramnifera	
B15-02-VC	2.29-2.33	0.03	A (Degraded wood frags)			Marine	Roundwood
B13-03- ARCH VCB	2.55-2.60	0.015	A (Degraded wood frags)			Marine	
B02-02-VC/5BAGD	4.75-5.0	1.7	A* (Broken down plant material and degraded wood frags)	C Cyperaceae, *Cenococcum geophilum*fungi sclerotia	C	A* Marine shell + Foramnifera	Marine shell
B02-03-VC/2BAGC	1.6-1.8	1.2	A (Broken down plant material and degraded wood frags)	-	-	A*** marine shell + some Foramnifera + Ostracods	Marine shell
B02-20-VC/2BAGC	1.7-2.0	1.6	A (Broken down plant material and	-	-	A** marine shell + some Ostracods	Marine shell

Borehole/Sample	Depth (m)	Sample Vol. (L)	Uncharred vegetative plant parts	Uncharred other	Wood charcoal	Molluscs	Comments (material picked for c14)
			degraded wood frags)				
B02-26-VC/3BAGC	2.6-3.0	2	A (Broken down plant material and degraded wood frags)	C *Cenococcum geophilum*fungi sclerotia	-	A marine shell + some ostracods	Marine shell
B06-03-VC/3BAGA	2.0-2.25	1	A* (Broken down plant material and degraded wood frags)	-	-	A** Marine shell + some ostracods + foranmifera	Marine shell
B06-03-VC/2BAGA	1.0-1.25	1	A* (Broken down plant material and degraded wood frags)	-	-	A** Marine shell + some ostracods + foranmifera	Marine shell
B06-24-VC/4BAGD	3.39-3.55	1	A*** (Broken down plant material and degraded wood frags)	A* (*Potamogeton* spp., Cyperaceae, *Ranunculus, Menyanthes trifoliata)*	-	C Marine shell	Roundwood (Marine shell kept as back up)
B06-30-VC/1BAGD	0.6-0.65	0.5	A*** (Broken down plant material and degraded wood frags)	A (*Ranunculus,*Cyperaceae, *Cenococcum geophilum* fungi sclerotia	C	B Marine shell + Foramnifera	Roundwood. (Marine shell and other material kept as back up)
B02-09-VC/1BAGE	0.9-1.0	0.5	A*** (Broken down plant material and degraded wood frags)	A (*Cenococcum geophilum* fungi sclerotia, Seeds)	-	-	*Rubus* seeds
B08-10-VC	1.05-1.20	1	A** (Broken down wood, wood pieces, including roundwod and degraded plant material)	A* Bog beans, Cenococcum geophilum fungi sclerotia, other aquatic seeds	C	Whole marine mollusc shells and frags	*Roundwood*
B08-16-VC	0.30-0.60	1.5	A** (Broken down wood, wood pieces, including roundwood and degraded plant material)	B Bog beans and other aquatic seeds	-	Whole marine mollusc shells and frags, Moll-f (Bithynia tentaculata operculum), Foramnifera	*Roundwood*
B09-20-VC	1.10-1.23	700ml	A*** (Broken down wood, wood pieces	A Corylus avellana shell frag, Cenococcum geophilium sclerotia,	-	Whole marine mollusc shells and frags	*Corylus avellana shell frag*

Borehole/Sample	Depth (m)	Sample Vol. (L)	Uncharred vegetative plant parts	Uncharred other	Wood charcoal	Molluscs	Comments (material picked for c14)
			including roundwood and degraded plant material)	aquatic bud scales			

Appendix VII: Radiocarbon samples (all Sectors)

Vibrocore ID	Lab ref.	Sample Depth (m aOD)	Material	Id	Date BP	Sector
B15-02-VC	UBA-32701	2.29-2.33	Waterlogged wood (juvenile)	Roundwood (3 fragments)	FAILED	
B13-03-ARCH-VCA	UBA-32702	3.02-3.03	Waterlogged wood (juvenile)	Roundwood (1 fragment)	10493±60	
	UBA-32703	2.05-2.10	Waterlogged wood (juvenile)	Roundwood (2 fragments)	9665±55	UK
	UBA-32704	3.00-3.02	Waterlogged wood (juvenile)	Roundwood (1 fragment)	11533±59	
	UBA-32705	2.40-2.45	Shell (Marine)	Cerastoderma edule	5597±32	
B02-02-VC/5BAGD	UBA-32859	4.75-5.0	Shell (Marine)	Scrobicularia/Tellina	>49392±	
B02-03-VC/2BAGC	UBA-32860	1.6-1.8	Shell (Marine)	Scrobicularia/Tellina	6457±43	
B02-20-VC/2BAGC	UBA-32861	1.7-2.0	Shell (Marine)	Scrobicularia/Tellina	3687±30	
B02-26-VC/3BAGC	UBA-32862	2.6-3.0	Shell (Marine)	Scrobicularia/Tellina	5277±32	
B06-03-VC/3BAGA		2.0-2.25	Shell (Marine)	Scrobicularia/Tellina	8290±37	Danish
B06-03-VC/2BAGA	UBA-32864	1.0-1.25	Shell (Marine)	Scrobicularia/Tellina	6997±41	
B06-24-VC/4BAGD	UBA-32865	3.39-3.55	Waterlogged wood (juvenile)		9126±52	
B06-30-VC/1BAGD	UBA-32866	0.6-0.65	Waterlogged wood (juvenile)		11666±48	
B02-09-VC/1BAGE	UBA-32867	0.9-1.0	Waterlogged plant remains	Rubus seeds x 3	8133±100	
B08-16-VC	UBA-33510	0.3-0.6	Waterlogged wood (juvenile)	Roundwood	9566±45	
B08-10-VC	UBA-33511	1.05-1.2	Waterlogged wood (juvenile)	Roundwood	10001±50	Dutch
B09-20-VC	UBA-33512	1.1-1.23	Waterlogged plant remains	Corylus avellana shell fragment	9071±45	

Appendix VIII: Radiocarbon results (UK Sector only)

Vibrocore ID	Lab Code	Uncalibrated BP	Depth (m)	Marine correction	Material dated	Calibrated age BC	% Probability
B15-02-VC	UBA-32702	10493±60	3.00-3.02	-	Waterlogged wood	10662 - 10187	95.4
B13-03-ARCH-VCA	UBA-32703	9665±55	2.05-2.10	-	Waterlogged wood	9261 – 9111 9085 - 8836	50.4 45.0
	UBA-32704	11533±59	3.02-3.03	-	Waterlogged wood	11529 - 11314	95.4
	UBA-32705	5597±32	2.40-2.45	-200 (ΔR) 262 (uncertainty)	*Cerastoderma edule*	4821 - 3656	95.4

Appendix IX: Palaeogeographic features of archaeological potential

WA ID	Name / Classification	Archaeological Discrimination	Description	Section
7500	Bank	P2	Possible bank deposits (Unit 6) in the upper Holocene sediments, sat above the interpreted Yarmouth Roads Formation (Unit 1). Feature is identified on a number of survey lines with faint, sub-parallel reflector. Feature is not particularly distinct. Depth range: 8.5 - 10.4 m BSB.	1
7501	Bank	P2	Possible bank deposits sat above the interpreted Yarmouth Roads formation (Unit 1) within in the upper Holocene sediments. Possibly an early transgression feature (Unit 6). Feature is not particularly distinct however is characterised by faint, sub-parallel reflectors. Depth range: 8.1 - 10.6 m BSB.	1
7502	Simple cut and fill	P2	Small, simple cut and fill feature (Unit 6) identified on one line beneath upper unit of Holocene sediments, cut into the interpreted Yarmouth Roads Formation (Unit 1). Feature is characterised by faint, sub-parallel reflectors. Possibly an early transgression feature on Yarmouth Roads landscape. Depth range: 8.58 - 13.0 m BSB.	1
7503	Bank	P2	Possible small bank deposit identified sat above the interpreted Yarmouth Roads formation (Unit 1). Feature is characterised by numerous, faint sub-parallel reflectors and is interpreted as being an early transgression feature (Unit 6). Feature is not particularly distinct. Depth range: 8.8 - 11.4 m BSB.	1
7504	Bank	P2	Possible bank deposits identified above the interpreted Yarmouth Roads formation (Unit 1). The feature is not particularly distinct, however is characterised by numerous, faint sub-parallel reflectors and is interpreted as being an early transgression feature (Unit 6). Identified on a number of survey lines. Depth range: 8.7 - 12.7 m BSB.	1
7505	Bank	P2	Possible bank deposits identified above the interpreted Yarmouth Roads formation (Unit 1). The feature is not particularly distinct, however is characterised by numerous, faint sub-parallel reflectors and is interpreted as being an early transgression feature (Unit 6). Depth range: 8.9 - 10.7 m BSB.	1
7506	Bank	P2	Broad possible bank deposits identified above the interpreted Yarmouth Roads formation (Unit 1). The feature is not particularly distinct, however is characterised by numerous, faint sub-parallel reflectors and is interpreted as being an early transgression feature (Unit 6). Depth range: 7.1 - 13.3 m BSB.	1
7507	Simple cut and fill	P2	Possible simple cut and fill feature, with some well-layered sediments (Unit 2 or 4) and relatively strong basal reflector, identified beneath the upper unit of Holocene sediments, cut into the top of the interpreted Yarmouth Roads Formation (Unit 1). A majority of this feature is below 10m. Depth range: 8.9 - 12.3 m BSB.	1

WA ID	Name / Classification	Archaeological Discrimination	Description	Section
7508	Bank	P2	Possible bank deposits identified above the interpreted Yarmouth Roads formation (Unit 1). The feature is not particularly distinct, however is characterised by numerous, faint sub-parallel reflectors and is interpreted as being an early transgression feature (Unit 6). Depth range: 6.4 - 9.6 m BSB.	1
7509	Bank	P2	Possible bank deposits identified above the interpreted Yarmouth Roads formation (Unit 1). The feature is not particularly distinct, however is characterised by numerous, faint sub-parallel reflectors and is interpreted as being an early transgression feature (Unit 6). Depth range: 5.1 m - 9.9 m BSB.	1
7510	Complex cut and fill	P2	Possible complex cut and fill feature, with more than one phase of fill, identified beneath the upper unit of Holocene sediments, cut into the top of the interpreted Yarmouth Roads Formation (Unit 1). Feature has a relatively strong basal reflector and is characterised by relatively transparent fill with some faint sub-parallel reflectors. Depth range: 6.2 - 12.7 m BSB.	1
7511	Simple cut and fill	P2	Possible shallow simple cut and fill identified beneath upper unit of Holocene sediments, cut into the top of the interpreted Yarmouth Roads Formation (Unit 1). Feature is acoustically chaotic indicating mixed, possibly coarse sediments (Unit 2 or 4). Poorly defined basal reflector. Depth range: 8.7 - 11.8 m BSB.	1
7512	Simple cut and fill	P2	Possible simple cut and fill feature identified beneath upper unit of Holocene sediment, cut into the top of the interpreted Yarmouth Roads Formation (Unit 1). The unit appears to be relatively acoustically quiet indicating homogenous fine-grained sediment (Unit 2 or 4). A majority of the feature is below 10 m. Depth range: 9.2 - 13.5 m BSB.	1
7513	Simple cut and fill	P2	Possible small, simple cut and fill feature identified beneath upper unit of Holocene sediment, cut into the top of the interpreted Yarmouth Roads Formation (Unit 1). The unit appears to be relatively acoustically quiet indicating homogenous fine-grained sediment (Unit 2 or 4). A majority of the feature is below 10 m. Depth range: 9.7 - 11.9 m BSB.	1
7514	Simple cut and fill	P2	Possible simple cut and fill feature identified on one line beneath upper unit of Holocene sediment, cut into the top of the interpreted Yarmouth Roads Formation (Unit 1). Infill sediment appears to be well-layered with a strong, basal reflector interpreted as being an early Holocene transgression feature (Unit 6). A majority of the feature is below 10m. Depth range: 9.0 - 12.7 m BSB.	1
7515	Simple cut and fill	P2	Possible simple cut and fill identified on one line beneath upper unit of Holocene sediments, cut into the interpreted Yarmouth Roads Formation (Unit 1). Feature fill appears to be acoustically quiet and has been interpreted as being a possible early Holocene transgression feature (Unit 6). Depth range: 7.1 - 9.1 m BSB.	1

WA ID	Name / Classification	Archaeological Discrimination	Description	Section
7516	Simple cut and fill	P2	Possible shallow simple cut and fill identified on one line, cut into the interpreted Yarmouth Roads Formation (Unit 1). The feature is generally acoustically quiet with some faint sub-parallel reflectors and has been interpreted as an early Holocene transgression feature (Unit 6). Depth range: 7.7 - 9.7 m BSB.	1
7517	Simple cut and fill	P2	Possible small, simple cut and fill feature identified cut into the top of the interpreted Yarmouth Roads Formation (Unit 1). Feature has a strong basal reflector and some faint parallel reflectors and has been interpreted as an early Holocene transgression feature (Unit 6). Depth range: 5.8 - 7.8 m BSB	1
7518	Simple cut and fill	P2	Possible simple cut and fill feature identified cut into the top of the interpreted Yarmouth Roads Formation (Unit 1). Feature is not especially well defined, however is characterised by acoustically chaotic fill which may suggest mixed coarse-grained sediments and, as such, has been interpreted as sub-glacial deposits (either Unit 2 or 4). Depth range: 5.7 - 11.9 m BSB.	1
7519	Simple cut and fill	P2	Possible simple cut and fill feature identified cut into the top of the interpreted Yarmouth Roads Formation (Unit 1). Feature is not especially well defined, however is characterised by acoustically chaotic fill which may suggest mixed coarse-grained sediments and, as such, has been interpreted as sub-glacial deposits (either Unit 2 or 4).. Depth range: 5.4 - 9.9 m BSB.	1
7520	Simple cut and fill	P2	Possible shallow, simple cut and fill identified cut into the top of the interpreted Yarmouth Roads Formation (Unit 1). Feature is not especially well defined, however is characterised by acoustically chaotic fill which may suggest mixed coarse-grained sediments and, as such, has been interpreted as sub-glacial deposits (either Unit 2 or 4). Depth range: 7.3 - 11.1 m BSB.	1
7521	Channel	P1	Possible channel feature identified cut into the top of the interpreted Yarmouth Roads Formation (Unit 1). Vibrocore sample B12-06 found very loose silty fine sand between 0.0 - 4.1 m BSB, olive brown very gravelly sand between 4.1 - 4.7 m BSB and dense dark greenish grey sand between 4.7 - 5.5 m. Feature fill appears to be acoustically chaotic and has been interpreted as either unit 2 or 4. Depth range: 4.1 - 10.2 m BSB.	1
7522	Channel	P2	Possible channel feature identified cut into the top of the interpreted Yarmouth Roads Formation (Unit 1). Feature is characterised by acoustically chaotic fill, which may suggest mixed coarse-grained sediments and, as such, has been interpreted as sub-glacial deposits (either unit 2 or 4). Channel appears to split into two forks towards the south. Depth range: 3.4 - 9.0 m BSB.	1
7523	Simple cut and fill	P2	Possible shallow simple cut and fill identified cut into the top of the interpreted Yarmouth Roads Formation (Unit 1). Feature appears to be acoustically quiet, suggesting homogenous fine-grained sediment, and has a distinct basal reflector. This feature has been interpreted as possible subglacial deposits (either Unit 2 or 4). Depth range: 3.7 - 6.4 m BSB.	1

WA ID	Name / Classification	Archaeological Discrimination	Description	Section
7524	Simple cut and fill	P2	Possible simple cut and fill feature cut into the top of the interpreted Yarmouth Roads Formation (Unit 1). Feature is characterised by numerous, sub-parallel reflectors and has been interpreted as an early Holocene transgression feature (Unit 6). Depth range: 5.1 - 9.9 m BSB.	1
7525	Bank	P2	Possible bank of sediment identified above the interpreted Yarmouth Roads Formation (Unit 1). Feature is not particularly distinct, however is characterised by numerous, sub-parallel reflectors and, as such, has been interpreted as an early Holocene transgression feature (Unit 6). Depth range: 6.2 - 9.0 m BSB.	1
7526	Complex cut and fill	P1	Possible complex cut and fill feature, with more than one phase of fill, identified cut into the top of the interpreted Yarmouth Roads Formation (Unit 1). Unit has a distinct basal reflector with relatively acoustically quiet fill indicating homogenous, fine-grained sediment (Unit 2 or 4). Depth range: 5.0 - 10.3 m BSB.	1
7527	Simple cut and fill	P2	Possible simple cut and fill, with relatively acoustically chaotic fill suggesting coarse, mixed sediments (Unit 2 or 4). Feature identified beneath the upper unit (Unit 8) cut into the top of the interpreted Yarmouth Roads Formation (Unit 1). Depth range: 5.5 - 9.6 m BSB.	1
7528	Simple cut and fill	P2	Possible simple cut and fill feature identified cut into the top of the interpreted Yarmouth Roads Formation (Unit 1). Feature fill appears to be relatively acoustically chaotic suggesting coarse, mixed sediments (Unit 2 or 4). Vibrocore sample B12-12 found unit comprises reddish brown silty, gravelly sand between 3.2 - 3.5 m and sand with some possible organic material between 3.5 - 5.1 m BSB. Depth range: 3.2 - 5.6 m BSB.	1
7529	Infilled Depression	P2	Possible shallow infilled depression identified BSB, cut into the top of the interpreted Yarmouth Roads Formation (Unit 1). Feature fill is relatively acoustically quiet with some, faint reflectors and has been interpreted as a possible early Holocene transgression feature (Unit 6). Depth range: 0.8 - 1.6 m BSB.	2
7530	Simple cut and fill	P2	Possible shallow simple cut and fill feature identified on one line BSB cut into the top of the interpreted Yarmouth Roads Formation (Unit 1). Feature appears to be relatively acoustically quiet and is interpreted as being Unit 6, early Holocene transgression sediments. Vibrocore sample B12-21 found unit comprises sand and gravel between 0.0 - 1.4 m BSB, with dense sand with pockets of clay between 1.4 - 1.6 m BSB. Depth range: 0.6 - 2.3 m BSB.	2
7531	Infilled Depression	P2	Possible shallow infilled depression identified on one line BSB cut into the top of the interpreted Yarmouth Roads Formation (Unit 1). Feature appears to be relatively acoustically quiet with a distinct basal reflector and is interpreted as being Unit 6, early Holocene transgression sediments. Depth range: 0.7 - 1.4 m BSB.	2

WA ID	Name / Classification	Archaeological Discrimination	Description	Section
7532	Infilled Depression	P2	Possible shallow infilled depression identified on one line BSB cut into the top of the interpreted Yarmouth Roads Formation (Unit 1). Feature appears to be relatively acoustically quiet with a distinct basal reflector and is interpreted as being Unit 6, early Holocene transgression sediments. . Depth range: 0.9 - 2.3 m BSB.	2
7533	Infilled Depression	P2	Possible shallow infilled depression identified BSB cut into the top of the interpreted Yarmouth Roads Formation (Unit 1). Feature appears to have some parallel reflectors within, suggesting well-layered sediment, and a distinct basal reflector and is interpreted as being Unit 6, early Holocene transgression sediments. Vibrocore sample B12-22 found that sediment comprises fine to medium sand with shell fragments between 0.0 - 1.1 m BSB with some possible organic material present between 1.2 - 3 m BSB. Depth range: 0.7 m - 3.5 m BSB.	2
7534	Infilled Depression	P2	Possible shallow infilled depression identified on one line BSB cut into the top of the interpreted Yarmouth Roads Formation (Unit 1). Feature appears to have some parallel reflectors within, suggesting well-layered sediment, and a distinct basal reflector and is interpreted as being Unit 6, early Holocene transgression sediments. Depth range: 0.7 - 2.4 m BSB.	2
7535	Infilled depression	P2	Possible shallow infilled depression identified on one line BSB cut into the top of the interpreted Yarmouth Roads Formation (Unit 1). Feature appears to have some parallel reflectors within, suggesting well-layered sediment and is interpreted as being Unit 6, early Holocene transgression sediments. Depth range: 0.9 - 1.7 m BSB.	2
7536	Channel	P1	Possible complex channel feature with multiple phases of fill identified beneath a veneer of modern marine sediments (Unit 8) cut into the top of the interpreted Yarmouth Roads Formation (Unit 1). Unit is relatively acoustically quiet, with some small phases of fill being characterised by well-layered sediments, and has been interpreted as early Holocene channel infill (Unit 5). Vibrocore sample B12-24 found the unit comprises olive grey gravelly medium to coarse sand with many fine gravel sized shell fragments between 0.75 - 4.75 m BSB. Depth range: 0.5 - 7.9 m BSB.	2
7537	Simple cut and fill	P2	Possible simple cut and fill feature identified BSB cut into in the top of the interpreted Yarmouth Roads Formation (Unit 1). The lines in this area use different setting, which make the feature easier to discern on some lines than others. The feature has faint sub-parallel reflectors and is interpreted as being a possible early Holocene feature (Unit 6). Depth range: 0.8 - 3.7 m BSB.	2

WA ID	Name / Classification	Archaeological Discrimination	Description	Section
7538	Complex cut and fill	P2	Possible broad, complex cut and fill feature, with multiple phases of fill, identified beneath the upper unit of modern marine sediments (Unit 8) cut into the interpreted Yarmouth Roads Formation (Unit 1). Due to the complex structure of the sediments, it is difficult to identify the boundaries of the feature. The unit has numerous sub-parallel reflectors and has been interpreted as being early Holocene channel infill sediments (Unit 5). Vibrocore sample B12-27 found unit comprises loose slightly silty sand between 0.0 - 0.6 m, slightly silty, very gravelly sand with fine to medium gravel-sized shells and shell fragments between 0.6 - 2.44 m BSB, and medium dense to dense gravelly sand between 2.44 - 3.0 m BSB. Depth range: 1.2 - 6.7 m BSB.	2
7539	Simple cut and fill	P1	Possible simple cut and fill feature identified BSB, cut into the top of the interpreted Yarmouth Roads Formation (Unit 1). The feature fill is relatively acoustically quiet with some faint sub-parallel reflectors. This feature is interpreted as being an early Holocene transgression feature (Unit 6). Depth range: 0.4 - 6.6 m BSB.	2
7540	Complex cut and fill	P1	Possible broad, complex cut and fill feature, with multiple phases of fill, identified beneath the upper unit of modern marine sediments (Unit 8) cut into interpreted Bolders Bank Formation in the west (Unit 3). Due to the complex structure of the sediments, it is difficult to identify the boundaries of the feature. The unit has numerous sub-parallel reflectors and has been interpreted as being early Holocene channel infill sediments. Depth range: 0.7 - 6.6 m BSB.	2
7541	Channel	P2	Possible shallow channel feature identified BSB cut into the interpreted Bolders Bank Formation (Unit 3). The boundaries of the feature are not always clearly defined. The feature fill is generally relatively acoustically quiet with some, faint reflectors, and has been interpreted as early Holocene infill sediments (Unit 5). Vibrocore sample B12-30 found the unit comprises very loose sand between 0.0 - 0.9 m BSB, with medium dense gravelly coarse sand from 0.9 - 3.5 m BSB. A bed of very high strength silty sandy clay was identified between 2.95 - 3.0 m BSB. Depth range: 0.6 - 5.6 m BSB.	2
7542	Infilled depression	P2	Small, possible infilled depression identified beneath a veneer of modern marine sediments (Unit 8), cut into the interpreted Bolders Bank Formation (Unit 3). The feature has a strong basal reflector, with the fill characterised by numerous, faint, parallel reflectors, and is interpreted as being an early Holocene transgression feature. Depth range: 1.0 - 2.3 m BSB.	2
7543	Complex cut and fill	P2	Possible complex cut and fill feature, with more than on phase of fill, identified BSB cut into the interpreted Bolders Bank Formation (Unit 3). Extents of feature are not clearly defined due to the complex structure of the sediments in this area. Feature has a strong basal reflector, with the fill characterised by parallel reflectors, and is interpreted as being an early Holocene transgression feature (Unit 6). Depth range: 0.7 - 4.0 m BSB. Feature appears to fork into two branches at its southern edge.	2

WA ID	Name / Classification	Archaeological Discrimination	Description	Section
7544	Simple cut and fill	P2	Possible small, simple cut and fill identified BSB on one line, cut into the interpreted Bolders Bank Formation (Unit 3). Feature has a strong basal reflector, with the fill characterised by parallel reflectors, and is interpreted as being an early Holocene transgression feature (Unit 6). Depth range: 0.9 - 2.2 m BSB.	2
7545	Complex cut and fill	P2	Possible complex cut and fill feature identified BSB, cut into the interpreted Yarmouth Roads Formation. With the first phase of fill being acoustically quiet, suggesting homogenous fine-grained sediments, and the second phase being characterised by parallel reflectors suggesting some well-layered sediments. The unit fill is interpreted as being from the early Holocene transgression (Unit 6). Depth range: 0.9 - 4.4 m BSB.	2
7546	Channel	P2	Possible channel feature identified beneath a veneer of modern marine sediments (Unit 8), cut into the interpreted Bolders Bank Formation (Unit 3), with a distinct basal reflector. Unit fill appears to be relatively acoustically quiet Vibrocore sample B12-32 found the unit comprises very loose fine to coarse sand between 0.0 - 0.5 m BSB, becoming more gravelly between 0.5 - 1.4 m BSB. Between 1.4 - 3.0 m BSB the unit is medium dense to dense gravelly coarse sand. Depth range: 0.8 - 6.1 m BSB.	2
7549	Channel	P1	A well-layered channel identified beneath the upper unit of modern marine sediments (Unit 8), cut into the interpreted Bolders Bank Formation (Unit 3). Unit appears to have multiple phases of fill and is characterised by numerous, sub-parallel reflectors. This is interpreted as being a fluvial feature infilled with early Holocene sediments (Unit 5). Vibrocore sample B12-45 found unit comprises of very loose to loose sand between 0.0 - 0.26 m BSB, with very loose slightly silty fine sand with a few pockets of brown material and some shell and shell fragments between 0.26 - 1.75 m BSB and loose to medium dense fine sand between 1.75 m - 2.65 m BSB. Depth range: 1.9 - 11.4 m BSB.	3
7550	Channel	P1	Small channel feature identified beneath an upper unit of modern marine sediments (Unit 8), cut into the interpreted Bolders Bank Formation (Unit 3). Unit fill appears to be acoustically quiet suggesting homogenous, fine-grained sediment, and has been interpreted as early Holocene infill (Unit 5). Depth range: 2.3 - 7.5 m BSB.	3
7551	Channel	P1	Possible channel feature identified beneath upper unit of modern marine sediments (Unit 8), cut into the interpreted Bolders Bank Formation (Unit 3). Boundaries of feature not particularly well defined therefore shapefile may not represent true extent of feature. Seismic profile suggests multiple phases of fill and some well-layered sediment and has been interpreted as early Holocene channel infill (Unit 5). Depth range: 2.3 - 12.0 m BSB.	3

WA ID	Name / Classification	Archaeological Discrimination	Description	Section
7552	Channel	P1	Possible channel identified beneath the upper unit of modern marine sediments (Unit 8), cut into the top of the interpreted Bolders Bank Formation (Unit 3). The feature is relatively acoustically quiet suggesting homogenous, fine-grained sediments. Depth range: 1.4 - 6.2 m BSB. Vibrocore sample B13-03-ARCH found unit comprises slightly silty sand between 0.0 - 0.7 m BSB, with loose to medium dense slightly silty sand between 0.7 - 3.99 m BSB, becoming very loose between 2.67 to 3.55 m BSB and with a thin bed of clay between 3.42 - 3.55 m BSB. From 3.99 to the end of the sample at 6.0 m BSB, the unit comprised very stiff slightly sandy slightly gravelly clay. Radiocarbon dating was carried out on fragments of waterlogged wood found in this sample. The sample taken from 2.05 - 2.10 m BSB provided a 14C age of 9665 ± 55 BP, which would age the sample from the Mesolithic. A sample taken at 3.00 - 3.02 m BSB gave a C14 age of 11533 ± 59 BP and a slightly deeper sample taken at 3.02 - 3.03 m BSB had a younger age of 10493 ± 60 BP, which may suggest some reworking of the channel infill sediments, or disturbance of the sample when it was cored.	3
7553	Channel	P1	Possible shallow channel feature beneath the upper unit of modern marine sediments (Unit 8), cut into the top of the interpreted Bolders Bank Formation (Unit 3). Feature fill appears to be slightly complex, well-layered fill and is interpreted as being early Holocene infill (Unit 5). Depth range: 1.3 - 3.9 m BSB. Vibrocore sample B13-04-ARCH found unit comprises very loose to medium dense sand between 0.0 - 2.0 m, becoming gravelly between 2.0 - 2.58 m BSB and changing to stiff slightly sandy, slightly gravelly clay between 2.58 - 3.79 m BSB.	3
7554	Channel	P1	Possible channel feature, with multiple phases of fill, identified beneath the upper unit of modern marine sediments (Unit 8), cut into the top of the interpreted Bolders Bank Formation (Unit 3). Unit fill characterised by faint, sub-parallel reflectors indicating well-layered infill sediments, interpreted as being early Holocene (Unit 5). Depth range: 1.0 - 7.3 m BSB. Channel appears to branch out into two prongs towards the north. Vibrocore sample B13-06 found unit comprises very loose slightly silty sand with shell fragments between 0.0 - 0.2 m BSB, becoming loose to medium dense silty sand between 0.2 - 1.45 m BSB. Between 1.45 - 2.60 m BSB the sediment comprises medium dense to very dense slightly silty gravelly sand with some shell fragments becoming very loose to medium dense between 2.65 - 3.0 m BSB.	3
7555	Complex cut and fill	P2	Possible complex cut and fill feature, potentially with more than one phase of fill, identified beneath the upper unit of modern marine sediments (Unit 8), cut into the interpreted Bolders Bank Formation (Unit 3). Fill is characterised by faint, sub-parallel reflectors, indicating well-layered sediments, and is interpreted as early Holocene infill sediments (Unit 5). Depth range: 1.4 - 7.2 m BSB.	3

WA ID	Name / Classification	Archaeological Discrimination	Description	Section
7556	Simple cut and fill	P2	Possible simple cut and fill feature identified beneath the upper unit of modern marine sediments (Unit 8), cut into the interpreted Bolders Bank Formation (Unit 3). Feature fill is relatively acoustically quiet with some faint sub-horizontal reflectors indicating some well-layered, fine-grained sediments, and is interpreted as being early Holocene infill (Unit 5). Depth range: 3.9 - 8.8 m BSB	3
7557	Channel	P1	Possible small channel feature identified beneath upper unit of modern marine sediments (Unit 8), cut into the top of the interpreted Bolders Bank Formation (Unit 3). Unit fill appears to be relatively acoustically quiet and is interpreted as being early Holocene (Unit 5). Depth range: 2.4 - 7.0 m BSB.	3
7558	Channel	P1	Possible channel feature with some well-layered sediment identified beneath the upper unit of modern marine sediments (Unit 8), cut into the top of the interpreted Bolders Bank Formation (Unit 3). Faint, parallel reflectors within the feature fill suggest some well-layered sediment and has been interpreted as early Holocene infill (Unit 5) Depth range: 3.4 - 9.7 m BSB.	3
7559	Channel	P1	Possible channel feature identified BSB, cut into the interpreted Bolders Bank Formation (Unit 3). Feature appears to have more than one phase of fill, with faint, parallel reflectors indicating some well-layered sediments, and has been interpreted as early Holocene (Unit 5). Depth range: 0.2 - 7.9 m BSB. Vibrocore B-13-R-01 indicate a veneer or modern marine sediments (Unit 8) with very loose slightly silty sand with gravel-sized shell fragments between 0.0 - 0.16 m BSB, medium dense to dense slightly silty sand with gravel-sized shell fragments between 0.16 - 2.36 m BSB, becoming slightly gravelly from 1.95 - 2.36 m, very soft slightly sandy clay between 2.36 - 4.87 m and loose to medium dense slightly gravelly silty fine sand between 4.87 - 5.89 m BSB.	3
7560	Complex cut and fill	P2	Possible complex cut and fill feature identified BSB cut into the interpreted Bolders Bank Formation (Unit 3). Feature is relatively shallow and appears to have more than one phase of fill. Feature fill is characterised by numerous faint parallel reflectors, indicating well-layered sediment, and is interpreted as being early Holocene (Unit 5). Vibrocore B13-R-02 shows sediments comprise very loose to loose slightly silty gravelly sand with shell and shell fragments between 0.0 - 0.17 m BSB, becoming medium dense to very dense slightly silty very gravelly sand with shell fragments between 0.17 - 3.0 m BSB. Depth range: 0.3 - 6.5 m BSB.	3

WA ID	Name / Classification	Archaeological Discrimination	Description	Section
7561	Fine grained deposit	P2	Possible fine-grained deposit identified BSB, above an interpreted fluvial Holocene features (**7562** and **7570**). Infill sediment appears to be relatively well-layered and has been interpreted as possible overbank related to channel **7562** and, as such, still early Holocene infill deposits (Unit 5). Depth range: 0.4 - 2.4 m BSB. Vibrocore sample B13-29 transects both feature **7561** and **7570**, and found the sediments to comprise very loose slightly silty very gravelly sand with some shell fragments between 0.0 - 0.2 m BSB, medium dense to very dense slightly silty sand with closely spaced thin laminae of clay with gravel sized pockets of black silty, possibly organic, material between 0.2 - 1.05 m BSB and low-strength clay with extremely closely spaced thin beds of fine sand with pockets of possibly organic black staining between 1.05 - 6.0 m BSB.	3
7562	Channel	P1	Possible channel feature identified beneath a well-layered upper unit (**7561**), cut into the interpreted Bolders Bank Formation (Unit 3). Boundaries of the feature are not always easily distinguishable; however, the fill is relatively acoustically quiet with some faint sub-parallel reflectors indicating well-layered sediment and has been interpreted as early Holocene infill (Unit 5). Depth range: 0.7 - 7.5 m BSB. Feature appears similar to nearby feature **7570,** which is also identified beneath feature **7561** and was sampled by vibrocore B13-29, and is interpreted as being an early Holocene infill. As such, it may be inferred that unit fill may also be low strength clay with thin beds of sand, however this cannot be proven without further vibrocore testing.	3
7563	Channel	P1	Possible channel feature identified beneath a veneer of modern marine sediments (Unit 8), cut into the top of the interpreted Bolders Bank Formation (Unit 3) Unit fill appears complex with more than one phase of fill and some faint, sub-horizontal reflectors indicating some well-layered sediment within the channel interpreted as being early Holocene infill (Unit 5). Depth range: 2.4 - 14.0 m BSB.	3
7564	Channel	P1	Possible channel feature identified BSB, cut into the interpreted Bolders Bank Formation (Unit 3). Feature fill appears complex with more than one phase of fill and some faint, sub-horizontal reflectors indicating some well-layered sediment within the channel interpreted as being early Holocene infill (Unit 5). Depth range: 1.5 - 12.4 m BSB.	3

WA ID	Name / Classification	Archaeological Discrimination	Description	Section
7565	Channel	P1	Large, complex channel feature with multiple phases of fill identified BSB, cut into the top of the interpreted Bolders Bank Formation (Unit 3). Some of the units of fill have distinct, even reflectors suggesting well-layered sediment. Depth Range: 0.6 - 13.6 m BSB. Vibrocore sample B14-21 shows unit comprises a thick layer of very loose silty very gravelly sand with shell and shell fragments between 0.0 -0.15 m, soft to firm slightly sandy, slightly gravelly clay between 0.15 - 1.67 m with very closely spaced thin to thick laminae of very silty fine sand from 0.4 - 1.67m, becoming inclined from 0.9m -1.67 and high strength the very high strength slightly sandy silty clay with thin beds of silt and sand between 1.67 - 6.58m with some fine gravel sized bits of coal at 4.5 m BSB. Based on the vibrocore logs this unit may be a is possibly a Botney Cut Channel Formation (Unit 4). The SW end of the feature is sampled by Vibrocore B14-22 which shows a unit of dense to very dese very silty fine sand with some pockets of possibly organic black material between 0.25 - 1.95 m and high strength to very high strength silty clay between 1.95 - 3.0 m BSB, which may represent early Holocene infill (Unit 5) cutting into the top of the interpreted Botney Cut fill (Unit 4). The base of lower cut indistinct on some lines due to the depth range of the sub-bottom profiler, therefore depth range should be considered a minimum.	3
7566	Channel	P1	Possible channel identified BSB cut into the top of the interpreted Bolders Bank Formation (Unit 3). Feature fill is characterised by faint, sub-parallel reflectors, which may indicate well-layered sediment, and is interpreted as being either early Holocene (Unit 5) Or Botney Cut (Unit 4). Boundaries of feature is relatively indistinct on some lines making it difficult to map the full extent of the feature. Depth range: 0.5 - 7.5 m BSB. Vibrocore sample B14-26 found unit comprises soft slightly gravelly sandy clay between 0.0 - 0.5 m BSB, with firm clay between 0.5 - 0.94 m, soft to firm slightly sandy silty clay between 0.94 - 3.0 m becoming interbedded firm to stiff slightly sandy clay and slightly silty sand between 2.0 - 2.75 m.	3
7567	Channel	P1	Possible complex channel feature identified BSB, cut into the interpreted Bolders Bank Formation (Unit 3). Infill sediments appear to be relatively well-layered, possibly with multiple phases of fill. An upper cut feature is identified to the northwest corner of the channel feature. High amplitude reflectors, with some blanking of lower horizons and identified in a few places within the channel feature, however a larger area is identified towards the southeast of the feature, possibly suggesting the presence of gaseous organic deposits. Vibrocore B15-02 found sediments comprise loose to medium dense slightly silty gravelly sand with traces of gravel between 0.0 - 0.15 m, very loose to loose slightly silty sand with pockets of possibly organic black staining between 0.15 - 2.31 m BSB with a thick bed of very soft slightly gravelly sandy clay from 0.15 - 1.0 m, and very stiff slightly sandy slightly gravelly clay between 2.31 - 6.0 m. The boundaries of this feature become discernible towards its southern edge; therefore, the boundaries mapped here should be considered its minimum limits. Depth range: 0.8 - 8.9 m BSB	3

WA ID	Name / Classification	Archaeological Discrimination	Description	Section
7568	High amplitude reflector	P2	High amplitude reflector identified in interpreted Bolders Bank Formation (Unit 3). Reflector sits on seabed multiple, possibly a geometry effect rather than a natural feature, however may also represent shallow gas. Depth range: 3.7 - 5.6 m BSB.	3
7569	Cut and fill	P2	Small cut and fill identified BSB, cut into the top of the interpreted Bolders Bank Formation (Unit 3). Boundaries are not particularly distinct. Feature fill appears a little chaotic possibly indicating well-mixed coarse sediment and is interpreted as being an early Holocene fill; however, the possibility remains that it may be an internal reflector within the Bolders Bank Formation. Depth range: 0.4 - 16.6 m BSB.	3
7570	Simple cut and fill	P2	Possible simple cut and fill feature identified beneath a fine grained deposit (**7561**), cut into the top of the interpreted Bolders Bank Formation (Unit 3). The boundaries of this feature are not always clearly distinguishable; however, the fill is relatively acoustically quiet with some faint sub-parallel reflectors indicating well-layered sediment and has been interpreted as early Holocene infill (Unit 5). Depth range: 2.0m - 9.8m BSB. Vibrocore sample B13-29 found the feature comprises very loose slightly silty very gravelly sand with some shell fragments between 0.0 - 0.2 m BSB (Modern marine sediments (Unit 8)), medium dense to very dense slightly silty sand with closely spaced thin laminae of clay with gravel sized pockets of black silty, possibly organic, material between 0.2 - 1.05 m BSB (Fine grained deposit feature **7561)** and low-strength clay with extremely closely spaced thin beds of fine sand with pockets of possibly organic black staining between 1.05 - 6.0 m BSB.	3

Appendix X: Seabed features of archaeological potential

Co-ordinates are in ETRS89 UTM Zone 30N. The positional accuracy of features recorded from the archaeological assessment of geophysical survey data is estimated to be ±10m

WA ID	Classification	Easting	Northing	Archaeological Discrimination	Length (m)	Width (m)	Height (m)	Magnetic Amplitude (nT)	Description	External References
7000	Seafloor disturbance	485370	6006965	A2	4	3.7	0	-	Irregularly shaped dark reflector surrounded by a larger bright reflector. Indistinct feature on otherwise featureless seabed.	-
7001	Mound	457928	5998113	A2	6	4.5	0.6	-	Elongate object with height, aligned N/S, situated in an oval depression with dimensions of 33 x 24 x -1.5 m. Appears in the sidescan data as a dark reflector with height.	-
7002	Mound	472021	6002604	A2	6	5	0.7	54	Object situated at the eastern end of an oval shaped depression measuring 34 x 18 x -0.7 m. Appears in the sidescan data as a dark reflector with height. General seabed depth 55.7 m. A medium magnetic anomaly is associated with this feature, indicating that there may be some ferrous content.	-

WA ID	Classification	Easting	Northing	Archaeological Discrimination	Length (m)	Width (m)	Height (m)	Magnetic Amplitude (nT)	Description	External References
7003	Wreck	472230	6002721	A1	42.7	10	3.7	198	Unrecorded wreck. Appears in the bathymetry data as an upright wreck, aligned 160/340, surrounded by scour. Deepest visible scour occurs around the SE end, approximately 1.9 m below adjacent seabed. Only approximately half of the wreck was covered by the bathymetry data as it lies on the edge of the survey area. No outlying debris visible in the bathymetry data. General seabed depth approximately 55.8 m. In the sidescan sonar data the wreck appears somewhat broken up and scattered. It is surrounded by a seafloor disturbance (51.4 x 22.4 m) which may contain debris. Has a large magnetic anomaly identified on more than one survey line associated with it, indicating ferrous content.	-

WA ID	Classification	Easting	Northing	Archaeological Discrimination	Length (m)	Width (m)	Height (m)	Magnetic Amplitude (nT)	Description	External References
7004	Wreck	485810	6007463	A1	33.6	10	3.6	425	Unrecorded wreck. A large wreck that appears upright and mostly intact. Oriented 090/270. No internal structure clearly seen. Some possible seafloor disturbance (44.5 x 22.1 m) to sediment adjacent to wreck. A bright reflector feature and four linear dark reflectors of possible associated debris are present. The wreck is surrounded by a large scour orientated 065/245 and with a maximum depth of 3.9 m. It has a large dipole identified on more than one survey line associated indicating significant ferrous debris. Also observed as an indistinct possible mound within a depression within the sub-bottom profiler data. Strong reflectors are observed below the seabed at this location.	-
7005	Debris	449458	5996601	A2	10.1	2.1	2	-	Angular, linear feature with uneven shadow indicating part of the feature is much higher than the rest.	-
7006	Seafloor disturbance	472042	6002384	A2	3.3	2.9	0	19	An indistinct small area of seafloor disturbance with a bright reflector in front of a dark reflector, possibly a depression but has a small magnetic anomaly associated indicating ferrous debris may be present.	-
7007	Magnetic	478150	6004522	A2	-	-	-	42	Small anomaly only identified on one survey line. Indicative of possible buried ferrous debris.	-

WA ID	Classification	Easting	Northing	Archaeological Discrimination	Length (m)	Width (m)	Height (m)	Magnetic Amplitude (nT)	Description	External References
7008	Magnetic	454452	5997437	A2	-	-	-	7	Small anomaly only identified on one survey line. Indicative of possible buried ferrous debris.	-
7009	Magnetic	461790	5998822	A2	-	-	-	15	Small anomaly only identified on one survey line. Indicative of possible buried ferrous debris.	-
7010	Magnetic	477860	6004555	A2	-	-	-	23	Small anomaly only identified on one survey line. Indicative of possible buried ferrous debris.	-
7011	Magnetic	475370	6003445	A2	-	-	-	596	Large anomaly identified on more than one survey line. Indicative of possible substantial buried ferrous debris.	-
7012	Magnetic	468455	6000972	A2	-	-	-	15	Small anomaly only identified on one survey line. Indicative of possible buried ferrous debris.	-
7013	Magnetic	453582	5997075	A2	-	-	-	15	Small anomaly only identified on one survey line. Indicative of possible buried ferrous debris.	-
7014	Magnetic	451960	5997055	A2	-	-	-	34	Small anomaly only identified on one survey line. Indicative of possible buried ferrous debris.	-
7015	Magnetic	464717	5999927	A2	-	-	-	5	Small anomaly only identified on one survey line. Indicative of possible buried ferrous debris.	-
7016	Magnetic	472370	6002655	A2	-	-	-	19	Small anomaly only identified on one survey line. Indicative of possible buried ferrous debris.	-
7017	Magnetic	483300	6006550	A2	-	-	-	31	Small anomaly only identified on one survey line. Indicative of possible buried ferrous debris.	-

WA ID	Classification	Easting	Northing	Archaeological Discrimination	Length (m)	Width (m)	Height (m)	Magnetic Amplitude (nT)	Description	External References
7018	Magnetic	484232	6006887	A2	-	-	-	15	Small anomaly only identified on one survey line. Indicative of possible buried ferrous debris.	-
7019	Magnetic	450855	5996512	A2	-	-	-	55	Medium sized anomaly only identified on one survey line. Indicative of possible buried ferrous debris.	-
7020	Magnetic	484825	6006770	A2	-	-	-	49	Small anomaly only identified on one survey line. Indicative of possible buried ferrous debris.	-
7021	Magnetic	460337	5998695	A2	-	-	-	20	Small anomaly only identified on one survey line. Indicative of possible buried ferrous debris.	-
7022	Magnetic	470315	6002000	A2	-	-	-	22	Small anomaly only identified on one survey line. Indicative of possible buried ferrous debris.	-
7023	Magnetic	482737	6006215	A2	-	-	-	20	Small anomaly only identified on one survey line. Indicative of possible buried ferrous debris.	-
7024	Magnetic	458197	5998065	A2	-	-	-	14	Small anomaly only identified on one survey line. Indicative of possible buried ferrous debris.	-
7025	Dark reflector	422767	5992053	A2	4.4	1.2	0.3	-	Rounded object with height and scour.	-
7026	Dark reflector	420813	5991439	A2	4.2	1.8	0.2	-	Appears angular but this may just be distortion. Indistinct shadow. Isolated object on featureless seabed.	-
7027	Dark reflector	418239	5990734	A2	5.3	0.5	0.3	-	Linear object with height. May be rather stretched. May also be two objects immediately adjacent rather than one as there is a break in the shadow. Possible debris.	-

WA ID	Classification	Easting	Northing	Archaeological Discrimination	Length (m)	Width (m)	Height (m)	Magnetic Amplitude (nT)	Description	External References
7028	Seafloor disturbance	418158	5990762	A2	8.3	7.5	-0.2	-	Principally consists of bright reflectors. May be two parallel scars/depressions. Contains a small dark reflector with possible shadow but doesn't look like a simple scour around a rock. In the bathymetry data it appears as an approximately circular depression on the side of a large sandwave.	-
7029	Dark reflector	417948	5990835	A2	2	1	0.4	-	Small blocky object with height in scour/scar.	-
7030	Dark reflector	415482	5990414	A2	9.8	0.5	0.2	-	Possibly three small objects in a line rather than linear debris. Single scour on near side. May be somewhat distorted. Not visible in bathymetry data.	-
7031	Debris	417032	5991046	A2	6.4	0.4	0.2	-	Curvilinear feature with height.	-
7032	Dark reflector	417084	5991045	A2	3.2	1.8	0.9	-	Semi-circular object with height. May be debris but could just be a rock. Near **7031**.	-
7033	Seafloor disturbance	415492	5990573	A2	10.3	8	-0.2	20	Looks like two parallel scars with three very small rocks or possible items of debris in the sidescan data. In the bathymetry data it appears as an oval shaped shallow depression. Has a small magnetic anomaly associated indicating some ferrous debris may be present.	-

WA ID	Classification	Easting	Northing	Archaeological Discrimination	Length (m)	Width (m)	Height (m)	Magnetic Amplitude (nT)	Description	External References
7034	Seafloor disturbance	416299	5990651	A2	11.2	10.4	0.8	107	Confused area of dark and bright reflectors possibly containing debris. A linear bright reflector within measures 4.0 x 0.8 x 0 m. There is also a small irregularly shaped object (1.6 x 1.2 x 0.8 m) within the area. The feature appears as a shallow depression in the bathymetry data. A magnetic anomaly is associated with this feature indicating that it may contain ferrous debris.	-
7035	Mound	408263	5989189	A2	12	8	0.2	-	Elongate low mound in the bathymetry data. Appears in the sidescan data as an indistinct object with clear shadow. The object contains two parallel dark reflectors and measures 5.3 x 2.4 x 1.1 m. Isolated object.	-
7036	Seafloor disturbance	413043	5990118	A2	14.4	7.3	0.2	-	Indistinct area consisting mainly of bright reflectors. Near end of fishing scar. Contains a rounded object measuring 2.2 x 0.5 x 0.2 m, which may be debris. The feature appears in the bathymetry data as a shallow depression measuring approximately 8 x 7 x -0.3 m.	-
7037	Dark reflector	411609	5989862	A2	5.9	1.9	0	-	Outline oval feature, similar to a tyre in shape, with possible scour on near side. Possible debris.	-
7038	Magnetic	444999	5996087	A2	-	-	-	13	Small anomaly only identified on one survey line. Indicative of possible buried ferrous debris.	-

WA ID	Classification	Easting	Northing	Archaeological Discrimination	Length (m)	Width (m)	Height (m)	Magnetic Amplitude (nT)	Description	External References
7039	Magnetic	445014	5996207	A2	-	-	-	74	Medium sized anomaly only identified on one survey line. Indicative of possible buried ferrous debris.	-
7040	Magnetic	447187	5996123	A2	-	-	-	13	Small anomaly only identified on one survey line. Indicative of possible buried ferrous debris.	-
7041	Magnetic	442961	5996541	A2	-	-	-	16	Small anomaly only identified on one survey line. Indicative of possible buried ferrous debris.	-
7042	Magnetic	442457	5996663	A2	-	-	-	24	Small anomaly only identified on one survey line. Indicative of possible buried ferrous debris.	-
7043	Magnetic	423607	5992164	A2	-	-	-	35	Small anomaly only identified on one survey line. Indicative of possible buried ferrous debris.	-
7044	Magnetic	422797	5991941	A2	-	-	-	68	Medium sized anomaly only identified on one survey line. Indicative of possible buried ferrous debris.	-
7045	Magnetic	438105	5996233	A2	-	-	-	26	Small anomaly only identified on one survey line. Indicative of possible buried ferrous debris.	-
7046	Magnetic	427206	5993300	A2	-	-	-	34	Small anomaly only identified on one survey line. Indicative of possible buried ferrous debris.	-
7047	Magnetic	428797	5993756	A2	-	-	-	28	Small anomaly only identified on one survey line. Indicative of possible buried ferrous debris.	-
7048	Magnetic	418024	5990724	A2	-	-	-	354	Large anomaly only identified on one survey line. Indicative of possible substantial buried ferrous debris.	-

WA ID	Classification	Easting	Northing	Archaeological Discrimination	Length (m)	Width (m)	Height (m)	Magnetic Amplitude (nT)	Description	External References
7049	Magnetic	435340	5995340	A2	-	-	-	90	Medium sized anomaly only identified on one survey line. Indicative of possible buried ferrous debris.	-
7050	Magnetic	432467	5994736	A2	-	-	-	18	Small anomaly only identified on one survey line. Indicative of possible buried ferrous debris.	-
7051	Magnetic	418130	5990738	A2	-	-	-	75	Medium anomaly identified on more than one survey line. Indicative of possible buried ferrous debris.	-
7052	Magnetic	403704	5988118	A2	-	-	-	67	Medium sized anomaly only identified on one survey line. Indicative of possible buried ferrous debris.	-
7053	Magnetic	402444	5987954	A2	-	-	-	24	Small anomaly only identified on one survey line. Indicative of possible buried ferrous debris.	-
7054	Magnetic	402396	5987689	A2	-	-	-	21	Small anomaly only identified on one survey line. Indicative of possible buried ferrous debris.	-
7055	Dark reflector	364158	5963742	A2	3.8	2.3	0.8	-	Large blocky object with height. Looks similar to a rock but larger than any others seen so far, although stretched. Possible debris.	-
7056	Dark reflector	372739	5969307	A2	3.5	0.9	0.5	-	Irregular elongated feature with height lying in area of sandwaves.	-
7057	Bright reflector	364974	5964501	A2	4.9	1.7	0	-	Irregularly shaped feature. Possibly a shadow or shadows but only one possible object in front that is extremely indistinct and couldn't account for all the bright reflector.	-

WA ID	Classification	Easting	Northing	Archaeological Discrimination	Length (m)	Width (m)	Height (m)	Magnetic Amplitude (nT)	Description	External References
7058	Bright reflector	364958	5964506	A2	3.3	1	0	-	Might be a shadow but if there is an object in front it is very indistinct. Otherwise, it might be debris. Near **7057**.	-
7059	Wreck	362548	5962994	A1	82.6	20	4.1	122	Recorded by the UKHO as probably the wreck of *Rebono*, a British trawler mined and sunk on 23/09/1914. Large wreck aligned 045/225 that is extremely difficult to determine extents for. Lots of shadows in the sidescan data but hard to see the objects causing them. Appears broken up and mostly buried in area of sandwaves. Shadows indicate considerable height. May be some scouring near SW end. Has a medium magnetic anomaly associated indicating ferrous content. In the bathymetry data the wreck is not particularly well defined although it has a distinct peak at its centre. The wreck appears to have caused localised changes to the surrounding sediment with sediment build-up around the wreck.	UKHO 8918
7060	Debris	362554	5963014	A2	1.8	0.2	0.4	-	Near wreck **7059**, on NW side. Small elongate feature with height.	-
7061	Debris	362548	5963008	A2	1.2	0.7	0.4	-	Small rounded object with height. Looks like a rock but close to wreck **7059**, on NW side, and seemingly no rocks nearby.	-
7062	Debris	362527	5962994	A2	1.5	0.4	0.7	-	Small blocky object with height close to wreck **7059** on NW side. Possibly a smaller similar object very close by.	-

WA ID	Classification	Easting	Northing	Archaeological Discrimination	Length (m)	Width (m)	Height (m)	Magnetic Amplitude (nT)	Description	External References
7063	Bright reflector	358453	5960466	A2	7.4	3	0	-	Irregularly shaped object. Possible debris but may be a scar. Almost U-shaped. Dimensions are overall. Actual width 0.9 m. Length of 'unravelled' feature is 10.1 m.	-
7064	Debris	363480	5963509	A2	3.8	0.2	0.3	-	Narrow linear feature with height.	-
7065	Magnetic	380700	5974107	A2	-	-	-	35	Small anomaly only identified on one survey line. Indicative of possible buried ferrous debris.	-
7066	Magnetic	396268	5986315	A2	-	-	-	41	Small anomaly only identified on one survey line. Indicative of possible buried ferrous debris.	-
7067	Magnetic	381432	5973871	A2	-	-	-	70	Medium sized anomaly only identified on one survey line. Indicative of possible buried ferrous debris.	-
7068	Magnetic	389202	5980469	A2	-	-	-	10	Small anomaly only identified on one survey line. Indicative of possible buried ferrous debris.	-
7069	Magnetic	394212	5984721	A2	-	-	-	23	Small anomaly only identified on one survey line. Indicative of possible buried ferrous debris.	-
7070	Magnetic	394346	5984833	A2	-	-	-	19	Small anomaly only identified on one survey line. Indicative of possible buried ferrous debris.	-
7071	Magnetic	378542	5972721	A2	-	-	-	138	Medium anomaly identified on more than one survey line. Indicative of possible buried ferrous debris.	-
7072	Magnetic	393414	5983749	A2	-	-	-	40	Small anomaly identified on more than one survey line. Indicative of possible buried ferrous debris.	-

WA ID	Classification	Easting	Northing	Archaeological Discrimination	Length (m)	Width (m)	Height (m)	Magnetic Amplitude (nT)	Description	External References
7073	Magnetic	391384	5982025	A2	-	-	-	72	Medium sized anomaly only identified on one survey line. Indicative of possible buried ferrous debris.	-
7074	Magnetic	363072	5963145	A2	-	-	-	33	Small anomaly only identified on one survey line. Indicative of possible buried ferrous debris.	-
7075	Magnetic	395126	5984969	A2	-	-	-	197	Large anomaly identified on more than one survey line. Indicative of possible substantial buried ferrous debris.	-
7076	Magnetic	392640	5982849	A2	-	-	-	48	Small anomaly only identified on one survey line. Indicative of possible buried ferrous debris.	-
7077	Magnetic	390420	5980965	A2	-	-	-	37	Small anomaly only identified on one survey line. Indicative of possible buried ferrous debris.	-
7078	Magnetic	388356	5979201	A2	-	-	-	94	Medium anomaly identified on more than one survey line. Indicative of possible buried ferrous debris.	-
7079	Magnetic	388230	5979093	A2	-	-	-	49	Small anomaly only identified on one survey line. Indicative of possible buried ferrous debris.	-
7080	Magnetic	394678	5984735	A2	-	-	-	24	Small anomaly only identified on one survey line. Indicative of possible buried ferrous debris.	-
7081	Magnetic	394974	5984987	A2	-	-	-	47	Small anomaly identified on more than one survey line. Indicative of possible buried ferrous debris.	-
7082	Magnetic	395308	5985273	A2	-	-	-	9	Small anomaly only identified on one survey line. Indicative of possible buried ferrous debris.	-

WA ID	Classification	Easting	Northing	Archaeological Discrimination	Length (m)	Width (m)	Height (m)	Magnetic Amplitude (nT)	Description	External References
7083	Magnetic	380850	5973899	A2	-	-	-	7	Small anomaly only identified on one survey line. Indicative of possible buried ferrous debris.	-
7084	Magnetic	373142	5969255	A2	-	-	-	16	Small anomaly only identified on one survey line. Indicative of possible buried ferrous debris.	-
7085	Magnetic	376568	5971707	A2	-	-	-	50	Medium sized anomaly only identified on one survey line. Indicative of possible buried ferrous debris.	-
7086	Magnetic	356786	5959475	A2	-	-	-	28	Small anomaly only identified on one survey line. Indicative of possible buried ferrous debris.	-
7087	Magnetic	361458	5962481	A2	-	-	-	18	Small anomaly only identified on one survey line. Indicative of possible buried ferrous debris.	-
7088	Magnetic	393449	5984028	A2	-	-	-	45	Small anomaly only identified on one survey line. Indicative of possible buried ferrous debris.	-
7089	Debris field	335100	5927754	A2	44.6	18.7	0.7	-	Group of dark reflectors with height on an otherwise empty seabed. Some appear to be quite straight, however this may be distortion of the image due to movement of the sonar fish. Largest tagged contact measures 3.3 x 1.7 x 0.8m.	-
7090	Debris field	340074	5930504	A2	15.3	12.1	0.9	175	Debris field comprising dark reflectors with height, some of which are linear. Associated large magnetic anomaly indicates ferrous material. Largest object measures 5.9 x 3.5 x 0.9m.	-

WA ID	Classification	Easting	Northing	Archaeological Discrimination	Length (m)	Width (m)	Height (m)	Magnetic Amplitude (nT)	Description	External References
7091	Debris	346074	5940460	A2	6.4	0.8	0.3	1782	Short, linear item of debris with height. Appears to contain two parallel dark reflectors. Corresponds with very large anomaly identified in magnetometer data. The visible object is quite small and it is possible that further ferrous material is buried nearby.	-
7092	Debris	346037	5940598	A2	10.4	1	0.2	-	Linear feature consisting of two parallel dark reflectors with height. There is no associated magnetic anomaly.	-
7093	Debris	346024	5940614	A2	11.6	1.1	0.3	-	Elongated feature containing 2 parallel linear dark reflectors. Feature has height but no associated magnetic anomaly. Near to similar object **7092**.	-
7094	Debris	346047	5940774	A2	10.8	1.3	0.3	66	Linear item of debris consisting of two parallel dark reflectors identified in an area of multiple rocks. Feature has associated medium magnetic anomaly indicating ferrous content.	-
7095	Debris	346013	5940809	A2	8.2	1	0	359	Linear feature, possible shadow with indistinct object in front. Object corresponds with a large magnetic anomaly, indicating ferrous content.	-
7096	Debris	346002	5940833	A2	9.8	1.1	0.3	182	Linear dark reflector, two parallel objects, with height. Large magnetic anomaly associated indicating ferrous content. Near to **7095**.	-

WA ID	Classification	Easting	Northing	Archaeological Discrimination	Length (m)	Width (m)	Height (m)	Magnetic Amplitude (nT)	Description	External References
7097	Debris	346314	5941172	A2	15.4	1	0.5	-	Linear dark reflector identified close to interpreted fishing gear. Possibly related item of modern anthropogenic debris.	-
7098	Magnetic	346656	5941697	A2	-	-	-	40	Small anomaly only identified on one survey line. Indicative of possible buried ferrous debris.	-
7099	Magnetic	346697	5942110	A2	-	-	-	125	Medium sized anomaly only identified on one survey line. Indicative of possible buried ferrous debris.	-
7100	Dark reflector	349861	5948941	A2	3.8	3.1	1.6	-	Angular dark reflector with a broad, distinct shadow. Surrounded by a large bright reflector. Observed on the bathymetry data as a distinct mound (5 x 5 x 0.9 m) within a depression.	-
7101	Bright reflector	346110	5940459	A2	10.9	1.1	0	-	Linear feature. May be natural but anomalous.	-
7102	Bright reflector	346054	5940416	A2	8.4	0.6	0	-	Linear feature similar to nearby **7101**.	-
7103	Bright reflector	346095	5940448	A2	8.5	1.6	0	-	Linear feature. Possibly has an object on the near side.	-
7104	Seafloor disturbance	353647	5956235	A2	9.3	7.9	0	-	Mostly bright reflectors. Contains smaller dark reflectors which might possibly be debris. Or, might be a rock with a scour. Identified on the bathymetry data as a small depression, possibly with a slight mound in the centre.	-
7105	Debris field	353979	5956851	A2	11.6	8.3	1.1	-	Group of small objects with height. May just be rocks as lots of individual rocks around but does look very anomalous.	-

WA ID	Classification	Easting	Northing	Archaeological Discrimination	Length (m)	Width (m)	Height (m)	Magnetic Amplitude (nT)	Description	External References
7106	Debris	352410	5954345	A2	5.2	1.5	0.6	-	Elongate indistinct feature with much darker outline on the near side. Clear bright shadow indicates varying height.	-
7107	Dark reflector	345966	5940434	A2	4.9	0.4	0.3	-	Indistinct narrow linear dark reflector with height.	-
7108	Debris	347376	5944299	A2	2.8	1.3	0.3	-	Elongate object consisting of two parallel dark reflectors. Has height.	-
7109	Debris	352041	5953495	A2	18.5	0.4	0.1	-	Possible modern debris. Indistinct curling dark reflector with height.	-
7110	Dark reflector	343610	5937869	A2	3.4	2.3	0.3	-	Possible debris. Rather distorted. Consists of three parallel, linear dark reflectors. Magnetic anomaly **7111** identified 25 m ESE and may possibly be related as it is on the closest line of magnetic data.	-
7111	Magnetic	343635	5937862	A2	-	-	-	50	Medium sized anomaly only identified on one survey line. Indicative of possible buried ferrous debris.	-
7112	Dark reflector	343179	5937261	A2	3.9	2.5	0.5	-	Elongated object with height. Contains linear very dark reflector. Scour on near side. Identified on bathymetry data as small mound within a slight depression	-
7113	Dark reflector	343631	5937925	A2	4	1.4	0.5	-	V shaped narrow dark reflector with height. Surrounded by bright reflector There is a rounded object at the top of the V. Small depression visible in the bathymetry data here.	-
7114	Bright reflector	336898	5928311	A2	15.4	0.8	0	-	Indistinct linear feature. Principally a bright reflector. Possible debris.	-

WA ID	Classification	Easting	Northing	Archaeological Discrimination	Length (m)	Width (m)	Height (m)	Magnetic Amplitude (nT)	Description	External References
7115	Seafloor disturbance	343512	5937829	A2	6.1	5	0.3	-	Looks like a depression with a dark reflector on one side. Appears as a depression in the bathymetry data.	-
7116	Bright reflector	346129	5940730	A2	7.3	0.7	0	-	Linear feature, rather indistinct. Possible debris.	-
7117	Magnetic	338669	5929062	A2	-	-	-	39	Small anomaly only identified on one survey line. Indicative of possible buried ferrous debris.	-
7118	Magnetic	339041	5929180	A2	-	-	-	74	Medium sized anomaly only identified on one survey line. Indicative of possible buried ferrous debris.	-
7119	Magnetic	340767	5933950	A2	-	-	-	218	Large anomaly identified on more than one survey line. Indicative of possible substantial buried ferrous debris.	-
7120	Magnetic	341955	5936374	A2	-	-	-	59	Medium sized anomaly only identified on one survey line. Indicative of possible buried ferrous debris.	-
7121	Magnetic	344285	5938426	A2	-	-	-	492	Large anomaly only identified on one survey line. Indicative of possible substantial buried ferrous debris.	-
7122	Magnetic	343867	5938122	A2	-	-	-	174	Large anomaly identified on more than one survey line. Indicative of possible substantial buried ferrous debris.	-
7123	Magnetic	354797	5957432	A2	-	-	-	77	Medium sized anomaly only identified on one survey line. Indicative of possible buried ferrous debris.	-
7124	Magnetic	355907	5958328	A2	-	-	-	78	Medium sized anomaly only identified on one survey line. Indicative of possible buried ferrous debris.	-

WA ID	Classification	Easting	Northing	Archaeological Discrimination	Length (m)	Width (m)	Height (m)	Magnetic Amplitude (nT)	Description	External References
7125	Magnetic	349763	5948698	A2	-	-	-	86	Medium sized anomaly only identified on one survey line. Indicative of possible buried ferrous debris.	-
7126	Magnetic	346409	5941200	A2	-	-	-	76	Medium anomaly identified on more than one survey line. Indicative of possible buried ferrous debris.	-
7127	Magnetic	336629	5928412	A2	-	-	-	57	Medium sized anomaly only identified on one survey line. Indicative of possible buried ferrous debris.	-
7128	Magnetic	338825	5929134	A2	-	-	-	87	Medium sized anomaly only identified on one survey line. Indicative of possible buried ferrous debris.	-
7129	Magnetic	340567	5931260	A2	-	-	-	76	Medium sized anomaly only identified on one survey line. Indicative of possible buried ferrous debris.	-
7130	Magnetic	340655	5931792	A2	-	-	-	56	Medium sized anomaly only identified on one survey line. Indicative of possible buried ferrous debris.	-
7131	Magnetic	340659	5931820	A2	-	-	-	222	Large anomaly identified on more than one survey line. Indicative of possible substantial buried ferrous debris.	-
7132	Magnetic	342163	5936722	A2	-	-	-	54	Medium sized anomaly only identified on one survey line. Indicative of possible buried ferrous debris.	-
7133	Magnetic	345531	5939224	A2	-	-	-	39	Small anomaly only identified on one survey line. Indicative of possible buried ferrous debris.	-
7134	Magnetic	355269	5957918	A2	-	-	-	33	Small anomaly only identified on one survey line. Indicative of possible buried ferrous debris.	-

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7135	Magnetic	353727	5956226	A2	-	-	-	39	Small anomaly only identified on one survey line. Indicative of possible buried ferrous debris.	-
7136	Magnetic	351293	5951542	A2	-	-	-	91	Medium sized anomaly only identified on one survey line. Indicative of possible buried ferrous debris.	-
7137	Magnetic	346221	5940292	A2	-	-	-	23	Small anomaly only identified on one survey line. Indicative of possible buried ferrous debris.	-
7138	Magnetic	346115	5940014	A2	-	-	-	40	Small anomaly only identified on one survey line. Indicative of possible buried ferrous debris.	-
7139	Magnetic	352391	5954562	A2	-	-	-	28	Small anomaly only identified on one survey line. Indicative of possible buried ferrous debris.	-
7140	Magnetic	352215	5954020	A2	-	-	-	59	Medium sized anomaly only identified on one survey line. Indicative of possible buried ferrous debris.	-
7141	Magnetic	340985	5934036	A2	-	-	-	53	Medium anomaly identified on more than one survey line. Indicative of possible buried ferrous debris.	-
7142	Magnetic	343313	5937484	A2	-	-	-	24	Small anomaly only identified on one survey line. Indicative of possible buried ferrous debris.	-
7143	Magnetic	342907	5937188	A2	-	-	-	18	Small anomaly only identified on one survey line. Indicative of possible buried ferrous debris.	-
7144	Magnetic	339535	5929468	A2	-	-	-	488	Large anomaly identified on more than one survey line. Indicative of possible substantial buried ferrous debris.	-

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7145	Magnetic	337337	5928816	A2	-	-	-	100	Medium sized anomaly only identified on one survey line. Indicative of possible buried ferrous debris.	-
7146	Magnetic	334425	5927520	A2	-	-	-	61	Medium anomaly identified on more than one survey line. Indicative of possible buried ferrous debris.	-
7147	Magnetic	337453	5928532	A2	-	-	-	31	Small anomaly identified on more than one survey line. Indicative of possible buried ferrous debris.	-
7148	Magnetic	338767	5928956	A2	-	-	-	32	Small anomaly only identified on one survey line. Indicative of possible buried ferrous debris.	-
7149	Magnetic	339127	5929070	A2	-	-	-	64	Medium sized anomaly only identified on one survey line. Indicative of possible buried ferrous debris.	-
7150	Magnetic	339139	5929018	A2	-	-	-	42	Small anomaly only identified on one survey line. Indicative of possible buried ferrous debris.	-
7151	Magnetic	332042	5926780	A2	-	-	-	25	Small anomaly identified on more than one survey line. Indicative of possible buried ferrous debris.	-
7152	Magnetic	335701	5927918	A2	-	-	-	44	Small anomaly only identified on one survey line. Indicative of possible buried ferrous debris.	-
7153	Magnetic	336553	5928472	A2	-	-	-	105	Medium anomaly identified on more than one survey line. Indicative of possible buried ferrous debris.	-
7154	Magnetic	336597	5928474	A2	-	-	-	20	Small anomaly only identified on one survey line. Indicative of possible buried ferrous debris.	-

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7155	Magnetic	336021	5928368	A2	-	-	-	99	Medium anomaly identified on more than one survey line. Indicative of possible buried ferrous debris.	-
7156	Magnetic	334273	5927754	A2	-	-	-	54	Medium sized anomaly only identified on one survey line. Indicative of possible buried ferrous debris.	-
7157	Magnetic	332375	5927130	A2	-	-	-	85	Medium sized anomaly only identified on one survey line. Indicative of possible buried ferrous debris.	-
7158	Magnetic	333639	5927642	A2	-	-	-	10	Small anomaly only identified on one survey line. Indicative of possible buried ferrous debris.	-
7159	Magnetic	351073	5951836	A2	-	-	-	11	Small anomaly only identified on one survey line. Indicative of possible buried ferrous debris.	-
7160	Magnetic	351341	5952376	A2	-	-	-	91	Medium sized anomaly only identified on one survey line. Indicative of possible buried ferrous debris.	-
7161	Magnetic	352413	5953950	A2	-	-	-	41	Small anomaly only identified on one survey line. Indicative of possible buried ferrous debris.	-
7162	Magnetic	352135	5953384	A2	-	-	-	105	Medium sized anomaly only identified on one survey line. Indicative of possible buried ferrous debris.	-
7163	Magnetic	351939	5952990	A2	-	-	-	85	Medium sized anomaly only identified on one survey line. Indicative of possible buried ferrous debris.	-
7164	Magnetic	351611	5952312	A2	-	-	-	81	Medium sized anomaly only identified on one survey line. Indicative of possible buried ferrous debris.	-

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7165	Magnetic	351441	5951962	A2	-	-	-	43	Small anomaly only identified on one survey line. Indicative of possible buried ferrous debris.	-
7166	Magnetic	339993	5930002	A2	-	-	-	56	Medium sized anomaly only identified on one survey line. Indicative of possible buried ferrous debris.	-
7167	Magnetic	353513	5956152	A2	-	-	-	80	Medium sized anomaly only identified on one survey line. Indicative of possible buried ferrous debris.	-
7168	Magnetic	353093	5955870	A2	-	-	-	95	Medium sized anomaly only identified on one survey line. Indicative of possible buried ferrous debris.	-
7169	Magnetic	352273	5954220	A2	-	-	-	152	Large anomaly identified on more than one survey line. Indicative of possible substantial buried ferrous debris.	-
7170	Magnetic	349351	5948150	A2	-	-	-	100	Medium sized anomaly only identified on one survey line. Indicative of possible buried ferrous debris.	-
7171	Magnetic	349429	5948308	A2	-	-	-	20	Small anomaly only identified on one survey line. Indicative of possible buried ferrous debris.	-
7172	Magnetic	346161	5940131	A2	-	-	-	154	Large anomaly only identified on one survey line. Indicative of possible substantial buried ferrous debris.	-
7173	Magnetic	342679	5937229	A2	-	-	-	43	Small anomaly only identified on one survey line. Indicative of possible buried ferrous debris.	-
7174	Magnetic	343430	5937827	A2	-	-	-	64	Medium sized anomaly only identified on one survey line. Indicative of possible buried ferrous debris.	-

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7175	Magnetic	343779	5938030	A2	-	-	-	37	Small anomaly only identified on one survey line. Indicative of possible buried ferrous debris.	-
7176	Magnetic	346120	5940894	A2	-	-	-	17	Small anomaly only identified on one survey line. Indicative of possible buried ferrous debris.	-
7177	Magnetic	346524	5941283	A2	-	-	-	18	Small anomaly only identified on one survey line. Indicative of possible buried ferrous debris.	-
7178	Magnetic	344448	5938254	A2	-	-	-	118	Medium sized anomaly only identified on one survey line. Indicative of possible buried ferrous debris.	-
7179	Magnetic	344598	5938337	A2	-	-	-	54	Medium sized anomaly only identified on one survey line. Indicative of possible buried ferrous debris.	-
7194	Debris	326225	5919009	A2	3.4	3.1	0.4	-	Square shaped, isolated object with height. Seems to be a scour running off to the SW. There are areas of sandwaves nearby.	-
7195	Dark reflector	325582	5920887	A2	2.7	1.6	0.3	-	Blocky object. Shadow indicates variable height. Isolated object.	-
7196	Dark reflector	326086	5918996	A2	6.3	0.6	0.1	-	May be one linear object or two right next to each other. May be debris. Isolated object.	-
7197	Dark reflector	326087	5918874	A2	3.1	1.5	0.2	-	Irregularly shaped object with height. Near a large sandwave.	-
7198	Dark reflector	326029	5916618	A2	4.3	1.1	0.8	-	Irregularly shaped and angular object with height. Possible debris. Has a scour to the south measuring 15 m.	-

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7199	Dark reflector	325992	5916604	A2	4.8	1.3	0.5	-	Irregularly shaped object with height. Scour on the near side. On sandy area of seabed with rippled area nearby. Similar to **7198**, which lies nearby.	-
7200	Dark reflector	326038	5916639	A2	1.5	1.3	0.6	-	Triangular object with height and possible scour in area of rippled seabed. Possible debris.	-
7201	Debris	326433	5912506	A2	7.1	1.1	0.3	-	Linear dark reflector. Very distinct with bright shadow in area of rippled seabed.	-
7202	Debris field	326428	5912685	A2	7.9	4.4	0	-	Group of four small narrow dark reflectors. Very distinct on rippled seabed. Nothing similar around. Not visible in bathymetry data.	-
7207	Dark reflector	322147	5908432	A2	6.9	0.2	0.1	-	Long and thin slightly curvilinear dark reflector in poor quality data, indistinct feature on a sandy area of the seabed	-
7208	Dark reflector	324090	5909241	A2	1.8	1.6	0.2	-	Small object with height at the end of a long scar, suggesting it has been dragged.	-
7209	Debris	326059	5910732	A2	3.4	0.7	0.9	50	Indistinct dark reflector with a large tapered shadow. A small magnetic anomaly is associated with this feature indicating it is likely to have some ferrous content.	-
7210	Dark reflector	324107	5909139	A2	4.1	0.9	0.4	-	Large and distinctive curved dark reflector with a bright shadow and in a depression, located in sand waves, possibly anthropogenic.	-

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7215	Magnetic	324856	5924283	A2	-	-	-	53	Medium sized anomaly only identified on one survey line. Indicative of possible buried ferrous debris.	-
7216	Magnetic	330802	5926465	A2	-	-	-	9	Small anomaly only identified on one survey line. Indicative of possible buried ferrous debris.	-
7217	Magnetic	329151	5925807	A2	-	-	-	95	Medium sized anomaly only identified on one survey line. Indicative of possible buried ferrous debris.	-
7218	Magnetic	326955	5925189	A2	-	-	-	41	Small anomaly only identified on one survey line. Indicative of possible buried ferrous debris.	-
7219	Magnetic	331335	5926513	A2	-	-	-	18	Small anomaly identified on more than one survey line. Indicative of possible buried ferrous debris.	-
7220	Magnetic	325240	5922585	A2	-	-	-	49	Small anomaly only identified on one survey line. Indicative of possible buried ferrous debris.	-
7221	Magnetic	326878	5917393	A2	-	-	-	103	Medium sized anomaly only identified on one survey line. Indicative of possible buried ferrous debris.	-
7222	Magnetic	325568	5921407	A2	-	-	-	52	Medium sized anomaly only identified on one survey line. Indicative of possible buried ferrous debris.	-
7223	Magnetic	326102	5918654	A2	-	-	-	15	Small anomaly only identified on one survey line. Indicative of possible buried ferrous debris.	-
7224	Magnetic	326141	5915961	A2	-	-	-	99	Medium sized anomaly only identified on one survey line. Indicative of possible buried ferrous debris.	-

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7225	Magnetic	326159	5915801	A2	-	-	-	9	Small anomaly only identified on one survey line. Indicative of possible buried ferrous debris.	-
7226	Magnetic	326057	5915981	A2	-	-	-	39	Small anomaly only identified on one survey line. Indicative of possible buried ferrous debris.	-
7227	Magnetic	326315	5913761	A2	-	-	-	86	Medium sized anomaly only identified on one survey line. Indicative of possible buried ferrous debris.	-
7232	Magnetic	326416	5912566	A2	-	-	-	158	Large anomaly only identified on one survey line. Indicative of possible substantial buried ferrous debris.	-
7233	Magnetic	326421	5915235	A2	-	-	-	113	Medium anomaly identified on more than one survey line. Indicative of possible buried ferrous debris.	-
7234	Magnetic	326493	5912565	A2	-	-	-	35	Small anomaly only identified on one survey line. Indicative of possible buried ferrous debris.	-
7235	Magnetic	326103	5915903	A2	-	-	-	123	Medium anomaly identified on more than one survey line. Indicative of possible buried ferrous debris.	-
7236	Magnetic	326311	5915533	A2	-	-	-	29	Small anomaly only identified on one survey line. Indicative of possible buried ferrous debris.	-
7237	Magnetic	326549	5913489	A2	-	-	-	97	Medium sized anomaly only identified on one survey line. Indicative of possible buried ferrous debris.	-
7238	Magnetic	326361	5914796	A2	-	-	-	66	Medium sized anomaly only identified on one survey line. Indicative of possible buried ferrous debris.	-

WA ID	Classification	Easting	Northing	Archaeological Discrimination	Length (m)	Width (m)	Height (m)	Magnetic Amplitude (nT)	Description	External References
7239	Magnetic	326623	5912551	A2	-	-	-	16	Small anomaly only identified on one survey line. Indicative of possible buried ferrous debris.	-
7240	Magnetic	324407	5909329	A2	-	-	-	59	Medium sized anomaly only identified on one survey line. Indicative of possible buried ferrous debris.	-
7241	Magnetic	325601	5910144	A2	-	-	-	23	Small anomaly only identified on one survey line. Indicative of possible buried ferrous debris.	-
7242	Magnetic	325280	5909928	A2	-	-	-	69	Medium sized anomaly only identified on one survey line. Indicative of possible buried ferrous debris.	-
7244	Magnetic	324332	5909411	A2	-	-	-	16	Small anomaly identified on more than one survey line. Indicative of possible buried ferrous debris.	-
7245	Magnetic	325777	5910299	A2	-	-	-	31	Small anomaly only identified on one survey line. Indicative of possible buried ferrous debris.	-
7246	Magnetic	324939	5909418	A2	-	-	-	116	Medium sized anomaly only identified on one survey line. Indicative of possible buried ferrous debris.	-
7247	Magnetic	326848	5925290	A2	-	-	-	52	Medium sized anomaly only identified on one survey line. Indicative of possible buried ferrous debris.	-
7248	Magnetic	328527	5925837	A2	-	-	-	263	Large anomaly identified on more than one survey line. Indicative of possible substantial buried ferrous debris.	-
7249	Magnetic	329578	5926180	A2	-	-	-	122	Medium sized anomaly only identified on one survey line. Indicative of possible buried ferrous debris.	-

WA ID	Classification	Easting	Northing	Archaeological Discrimination	Length (m)	Width (m)	Height (m)	Magnetic Amplitude (nT)	Description	External References
7250	Magnetic	326975	5925441	A2	-	-	-	101	Medium anomaly identified on more than one survey line. Indicative of possible buried ferrous debris.	-
7251	Magnetic	329064	5926028	A2	-	-	-	186	Large anomaly identified on more than one survey line. Indicative of possible substantial buried ferrous debris.	-
7252	Magnetic	327693	5925621	A2	-	-	-	37	Small anomaly only identified on one survey line. Indicative of possible buried ferrous debris.	-
7253	Magnetic	329721	5926277	A2	-	-	-	39	Small anomaly only identified on one survey line. Indicative of possible buried ferrous debris.	-
7254	Magnetic	330412	5926502	A2	-	-	-	36	Small anomaly only identified on one survey line. Indicative of possible buried ferrous debris.	-
7255	Magnetic	325165	5909565	A2	-	-	-	17	Small anomaly only identified on one survey line. Indicative of possible buried ferrous debris.	-
7256	Magnetic	325094	5909802	A2	-	-	-	84	Medium sized anomaly only identified on one survey line. Indicative of possible buried ferrous debris.	-
7257	Magnetic	328457	5925930	A2	-	-	-	55	Medium anomaly identified on more than one survey line. Indicative of possible buried ferrous debris.	-
7258	Magnetic	345641	5940660	A2	-	-	-	48	Small anomaly only identified on one survey line. Indicative of possible buried ferrous debris.	-
7259	Magnetic	344051	5938494	A2	-	-	-	21	Small anomaly only identified on one survey line. Indicative of possible buried ferrous debris.	-

WA ID	Classification	Easting	Northing	Archaeological Discrimination	Length (m)	Width (m)	Height (m)	Magnetic Amplitude (nT)	Description	External References
7260	Magnetic	344260	5938645	A2	-	-	-	32	Small anomaly only identified on one survey line. Indicative of possible buried ferrous debris.	-
7261	Magnetic	344670	5938921	A2	-	-	-	40	Small anomaly only identified on one survey line. Indicative of possible buried ferrous debris.	-
7262	Magnetic	344856	5939093	A2	-	-	-	70	Medium anomaly identified on more than one survey line. Indicative of possible buried ferrous debris.	-
7263	Magnetic	345385	5939453	A2	-	-	-	45	Small anomaly only identified on one survey line. Indicative of possible buried ferrous debris.	-
7264	Dark reflector	321684	5908380	A2	5.3	0.9	0.2	-	Large dark reflector with a tapered shadow and in a depression, feature has a thick 'v' shaped part with a long curvilinear object coming from this. Not visible in bathymetry data.	-
7265	Dark reflector	321457	5908612	A2	4.5	0.8	0.3	18357	Long and thick linear dark reflector with no shadow, quite an indistinct object on a sandy and even area of the seabed. Extremely large dipole identified on more than one survey line in data collected by both vessels. Nothing on chart here. Possibly the dark reflector is only part of a much large feature that is buried. Nothing anthropogenic visible in bathymetry data. Nothing on chart.	-

WA ID	Classification	Easting	Northing	Archaeological Discrimination	Length (m)	Width (m)	Height (m)	Magnetic Amplitude (nT)	Description	External References
7266	Debris field	321420	5908688	A2	8	4.9	0.2	726	Possible debris field made up of a distinct 'T' shaped dark reflectors and dull shadows. There are smaller dark reflectors scattered around the main object. Located on a very sandy area of the seabed and may be partially buried. Large dipole identified on more than one survey line indicating substantial ferrous content. Possibly associated with **7265**, which lies approximately 85 m to the SE. Seabed appears uneven in bathymetry data here but no features of anthropogenic appearance.	-
7267	Debris field	321327	5908652	A2	7.7	3.2	0.5	28	Large spread of possible debris made up of group of thick linear/circular dark reflectors with large bright shadows, possibly group of rocks though appear in an alignment. Small dipole identified on more than one survey line corresponds, indicating some possible ferrous content. Seabed appears naturally uneven in bathymetry data here but no features of anthropogenic appearance.	-

WA ID	Classification	Easting	Northing	Archaeological Discrimination	Length (m)	Width (m)	Height (m)	Magnetic Amplitude (nT)	Description	External References
7268	Debris	320708	5908463	A2	4.4	0.4	0.1	2530	Thin and curvilinear distinct dark reflector object with a bright shadow, almost horse shoe shaped feature on a rough and gravelly area of the seabed, highly anomalous. Very large asymmetric dipole identified on more than one survey line indicating substantial ferrous content. It is possible more material is buried here as the magnetic anomaly is large compared to the visible size of the feature. Seabed appears naturally uneven in bathymetry data here but no features of anthropogenic appearance.	-
7269	Magnetic	320338	5908413	A2	-	-	-	50	Medium sized anomaly only identified on one survey line. Indicative of possible buried ferrous debris.	-
7270	Magnetic	321103	5908432	A2	-	-	-	46	Small anomaly identified on more than one survey line. Indicative of possible buried ferrous debris.	-
7271	Magnetic	320590	5908228	A2	-	-	-	36	Small anomaly only identified on one survey line. Indicative of possible buried ferrous debris.	-
7272	Magnetic	320472	5908296	A2	-	-	-	2155	Very large anomaly identified on more than one survey line. Indicative of possible substantial buried ferrous debris.	-
7273	Magnetic	321142	5908673	A2	-	-	-	9	Small anomaly only identified on one survey line. Indicative of possible buried ferrous debris.	-

WA ID	Classification	Easting	Northing	Archaeological Discrimination	Length (m)	Width (m)	Height (m)	Magnetic Amplitude (nT)	Description	External References
7274	Magnetic	321339	5908618	A2	-	-	-	10	Small anomaly only identified on one survey line. Indicative of possible buried ferrous debris.	-
7275	Magnetic	320910	5908281	A2	-	-	-	99	Medium anomaly identified on more than one survey line. Indicative of possible buried ferrous debris.	-
7276	Magnetic	320899	5908256	A2	-	-	-	98	Medium anomaly identified on more than one survey line. Indicative of possible buried ferrous debris.	-
7277	Magnetic	320811	5908371	A2	-	-	-	12	Small anomaly only identified on one survey line. Indicative of possible buried ferrous debris.	-
7278	Dark reflector	321528	5908551	A2	12.7	3.8	0	-	Long and thick linear dark reflector with no shadow, possibly natural though length and straightness suggests not. Nothing anthropogenic visible in bathymetry data. There is a large elongate mound (22 x 13 x 0.4 m) close by and it is possible that the dark reflector may represent the edge of the mound, but there is no shadow to indicate height.	-
7279	Mound	327118	5925885	A2	6	5	0.5	-	Approximately circular mound in bathymetry data. Seabed depth approximately -9.1 m. Slight scour around feature. May just be a rock but no sidescan data here to assist with interpretation.	-

WA ID	Classification	Easting	Northing	Archaeological Discrimination	Length (m)	Width (m)	Height (m)	Magnetic Amplitude (nT)	Description	External References
7280	Mound	326969	5925886	A2	5	5	0.3	-	Approximately circular mound in bathymetry data. Seabed depth approximately -9.1 m. Slight scour around feature. May just be a rock but no sidescan data here to assist with interpretation.	-
7281	Mound	327047	5925733	A2	4	4	0.2	-	Approximately circular mound in bathymetry data. Seabed depth approximately -9.0 m. Slight scour around feature. May just be a rock but no sidescan data here to assist with interpretation.	-
7282	Mound	326976	5925537	A2	4	4	0.3	-	Approximately circular mound in bathymetry data. Seabed depth approximately -9.1 m. Slight scour around feature. May just be a rock but no sidescan data here to assist with interpretation.	-
7283	Mound	326548	5925577	A2	5	4	0.2	-	Approximately circular mound in bathymetry data. Seabed depth approximately -8.9 m. Slight scour around feature. May just be a rock but no sidescan data here to assist with interpretation.	-

Appendix XI: Maritime archaeological potential

Introduction

10.1.1 Subsequent to the inundation of the UK element of the submarine cable corridor by post Devensian rising sea levels any human activity can be expected to be of a maritime nature, relating to seafaring and the human exploitation of the sea. As an island nation, the UK has a long maritime history and, as such, there is potential for the presence of archaeological material spanning from the Mesolithic period to the present day within the area. Lincolnshire boasts a long coastline and major waterway networks, associated historically with 'trading places', specialised industries and the production and distribution of goods. There is thus the potential for the discovery maritime archaeological material relating to this maritime activity.

10.1.2 There are many known and accurately charted wreck sites in UK waters. However, the known wreck resource is inherently biased, with a greater number of wrecks dating to the 19th and 20th centuries in comparison to sparse records from earlier periods. By way of illustrating this bias, the ALSF funded *Marine Class Description and Principles of Selection for Aggregate Producing Areas* project revealed that of the total number of known and dated wreck sites, a notable 96% are recorded to have been lost in the period between 1860 and 1950 (Wessex Archaeology 2008a).

10.1.3 There are a number of factors which can be considered as contributing to this bias. Firstly, prior to the establishment of the Lloyds of London list of shipping casualties in 1741, there was no central record of shipping losses. Moreover, the 19th century shipbuilding industry also witnessed the increasing use of iron and steel in construction. The use of metal components in vessel construction meant that not only were the submerged remains of wrecks more likely to survive, they were also considered to pose greater navigational hazards to existing shipping than their wooden-hulled counterparts, and were charted more scrupulously as a result (Merritt *et al*. 2007: 13).

10.1.4 It is therefore clear that there is the potential for wreck sites and wreck-related debris to exist within the submarine cable corridor that is not currently represented by the known resource. As such, the 'potential' maritime resource must be given due consideration. The 'potential' maritime resource includes the consideration of vessels known to have been lost but whose remains have yet to be located. Source material of relevance here comprises vessels recorded in the Lloyds of London list of shipping casualties, in newspaper accounts and in historic records of eye witness accounts. These records are commonly referred to as Recorded Losses and are discussed in section 5.3.

10.1.5 The "potential" maritime resource also includes consideration for vessels for which there is no account of their loss (e.g. prehistoric or early historic losses, loss of smaller local craft). This assessment is further underpinned by the characterisation of known maritime activity (e.g. shipping routes, fishing grounds, maritime battles) alongside a consideration of find spots within the submarine cable corridor (e.g. artefacts discovered and since raised from their location of find).

Pre-1508 AD

10.1.6 Maritime discoveries of pre-1508 date are rare. Little is known about Prehistoric maritime activities or types of craft while the data available for the Romano-British and Medieval periods is limited in comparison to subsequent periods. On this basis, all material from this period will be of special interest solely due to the rarity of any discoveries.

10.1.7 There are no known or charted wrecks and no recorded losses from this period within the UK element of the submarine cable corridor. However, terrestrial records for the

foreshore extent of the area assessed are indicative of human activity prior to 1508 AD. These records are discussed, where relevant, below.

10.1.8 There is no evidence for Palaeolithic maritime activities in the archaeological record for the UK, although archaeological material from elsewhere suggests that early modern humans did undertake maritime activities (e.g. Johnstone 1980; Lourandos 1997). The resources required to construct simple watercraft, such as hide-covered log or boat rafts, would have been available during this period and it has been postulated that late Upper Palaeolithic communities utilised such craft for coastal journeying and fishing (McGrail 1987, 2004). Palaeolithic activity within the Search Area is signified by the discovery of a Lower Palaeolithic flint blade (NRHE 1478688/LHER MLI43430).

10.1.9 During the Mesolithic, patterns of human settlement associated with rivers and coastal environments suggest the likely use of watercraft for fishing and transport although the lack of available evidence means that the nature of these maritime activities remain unclear. Archaeological discoveries of Mesolithic logboats (e.g. McGrail 2004: 174) attests to the ability of Mesolithic communities to construct watercraft and it is likely that rafts and hide boats would also have been used. Unfortunately, their light construction makes it less likely that they would survive in the archaeological record. In Lincolnshire, less than one hundred sites of Mesolithic date are recorded in the county, the majority of which represent lithic scatters (Membery 2015: 1). Nonetheless, the potential for sites of this period to exist is considered to be heightened at areas of Fen edge, coastal areas and alleviated river valleys (Membery 2015: 1).

10.1.10 During the Neolithic and early Bronze Age (4,000 to 700 BC) the coastline of the East Coast of Britain would have attained a form similar to that of today. The movement of goods across the sea is demonstrated by the introduction into the UK of non-native species of livestock and cereals (May 1976) and the discovery of porcellanite stone axes from Ireland, on the UK mainland, and the Western Isles of Scotland (Breen and Forsythe 2004: 32). The discovery of deep water fish in shell middens at Neolithic sites demonstrates that marine fishing was being carried out at this time (Ellmers 1996). Nonetheless, the evidence for Neolithic watercraft is limited to discoveries of log boats and the precise nature of maritime activities remains unclear. Activity dating to this period in the Search Area is represented by the discovery of a Neolithic antler pick (NRHE 355974), a Neolithic Axe (NRHE 1479641/LHER MLI343463) and an Early Bronze Age flint dagger (NRHE 355959/NRHE MLI41622).

10.1.11 The scale of seafaring activities is considered to have grown through the Bronze Age (2,400 - 700 BC) and Iron Age (700 BC - AD 43) with evidence of significant advances in technology and vessel size. Logboats and hide boats remained in use alongside new vessel types such as the flat-bottomed sewn plank boats suited to a wider variety of uses in a wider range of environments (McGrail 2004). These are the earliest known form of plank construction with planks lashed together and made watertight. Securely dated logboats have been discovered in Lincolnshire, namely the Brigg log boat (1,034 BC to 634 BC) and the Short Ferry boat (1,046 BC to 646 BC) (May 1976). Evidence of sewn plank boats from the Bronze Age has been discovered to the north of the submarine cable corridor at Brigg, North Ferriby and Kilnsea (Van de Noort 2003) and to the south at Dover (Clark 2002). The Bronze Age also saw the establishment of the salt industry in Lincolnshire. An Iron beaker fragment (NRHE 356020/LHER MLI41443). Iron Age activity in the Search Area is signified by an Iron Age beaker fragment (NRHE 356020/LHERMLI41443) and evidence for enclosures and field systems thought to date back to the Iron Age (NRHE1572465, NRHE1550501).

10.1.12 A closer unity between Britain and the southern North Sea margin was established during the Romano-British period (AD 43 to 410) with an expansion and diversification of trade with the Continent. The later Iron Age saw the emergence of a distinct tradition of "Romano-Celtic" shipbuilding representing both Roman and northern European methods, capable of coastal and oceanic voyages and reflecting substantial, sea-going trade. Tacitus described the activities of the British fleet in the north of Britain in the 1st century AD and there appears to have been a significant increase in maritime traffic from the Hadrianic period onwards (2nd century AD). A significant number of the vessels involved in these movements are likely to have passed through the area. Roman presence in the area is attested by nine terrestrial records relating to Roman activity in the Search Area.

10.1.13 The 'Dark Ages' which succeeded the Roman occupation of Britain saw the migration of Saxon, and later Norse and Danish, settlers into Britain which brought both renewed expansion of trade routes and new shipbuilding traditions. A wooden structure thought to date to the Saxon period indicates activity in the Search Area dating to this period (NRHE 1484850)/LHER MLI43148). Archaeological evidence indicates Lincolnshire to have been based on a largely agrarian economy in the Saxon period. However, there is clear evidence that long-distance trade occurred during this period, as signified from graves in Lincolnshire which have contained ivory from Siberia and garnets, cowrie shells and coral from Indian and the Indian Ocean (Leahy and Coutts 1987: 7). Geographically, Lincolnshire was well suited for Continental trade via the North Sea and its navigable internal waterways (Albone 2015: 6), and many of the vessels utilised for this trade are likely to have passed through the submarine cable corridor.

10.1.14 Viking raids on the eastern British coast began in the 8th century, with the first recorded Viking attack on Lincolnshire in 841 AD (Albone 2015: 2), and during the subsequent period of Viking settlement the North Sea continued to act as a communication, trade and migration route to the Scandinavian home countries with England's existing trade routes across the North Sea functioning into the 9th century, although a lower volume of trade passed along them (Friel 2003: 44). The first evidence of a purpose-built English royal naval force comes from this period at the time of Alfred (King of Wessex 871-99), when a fleet of large, oared ships was built to help fight the invading Danes (English Heritage 2012: 5).

10.1.15 By the time of the Norman Conquest in 1066, trade between the UK and Europe expanded and shipping is likely to have intensified as a result. Powerful trading confederations emerged, such as the Hanseatic League in North Germany and the Baltic. The English Channel and North Sea was the artery for increasing trade between the UK and Europe and the dramatic increase in shipping around UK waters meant greater chances for maritime casualties. It was this period that marked the emergence of a number of notable ports in Lincolnshire, such as Grimsby to the north-west of the submarine cable corridor which developed into a fishing and trading port in the 12th century and Boston to the south. Boston was particularly active in the exportation of wool during this period, and until the end of the 13th century, it exported more wool than any other port in England (Field 2015: 4). As a result, Boston attracted many foreign traders, with Scandinavian, Flemish and Hanseatic vessels trading through Grimsby, Saltfleet, Skegness and Wainfleet (Field 2015: 4). The international nature of the trade can be further seen by the documentary evidence from the port of Kingston-Upon-Hull where during the 14th and 15th centuries only half the vessels that berthed in the port were English-owned (Allison 1969).

10.1.16 Despite this flourishing international trade, the Medieval period saw the decline of the coastal trade around Lincolnshire. Despite the maritime potential of the county yielded by the long North Sea coast and estuarine frontages, a number of maritime locations are

recorded have declined in this period and were abandoned due to silting-up and coastal accretion (Everson 2015: 16). The salt trade went into decline by the 17th century, with imports replacing local products (Field 2015: 4).

10.1.17 Although Lincolnshire has a rich maritime historic during the Medieval period, the representation of the building and maintenance of craft in the archaeological record for this period is absent (Everson 2015: 16). Terrestrial records dating to the Medieval period within the Search Area include pottery (NRHE 1478702/LHER MLI41601), a salt working site (NRHE 355944/LHER MLI41624), a ridge and furrow (NRHE 1551851) and the foundations for a Medieval settlement (LHER MLI41446).

10.1.18 The available archaeological and historical evidence indicates the development of a wide range of vessel types during the medieval period associated with the increasing need for inexpensive and spacious cargo transporters and the need to defend these merchant vessels against piracy. This increasing need and the development of ordnance precipitated the development of purpose built warships and a standing navy by the 14th century (Kemp 2002: 71).

10.1.19 By the end of the medieval period the use of flush laid strakes in construction, further developments in propulsion (single masts replaced by more complicated three or four mast rigs), increasing tonnages and the development of reliable navigation techniques and aids facilitated an even greater expansion of the trade routes. This period saw the advent of maritime exploration on a global scale as vessels from Europe reached the New World and, subsequently, mapped the spice routes to the Far East.

10.1.20 However, while the design and construction of larger ships was becoming increasingly formal and standardised, the range and types of smaller, vernacular craft are likely to have remained extensive with the use of simple rafts and skin or hide covered boats as well as wooden vessels associated with recreation, transport and fishing, for example. The wide range of historical influences upon the design of such vessels, coupled with the specific requirements of the local environment, suggest that the different types of vessels operating in the seas and rivers around Britain would have been numerous and diverse.

1509-1815 AD

10.1.21 There are no known wrecks recorded for this period within the UK element of the submarine cable corridor.

10.1.22 Technological advances in the construction, fitting and arming of ships, and in navigation, sailing and steering techniques, continued into the post-medieval period. Traditions of shipbuilding for larger vessels continued to develop around the utilisation of the flush-laid strake technique while the form and construction of local craft remained diverse, continuing to incorporate traditions of earlier periods such as the clinker construction technique.

10.1.23 The great innovations in ship design during this period were stimulated by the development and growth of new trans-oceanic communication networks which saw the opening up of the New World. The late 15th and early 16th century voyages of exploration precipitated global mercantile trade and expansion and the emergence of the “Golden Age” in northern Europe (Glete 1999) with the establishment of the East India Company in 1599.

10.1.24 By the beginning of the 17th century the volume of trade, and the numbers of vessels involved in such trade, increased dramatically. The length of voyages, the hazards of

trans-oceanic journeys and the requirements of trade saw the development of even larger vessels with round-bellied, capacious holds to accommodate both stores and cargo.

10.1.25 The East Coast played a key role in this 'Golden Age' with established overseas trade connections ranging from the Baltic Sea to the Iberian Peninsula and beyond (Williams 1988: 70). In addition to this global explosion in trade and naval warfare, the East Coast economy was still underpinned by local trade and marine exploitation. This fishing industry continued to thrive and coastal trade flourished, with colliers likely to have passed through the submarine cable corridor, carrying coal from Newcastle to London from the 16th century (Kirby and Hinkkanen 2000). To signify this growth in maritime trade, between 1716 and 1793 there was an 18-fold increase in shipping tonnage entering Kingston upon Hull (Kirby and Hinkkanen 2000). One Documented Shipping Loss is recorded to date to this period in the area, the *Risingham* (NRHE 942756). The *Risingham* was a British cargo vessel which grounded at Chapel Tunnel in 1767 but was later recovered.

10.1.26 Alongside this global growth of trade and prosperity came an increasing need to protect financial interests and from the 16th to mid-19th centuries the separation of merchant ships and ships built for fighting also became more marked. Fighting ships were designed to fight broadside to broadside with heavy ordnance. Battles at sea became larger and more destructive and a standing Royal Navy, established during the Tudor period, grew to become an established and organised force. The expansion of the Navy in the Tudor period also saw the opening of a network of royal dockyards.

1816-1913 AD

10.1.27 By the start of the 19th century, coastal and international trade were dominated by wooden sailing vessels and the 'wooden walls' of the naval fleets during the French Revolutionary Wars represented the zenith of the naval sailing vessel (Lavery 1991). However, during the course of the 19th century the technological innovations of the Industrial Revolution brought fundamental changes in maritime technology, which amongst other advances in naval engineering, enabled the development of steam propulsion, oil engines and iron and steel construction.

10.1.28 The use of iron in shipbuilding began during the 18th century but it wasn't until the first half of the 19th century that the technology came into widespread use. Initially, iron was used to supplement structural elements in shipbuilding although it was later used for angular joints or knees and the framing of vessels and ultimately replacing wood as the covering for the hull. Steel was used periodically for ship construction from the late 1850s but did not supersede iron until the later 19th century (Greenhill 1993: 89; Ville 1993: 52).

10.1.29 The first Atlantic crossing by a paddle steamer took place in May 1819 and by the 1820s steamboat transport formed an extensive network around the British Isles. The high cost in coal consumption, however, limited their range and value to the trade economy and, as such, they were largely confined to the passenger trade where reliable quick passages were more important than cost (MacRae and Waine 1990: 11). The introduction of the screw propeller began in the 1830s but it wasn't until the development of the compound engine in 1854 that vessels equipped with screw propulsion could truly compete with the sail.

10.1.30 The first steam powered naval vessel HMS *Agamemnon* was ordered by the Royal Navy in 1849 with the first iron naval ship HMS *Warrior* built in 1861 (Royal Navy website, accessed October 2016). Following a period of experimentation, designs were standardised by the 1890s with new steel 'battleships' and the large armoured cruisers built to defend trade routes. The development of the torpedo, or mine, from early

experiments in the 1860s saw the introduction of small and fast torpedo boats and, in response, heavily armed torpedo boat destroyers and led to the development of the submarine and ultimately the all-big-gun dreadnought battleships in the early 20th century.

10.1.31 The use of metal in shipbuilding increased both durability and capacity while the use of steam propulsion allowed for greater speed, thus facilitating the further growth of long distance trade. However, the transition was gradual with wooden sailing vessels such as schooners, brigs, brigantines and snows continuing to dominate until the second half of the 19th century and continuing in use well into the 20th century (Ville 1993: 52). The use of wood in the construction of local craft also continued with new technologies contributing but rarely supplanting local maritime traditions and cultural values. A number of vernacular boats types would have been active in the region, locally built, often regionally varied in design and regionally specific to conditions and task (Greenhill 1993). For example, double-ended boats, ideal for beach launch and recovery, and believed to be unique to this stretch of coast, have been excavated at Sutton on Sea and Mablethorpe (Buglass and Brigham 2007). Despite this, Grimsby and Kingston upon Hull experienced a period of prosperity with the increasing use of steam fishing boats during this period, alongside the exploitation of new trawling grounds around Dogger Bank.

10.1.32 In the 19th century a massive increase in industrial output, a growing demand for imported raw materials, food and consumer goods and the development of an integrated global transport system resulted in a dramatic rise in the volume of maritime trade and fishing in UK territorial waters. By the late 19th century a global network had been established linking the major cities of the world into an integrated global transport system. Coastal traffic also continued to grow during this period. The transport of coal was a major contributor to coastal trade with *c.* 22 million tons carried coastwise (Jackson 1983: 117). The East Coast coal trade formed a large proportion of this, from the northern coalfields to the London market. However, the major ports of the area were challenged by the opening of the railway in 1848, with a large proportion of agricultural produce now being transported by rail to London and inland centres.

10.1.33 The recording of shipping losses became more centralised in the late post-medieval period, and as such from this period onwards the available record of shipping casualties is both more complete and accurate. It is notable that all but two of the Recorded Losses recorded in the search area date to this period (**Appendix XII**). Wrecks dating to latter part of this period are also more likely to be visible in hydrographic surveys. With the use of metal in boat and ship construction becoming more common for wrecks of this period, their remains are often more evident on the sea bed than their predecessors as their upstanding components are more clearly apparent to bathymetric and geophysical survey, and they generate strong magnetic anomalies.

1914-1945 AD

10.1.34 The East Coast was subject to a high level of wartime activity throughout both World Wars. The rapid technological advances of the preceding century facilitated the development of more homogenous naval fleets of larger, faster and more durable vessels, heavily armed and incorporating the widespread use of submersibles.

10.1.35 A great number of vessels were lost during the World Wars, including both warships and submarines, but a much greater number of merchant vessels were lost as the disruption and destruction of shipping became an established military tactic. Large numbers of mines were laid by the Germans off the East Coast while German U-boats were engaged in unrestricted attacks on the British merchant fleet from September 1915 onwards. At the

height of the campaign, between February and April 1917, U-boats sank 500 merchant ships (Hewitt 2008: 17).

10.1.36 During the war years the numbers of ships passing through the submarine cable corridor intensified as a result of increased demand for shipping to fulfil military requirements and to supply the wartime economy. For example, the East Coast trade route from the 'Great North Coalfield' was still the main supply line to London, which accounted for the single largest consumption for fuel in England (Hewitt 2008: 7). To protect the maritime trade merchant fleets started operating in convoys escorted by minesweepers (Steffen 2005: 802), and a great number of non-military vessels were requisitioned by the Royal Navy to support the war effort in this respect.

10.1.37 Convoys were also utilised in the WWII in an attempt to transform the east coastal trade route into an indestructible highway (Hewitt 2008: 17, 23). The main convoy routes passing through the East Coast during WII were the FN and FS convoy series, running between the Thames (Southend) to the Firth of Forth (Methil) or the Tyne. These convoy routes ran for the duration of the war between September 1939 and May 1945.

10.1.38 As in WWI, large numbers of steam trawlers and drifters were bought or hired by the Admiralty to supplement the Royal Navy's dwindling resources in WWII. Dozens of vessels such as these were lost due to enemy action, some sunk by torpedoes or gunfire from submarines, with the additional threat of German motor torpedo boats, known as E-Boats and fighter/bomber aircraft (Larn and Larn 1997).

10.1.39 The advent of flight brought another dimension to 20th century warfare and the deployment of aircraft to destroy both merchant and military ships became a key strategy during WWII (Bowyer 2003: 26). Alongside mines and submarines, aircraft posed a significant threat to shipping in WWII which was measurably enhanced as the accuracy and effectiveness of dive-bombing techniques increased (Whitley 2002: 12).

10.1.40 The high levels of losses between 1914 and 1945, combined with the increased likelihood of discovering wrecks from this period through geophysical survey or historical accounts, means that a significantly higher proportion of wrecks dating to this period are likely to be represented in the known and potential archaeological resource.

Post-1946

10.1.41 Maritime activity within the submarine cable corridor in the post-war era is multi-faceted, with the North Sea providing an arena for military, commerce, fishing and leisure activities. Although ships and boats are less numerous than in preceding years, the overall volume of seafaring activity continues to be very high (Wessex Archaeology 2009: 61). The numbers of vessels lost in the post war period are fewer in comparison to the preceding centuries as a result of increased safety coupled with the absence of any major hostile action.

Appendix XII: Maritime Recorded Losses

ID	Name	Type	Year Lost	Description	Summary	Source
942756	*Risingham*	Cargo Vessel	1767	A British cargo vessel recorded to have grounded at Chapel Tunnel en route from Klaipeda to Newcastle-upon-Tyne. This vessel was later recovered.	Recorded Loss	NRHE
1345902	*Charles and Mary*	Craft	1818	An English vessel recorded to have sunk in the Chapel Tunnel on the Lincolnshire coast.	Recorded Loss	NRHE
1346719	*William*	Brig	1819	An English brig, reported to have foundered off Trusthorpe after a collision whilst on passage from Sunderland, laden with coal. The William was a wooden sailing vessel.	Recorded Loss	NRHE
1347849	*Charlotte Augusta*	Cargo Vessel	1820	A cargo vessel reported to have been driven ashore on the Lincolnshire coast.	Recorded Loss	NRHE
1350098	*John and Harriet*	Craft	1823	A vessel recorded to have lost off the Lincolnshire coast.	Recorded Loss	NRHE
1359929	*Two Brothers*	Cargo Vessel	1825	A cargo vessel reported to have run ashore near Trusthorpe.	Recorded Loss	NRHE
1047788	*Barbadoes Packet*	Cargo Vessel	1831	A British cargo vessel which is recorded to have stranded near Chappel, en route from Cadiz to Kingston upon Hull. The vessel is recorded to have been a wooden sailing vessel.	Recorded Loss	NRHE
1316087	*Apollo*	Cargo Vessel	1832	An English cargo vessel reported to have grounded at Anderby whilst on passage from Kingston upon Hull with coal. The Apollo was a wooden hulled sailing vessel.	Recorded Loss	NRHE
1302347	*Betsey*	Craft	1834	A British craft, built in 1816, reported to have driven ashore at Huttoft Bank.	Recorded Loss	NRHE
1316673	*Freedom*	Craft	1854	An English craft, built in 1830, reported to have been driven ashore near Sutton.	Recorded Loss	NRHE
942834	*Young Mans Endeavour*	Sloop	1876	An English sloop, built in 1828, which is recorded to have sprung a leak and sank 4 miles east of Chapel Point.	Recorded Loss	NRHE
1302399	*Vive*	Ketch	1880	An English ketch, built in 1858, recorded to have sprung a leak and sunk 4-5 miles south-east of Sutton-on-Sea.	Recorded Loss	NRHE
1351186	*Industry*	Sloop	1883	An English sloop, recorded to have stranded off Sutton on Sea.	Recorded Loss	NRHE
1351315	*Vibilia*	Schooner	1891	A Norwegian schooner, built in 1854, recorded to have stranded near Chapel coastguard station.	Recorded Loss	NRHE
1351826	*Lizzie Lee*	Schooner	1893	An English schooner built in 1856 and recorded to have stranded at Sutton-on-Sea during a gale.	Recorded Loss	NRHE
1302127	*Star*	Dandy	1895	An English Dandy, built in 1870, recorded to have foundered following a collision with the steam ship Stag, 4 miles SE of Mablethorpe.	Recorded Loss	NRHE

ID	Name	Type	Year Lost	Description	Summary	Source
943045	*Minstrel*	Schooner	1904	An English schooner, built in 1847, which is recorded to have stranded near Chapel Point. The vessel was laden with a cargo of Government munition stores.	Recorded Loss	NRHE
48371	Unknown	Sailing Vessel	Unknown	The remains of a sailing vessel have been sighted on the foreshore at Sutton-on-Sea. The remains of the vessel weren't visible when the area was visited in 1997. Due to the uncertainty regarding its location, this asset is being regarded as a recorded loss.	Recorded Loss	LHER

Appendix XIII: Aviation Recorded Losses

NRHE Monument ID	Name	Type	Year Lost	Description	Summary
1401347	Heinkel HE111H-5 (3554) A1+CH	Bomber	1940	A German bomber which was disabled by enemy aircraft and ditched off Chapel St. Leonards.	Recorded Loss
1356378	Lancaster Mk III JB229	Heavy Bomber	1943	A British heavy bomber recorded to have crashed on the beach 5 miles north of Skegness, Lincolnshire on return from Berlin on the 24th November 1943.	Recorded Loss

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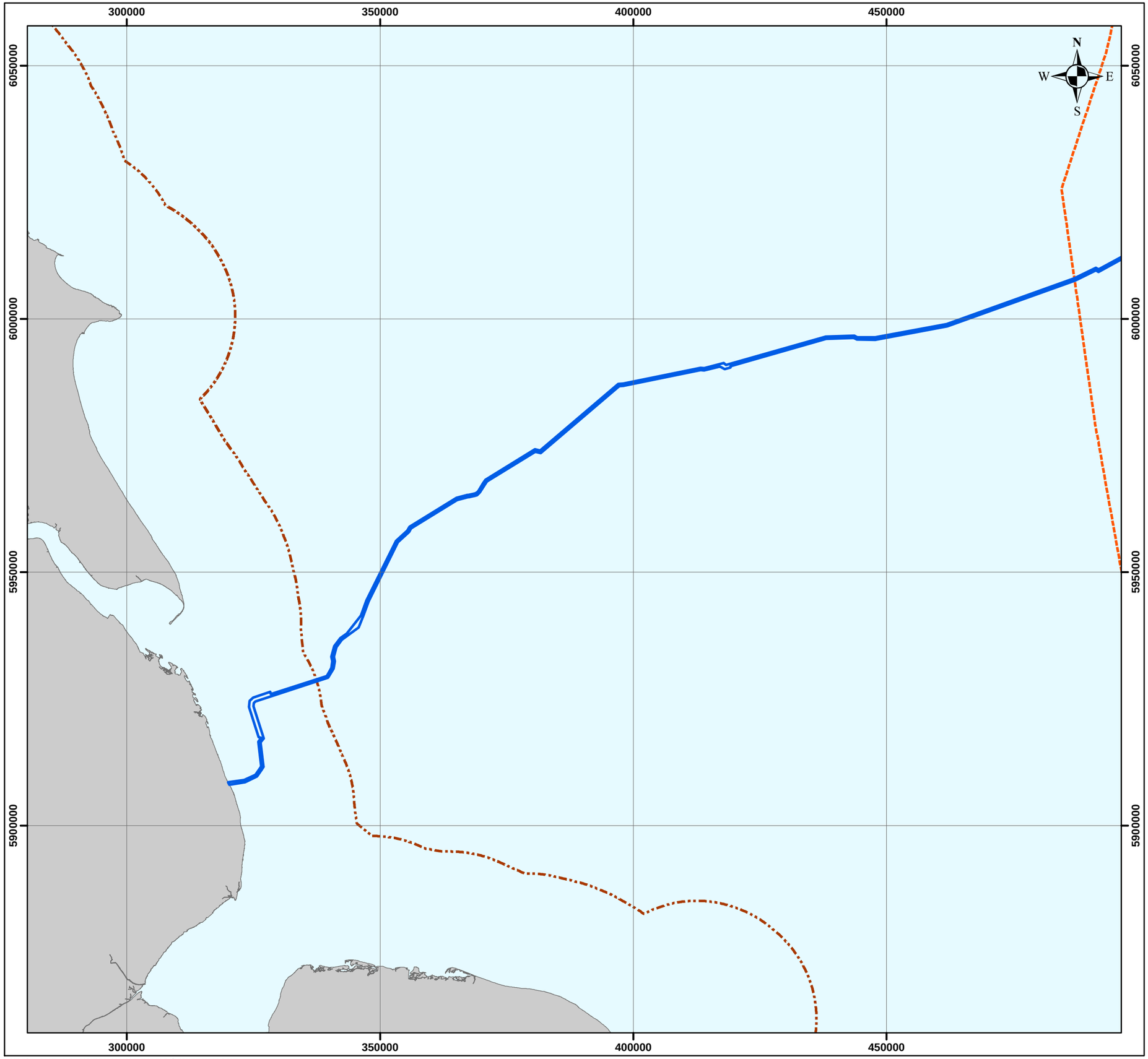
Figure 1. Location of submarine cable corridor



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Legend

- Submarine cable corridor
- Median Line
- 12nm territorial sea limit

NOTE: Not to be used for Navigation

Date	21/12/2016
Projection	Transverse Mercator
Spheroid	GRS 1980
Datum	ETRS 1989 UTM Zone 31N
Data Source	Mapping: Made with Natural Earth. Free vector and raster map data @ naturalearthdata.com
File Reference	Y:\PROJECTS_Edinburgh\112870\Graphics_Office\Report_figs\technical report\2016_12_08\Fig01.mxd
Created By	KF/KL
Reviewed By	LT/VL
Approved By	AB

0 5 10 20 30 40 km

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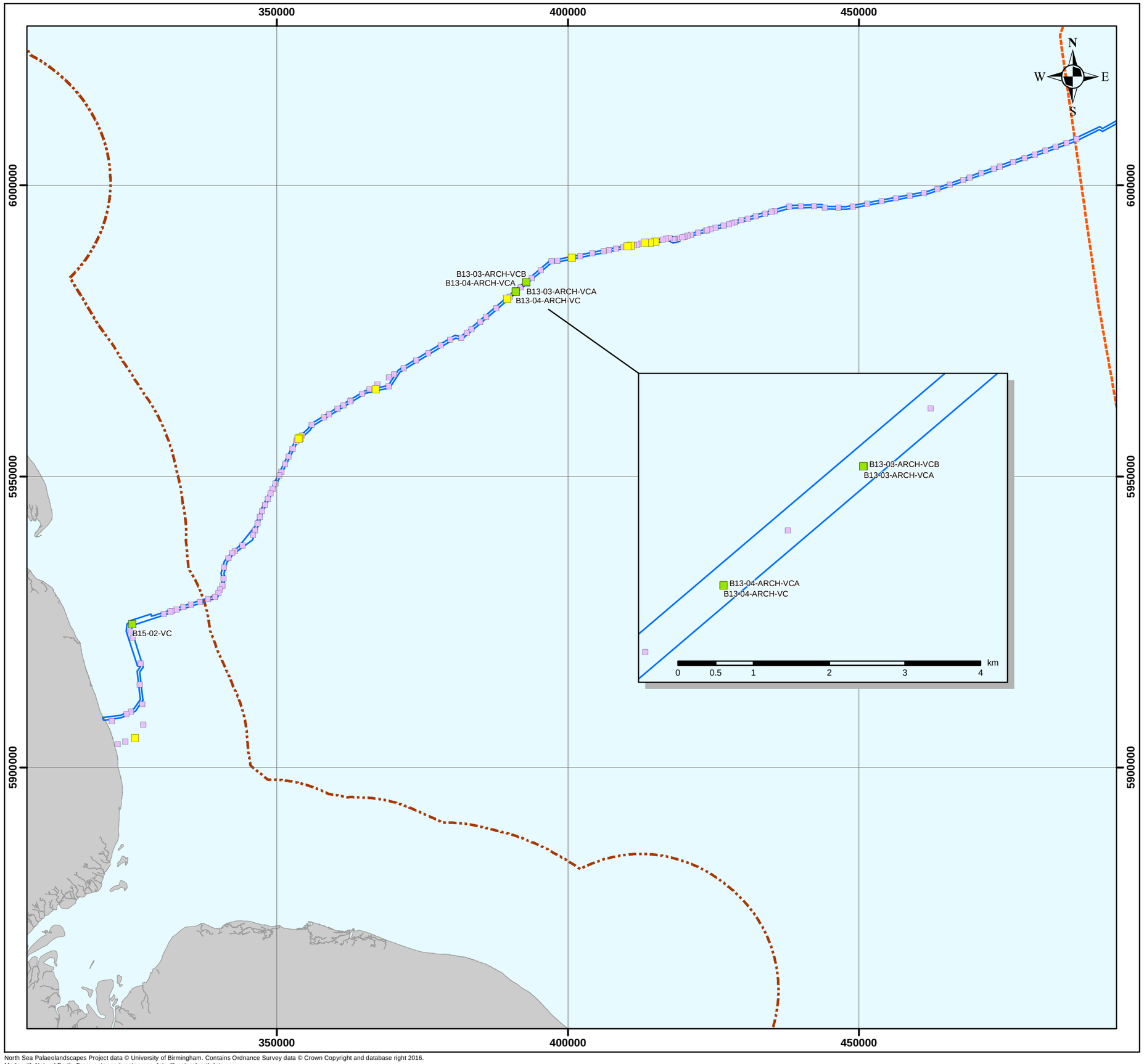
Figure 2. Location of vibrocores



Legend

- Submarine cable corridor
- Median Line
- 12nm territorial sea limit

Vibrocores

- Sub-sampled vibrocores
- Vibrocores at Salisbury office
- All vibrocore locations

NOTE: Not to be used for Navigation

Date	21/12/2016
Projection	Transverse Mercator
Spheroid	GRS 1980
Datum	ETRS 1989 UTM Zone 31N
Data Source	North Sea Palaeolandscapes Project data from the University of Birmingham.
File Reference	Y:\PROJECTS_Edinburgh\112870\Graphics_Office\Report_figs\technical report\2016_12_08\Fig02.mxd
Created By	KL
Reviewed By	LT/VL
Approved By	AB

0 4.5 9 18 27 36 km

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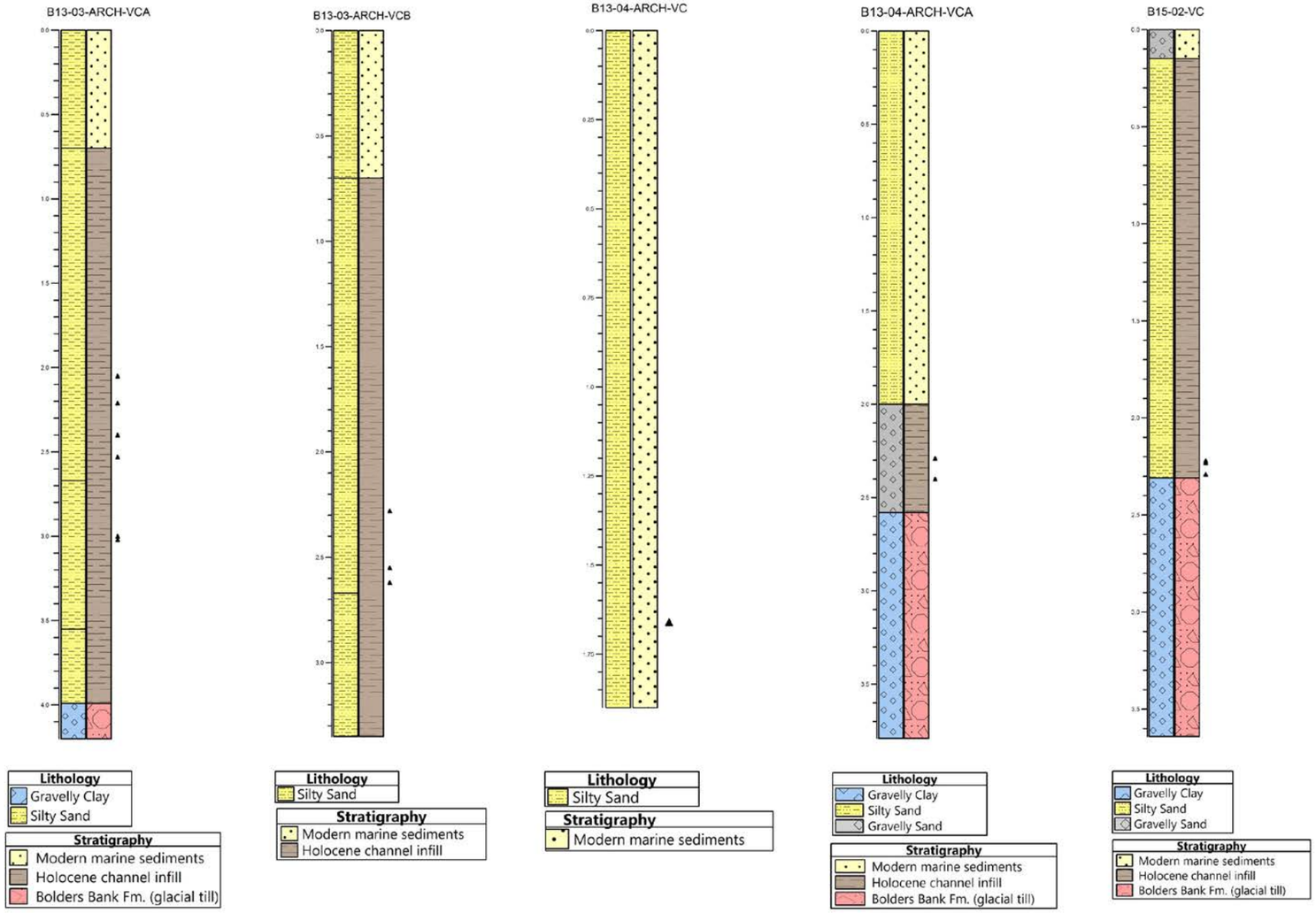

Probability of distribution of radiocarbon dates

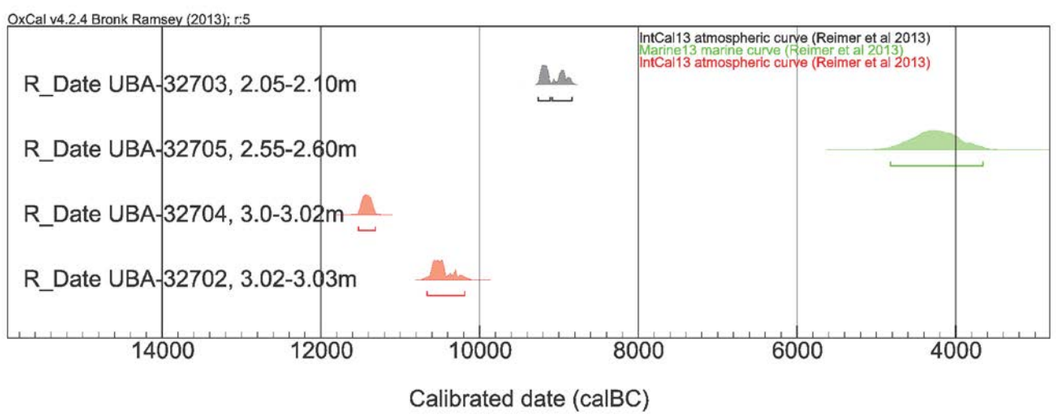

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Figure 3. Detailed core logs of high interest cores and probability of distribution of radiocarbon dates

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Projection	Transverse Mercator
Spheroid	GRS 1980
Datum	ETRS 1989 UTM Zone 31N
Data Source	North Sea Palaeolandscapes Project data from the University of Birmingham.
File Reference	Y:\PROJECTS_Edinburgh\112870\Graphics_Office\Report_figs\technical report\2016_12_08\Geo1.mxd
Created By	KL/KMN
Reviewed By	LT/VL
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Figure 4a. Palaeogeographic features of archaeological potential

Legend

- Submarine cable corridor

Palaeogeographic sections

- Section 3

Identified palaeogeographic features

- Channel
- Simple cut and fill
- High amplitude reflector

NOTE: Not to be used for Navigation

Date	21/12/2016
Projection	Transverse Mercator
Spheroid	GRS 1980
Datum	ETRS 1989 UTM Zone 31N
Data Source	
File Reference	Y:\PROJECTS_Edinburgh\112870\Graphics_Office\Report_figs\technical report\2016_12_08\Fig04.mxd
Created By	KF/KL
Reviewed By	LT/VL
Approved By	AB

km 0 0.5 1 2 3 4

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Figure 4b. Palaeogeographic features of archaeological potential

330000 340000

5940000 5930000

N W E S

Extraction Area

Outer Sand Q(3)10s Racon(O) US

Mid New Sand Q(9)15s

South Sand Q(6)+LFl.15s

Sea Reach LFl.10s NW Outer Sea Reach

Outer Rosse Reach LFl.10s RW

Extraction Area

B14-21 7564 7565

B14-26 7566

B15-02 7567

Fig 7

53°30'N 0°30'E 0°40'

Legend

- Submarine cable corridor
- 12nm territorial sea limit
- △ Geotechnical samples referenced in the text
- Data example locations

Palaeogeographic sections

- Section 3

Identified palaeogeographic features

- Channel

NOTE: Not to be used for Navigation

Date	21/12/2016
Projection	Transverse Mercator
Spheroid	GRS 1980
Datum	ETRS 1989 UTM Zone 31N
Data Source	
File Reference	Y:\PROJECTS_Edinburgh\112870\Graphics_Office\Report_figs\technical report\2016_12_08\Fig04.mxd
Created By	KF/KL
Reviewed By	LT/VL
Approved By	AB

0 0.5 1 2 3 4 km

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Figure 4c. Palaeogeographic features of archaeological potential

Legend

- Submarine cable corridor

Palaeogeographic sections

- Section 3

Identified palaeogeographic features

- Channel

NOTE: Not to be used for Navigation

Date	21/12/2016
Projection	Transverse Mercator
Spheroid	GRS 1980
Datum	ETRS 1989 UTM Zone 31N
Data Source	
File Reference	Y:\PROJECTS_Edinburgh\112870\Graphics_Office\Report_figs\technical report\2016_12_08\Fig04.mxd
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Reviewed By	LT/VL
Approved By	AB

wessex archaeology

Intertek Valued Quality. Delivered.

0 0.5 1 2 3 4 km

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Figure 4d. Palaeogeographic features of archaeological potential

Legend

- Submarine cable corridor
- △ Geotechnical samples referenced in the text

Palaeogeographic sections

- Section 3

Identified palaeogeographic features

- Channel
- Simple cut and fill
- Complex cut and fill
- Fine grained deposit

NOTE: Not to be used for Navigation

Date	21/12/2016
Projection	Transverse Mercator
Spheroid	GRS 1980
Datum	ETRS 1989 UTM Zone 31N
Data Source	
File Reference	Y:\PROJECTS_Edinburgh\112870\Graphics_Office\Report_figs\technical report\2016_12_08\Fig04.mxd
Created By	KF/KL
Reviewed By	LT/VL
Approved By	AB

km
0 0.5 1 2 3 4

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Figure 4e. Palaeogeographic features of archaeological potential

Legend

- Submarine cable corridor
- △ Geotechnical samples referenced in the text

Palaeogeographic sections

- Section 3

Identified palaeogeographic features

- Channel
- Simple cut and fill
- Complex cut and fill

NOTE: Not to be used for Navigation

Date	21/12/2016
Projection	Transverse Mercator
Spheroid	GRS 1980
Datum	ETRS 1989 UTM Zone 31N
Data Source	
File Reference	Y:\PROJECTS_Edinburgh\112870\Graphics_Office\Report_figs\technical report\2016_12_08\Fig04.mxd
Created By	KF/KL
Reviewed By	LT/VL
Approved By	AB

km
0 0.5 1 2 3 4

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Figure 4f. Palaeogeographic features of archaeological potential

Legend

- Submarine cable corridor
- Geotechnical samples referenced in the text
- Data example locations

Palaeogeographic sections

- Section 2
- Section 3

Identified palaeogeographic features

- Channel
- Simple cut and fill
- Complex cut and fill
- Infilled depression

NOTE: Not to be used for Navigation

Date	21/12/2016
Projection	Transverse Mercator
Spheroid	GRS 1980
Datum	ETRS 1989 UTM Zone 31N
Data Source	
File Reference	Y:\PROJECTS_Edinburgh\112870\Graphics_Office\Report_figs\technical report\2016_12_08\Fig04f.mxd
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Reviewed By	LT/VL
Approved By	AB

wessex archaeology

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km 0 0.5 1 2 3 4

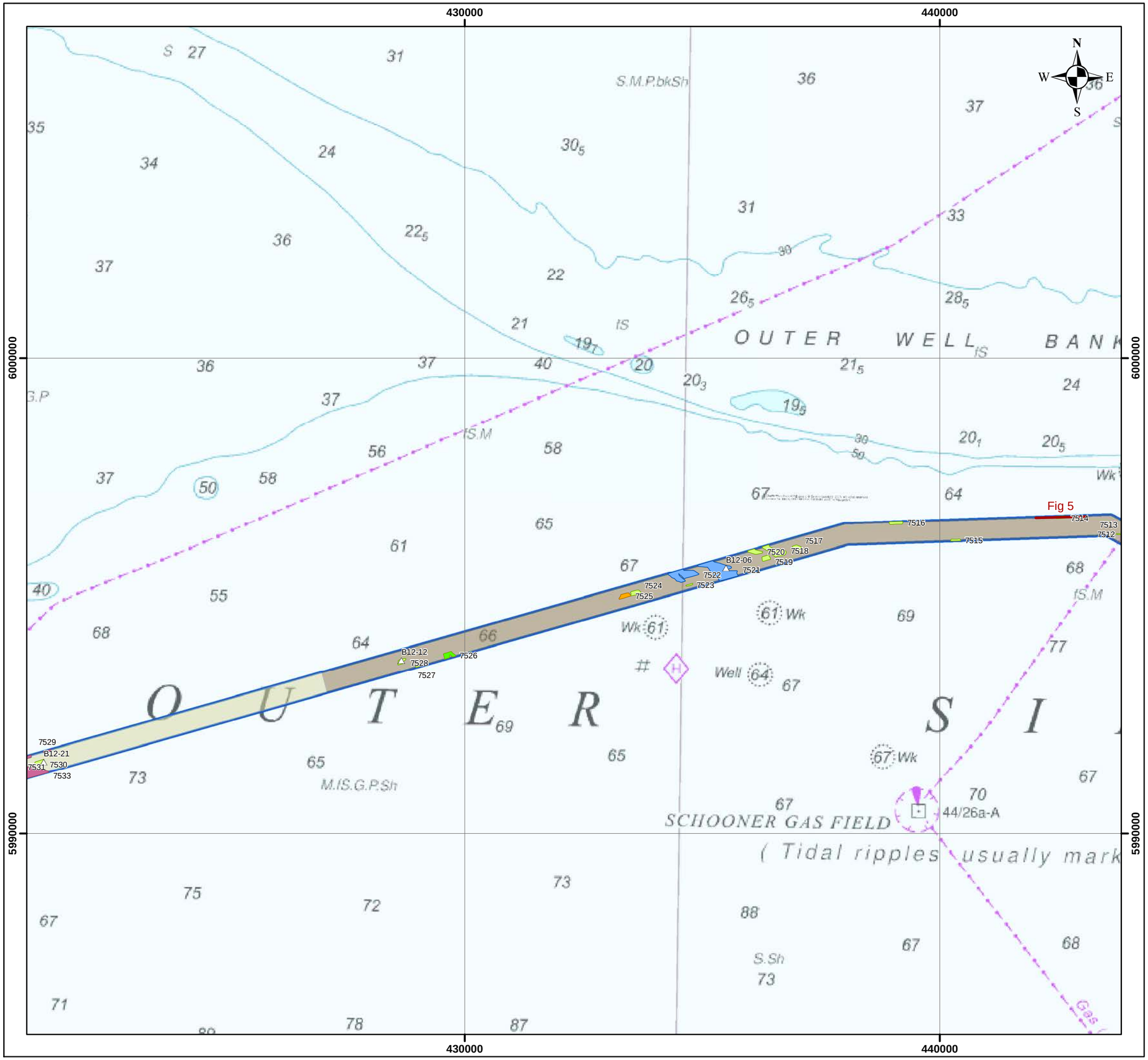

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Figure 4g. Palaeogeographic features of archaeological potential

Legend

- Submarine cable corridor
- Geotechnical samples referenced in the text
- Data example locations

Palaeogeographic sections

- Section 1
- Section 2

Identified palaeogeographic features

- Channel
- Simple cut and fill
- Complex cut and fill
- Bank deposits
- Infilled depression

NOTE: Not to be used for Navigation

Date	21/12/2016
Projection	Transverse Mercator
Spheroid	GRS 1980
Datum	ETRS 1989 UTM Zone 31N
Data Source	
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0 0.5 1 2 3 4 km

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Figure 4h. Palaeogeographic features of archaeological potential

Legend

- Submarine cable corridor
- Data example locations

Palaeogeographic sections

- Section 1

Identified palaeogeographic features

- Simple cut and fill

NOTE: Not to be used for Navigation

Date	21/12/2016
Projection	Transverse Mercator
Spheroid	GRS 1980
Datum	ETRS 1989 UTM Zone 31N
Data Source	
File Reference	Y:\PROJECTS_Edinburgh\112870\Graphics_Office\Report_figs\technical report\2016_12_08\Fig04.mxd
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0 0.5 1 2 3 4 km

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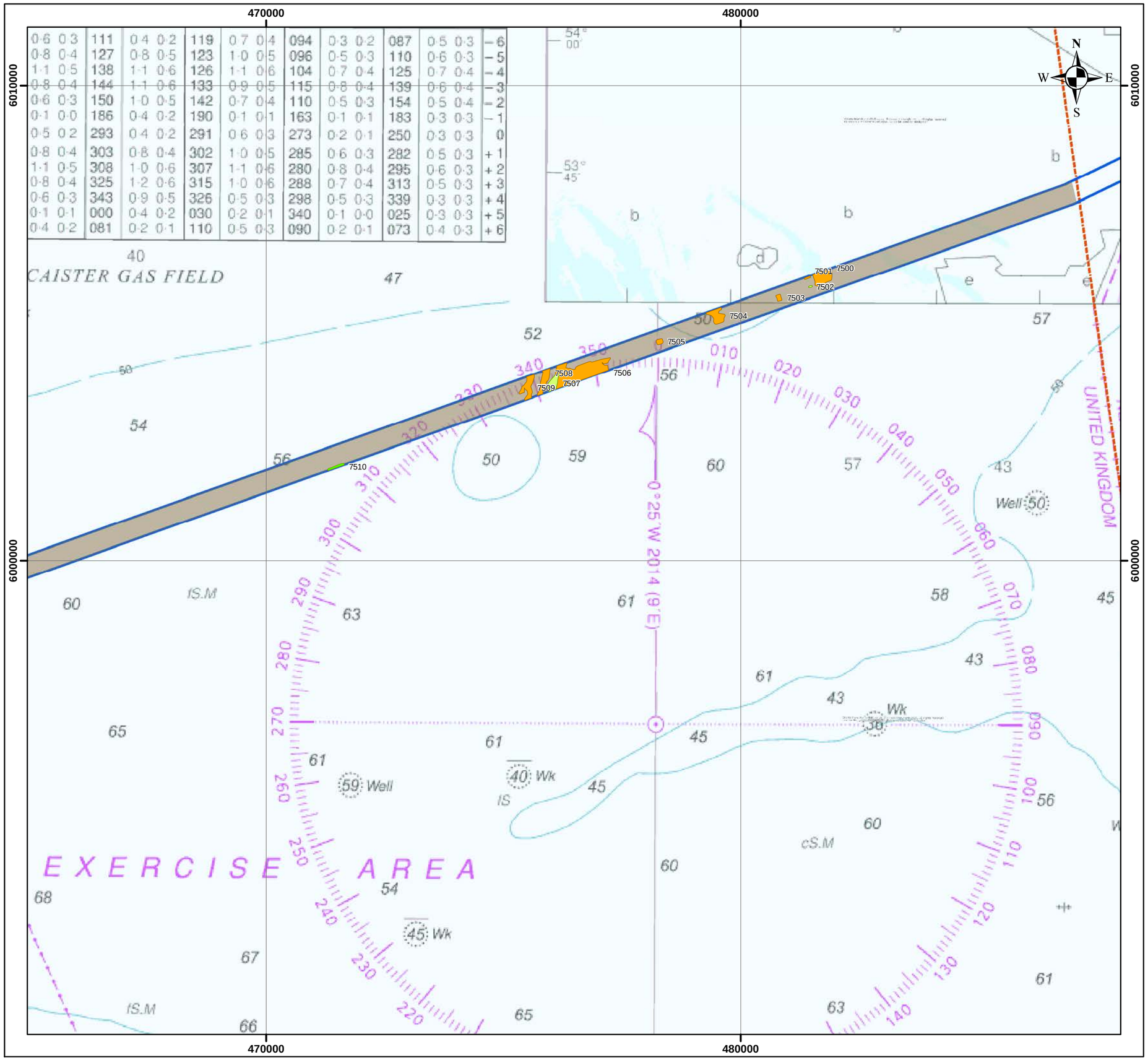

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Figure 4i. Palaeogeographic features of archaeological potential

Legend

- Submarine cable corridor
- Median Line

Palaeogeographic sections

- Section 1

Identified palaeogeographic features

- Simple cut and fill
- Complex cut and fill
- Bank deposits

NOTE: Not to be used for Navigation

Date	21/12/2016
Projection	Transverse Mercator
Spheroid	GRS 1980
Datum	ETRS 1989 UTM Zone 31N
Data Source	
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Valued Quality. Delivered.

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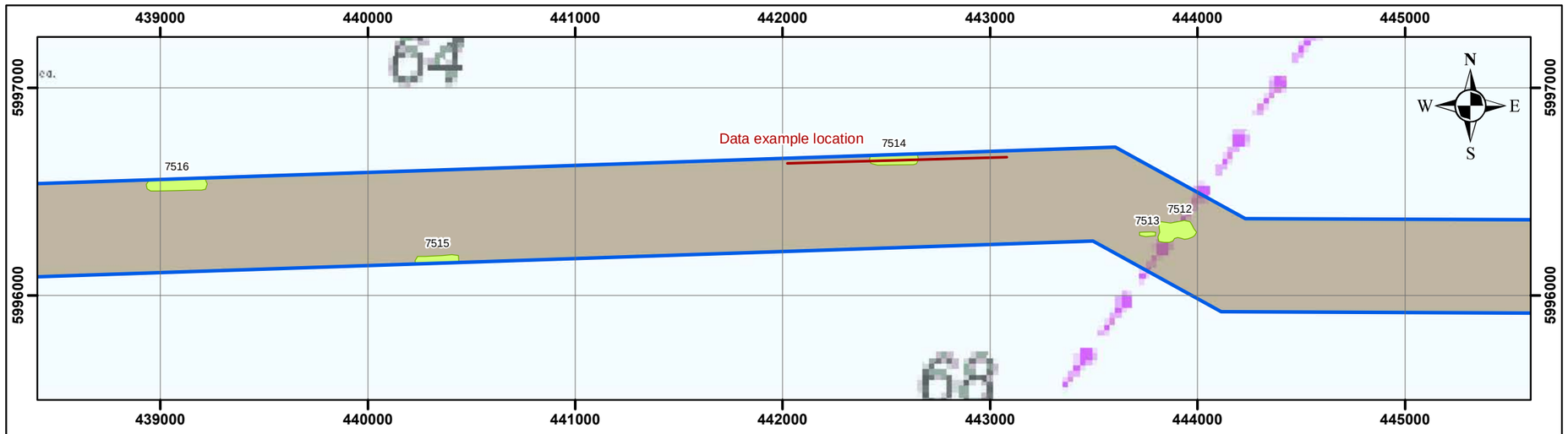

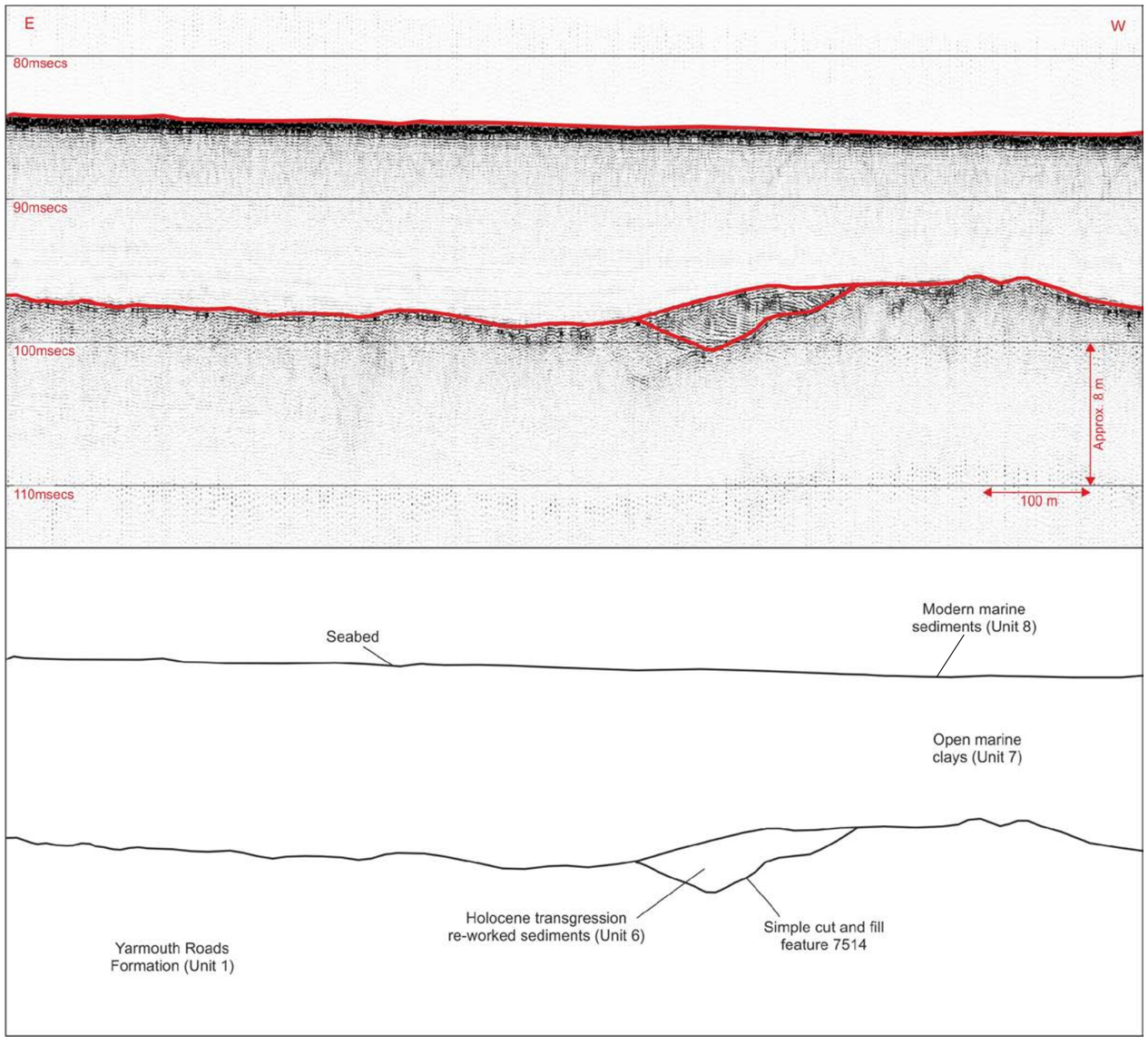

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Figure 5. Sub-bottom profiler data example – Feature 7514

Legend

- Submarine cable corridor
- Data example location

Identified palaeogeographic features

- Simple cut and fill

Palaeogeographic sections

- Section 1

NOTE: Not to be used for Navigation

Date	21/12/2016
Projection	Transverse Mercator
Spheroid	GRS 1980
Datum	ETRS 1989 UTM Zone 31N
Data Source	
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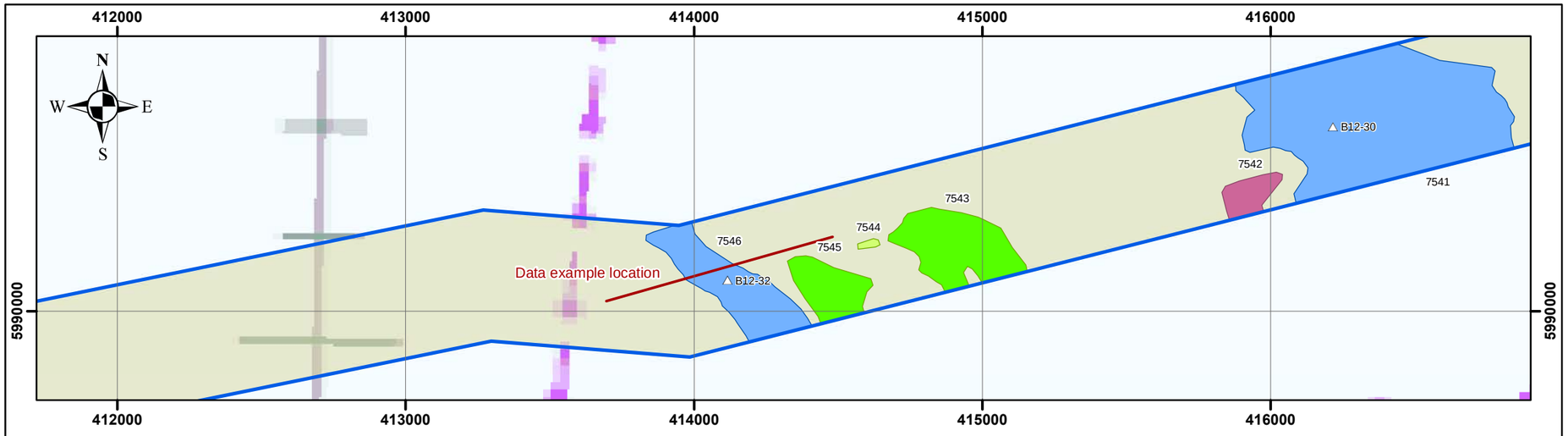
Created By	KF/KL
Reviewed By	LT/VL
Approved By	AB

0 0.1 0.2 0.4 0.6 0.8 km



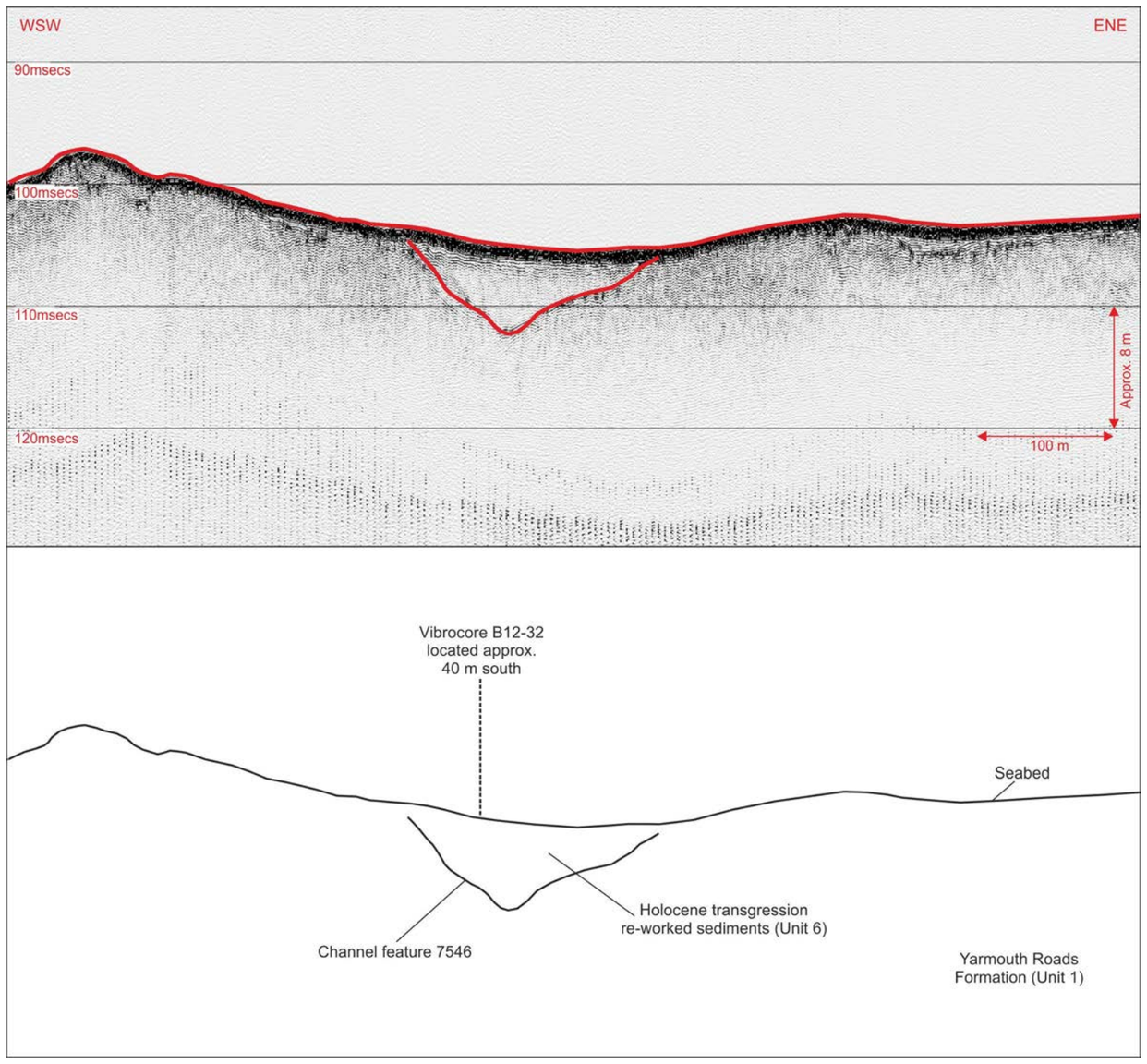


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Figure 6. Sub-bottom profiler data example – Feature 7546

Legend

- Submarine cable corridor
- △ Geotechnical samples referenced in the text
- Data example location

Identified palaeogeographic features

- Channel
- Simple cut and fill
- Complex cut and fill
- Infilled depression

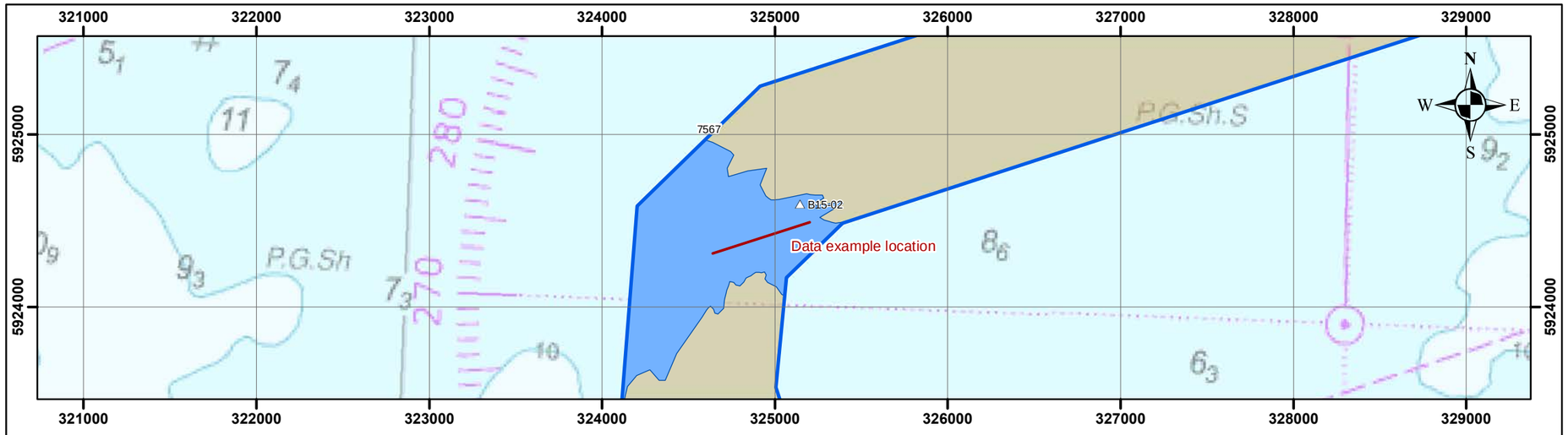
Palaeogeographic sections

- Section 2

NOTE: Not to be used for Navigation

Date	21/12/2016
Projection	Transverse Mercator
Spheroid	GRS 1980
Datum	ETRS 1989 UTM Zone 31N
Data Source	
File Reference	Y:\PROJECTS_Edinburgh\112870\Graphics_Office\Report_figs\technical report\2016_12_08\Fig06.mxd
Created By	KF/KL
Reviewed By	LT/VL
Approved By	AB

0 0.075 0.15 0.3 0.45 0.6 km



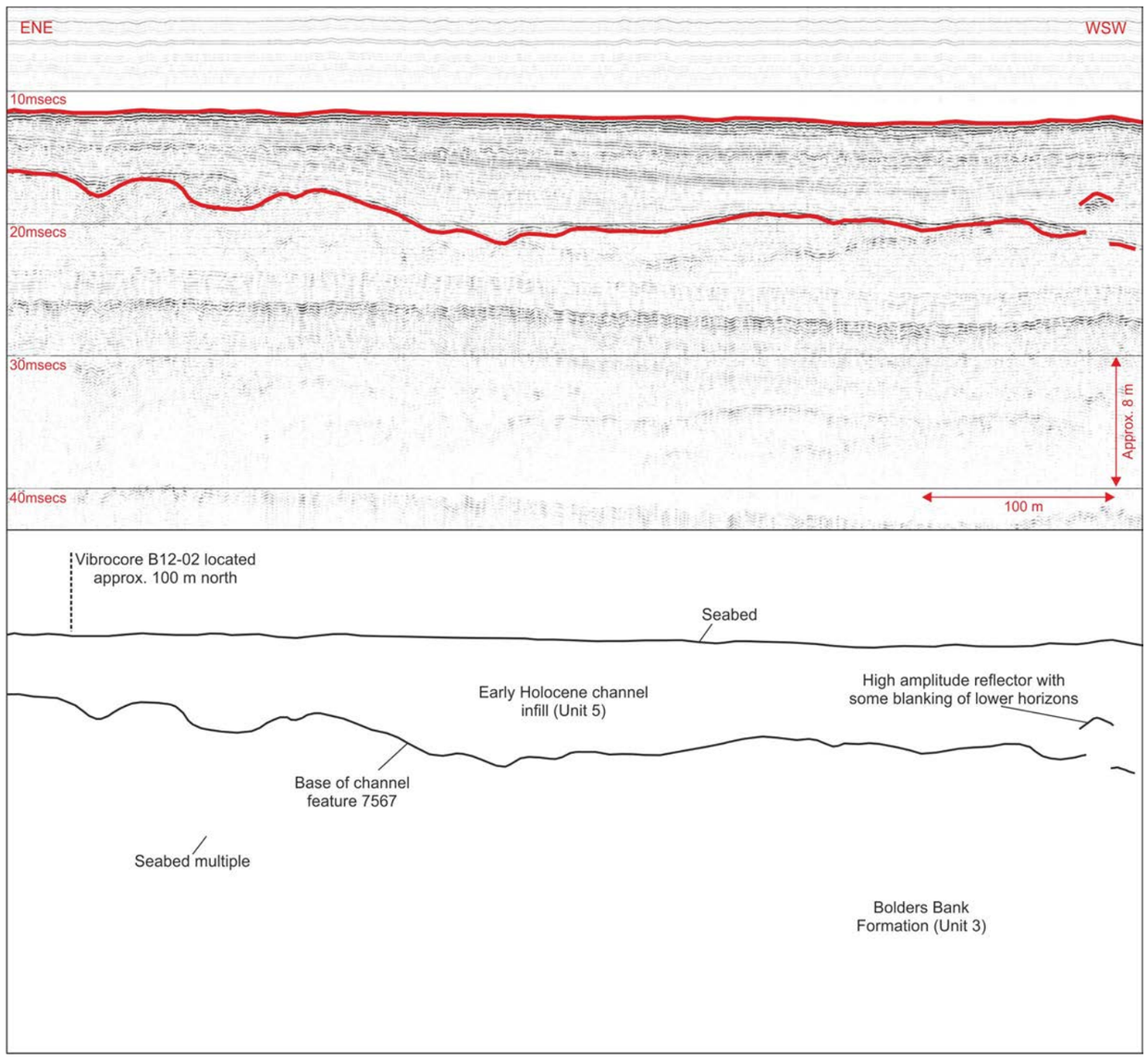


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Figure 7. Sub-bottom profiler data example – Feature 7567

Legend

- Submarine cable corridor
- △ Geotechnical samples referenced in the text
- Data example location

Identified palaeogeographic features

- Channel

Palaeogeographic sections

- Section 3

NOTE: Not to be used for Navigation

Date	21/12/2016
Projection	Transverse Mercator
Spheroid	GRS 1980
Datum	ETRS 1989 UTM Zone 31N
Data Source	
File Reference	Y:\PROJECTS_Edinburgh\112870\Graphics_Office\Report_figs\technical report\2016_12_21\Fig07.mxd
Created By	KL
Reviewed By	LT/VL
Approved By	AB

0 0.125 0.25 0.5 0.75 1 km

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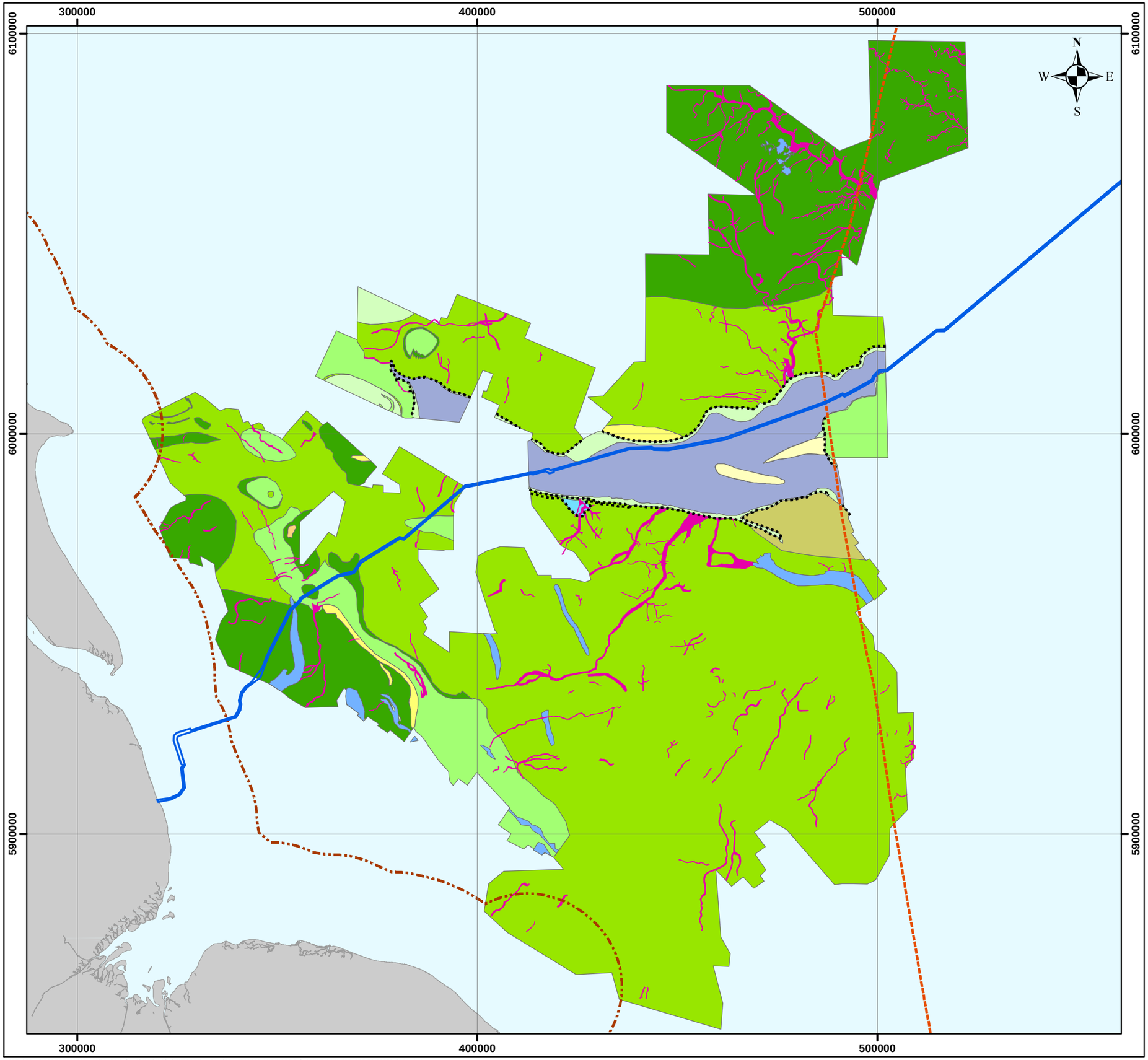
Figure 8. Relationship of the submarine cable corridor to the North Sea Palaeolandscapes Project



Legend

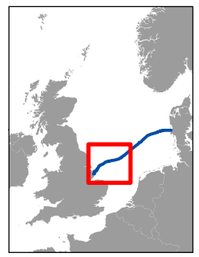
- Submarine cable corridor
- Median Line
- 12nm territorial sea limit

North Sea Palaeolandscapes Project Data

- Shoreline
- Salt marsh
- Marine sand banks
- Fluvial system
- Lake
- Estuary

Relative topography

- Very low
- Low
- Intermediate / low
- Moderate / low
- Moderate
- Moderate / high
- High



NOTE: Not to be used for Navigation

Date	21/12/2016
Projection	Transverse Mercator
Spheroid	GRS 1980
Datum	ETRS 1989 UTM Zone 31N
Data Source	North Sea Palaeolandscapes Project data from the University of Birmingham.
File Reference	Y:\PROJECTS_Edinburgh\112870\Graphics_Office\Report_figs\technical report\2016_12_08\Fig08.mxd
Created By	KF/KL
Reviewed By	LT/VL
Approved By	AB

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0 5 10 20 30 40 km

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Figure 9a
Seabed features of archaeological potential

Legend

- Submarine cable corridor
- Beyond survey extent
- Bathymetry and backscatter data only

Seabed Features

- A2 – Uncertain origin of possible archaeological interest

NOTE: Not to be used for Navigation

Date	21/12/2016
Projection	Transverse Mercator
Spheroid	GRS 1980
Datum	ETRS 1989 UTM Zone 31N
Data Source	
File Reference	Y:\PROJECTS_Edinburgh\112870\Graphics_Office\Report_figs\technical report\2016_12_08\Fig09a.mxd
Created By	KF/KL
Reviewed By	LT/VL
Approved By	AB

0 0.5 1 2 3 4 km

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Figure 9b
Seabed features of archaeological potential

Legend

- Submarine cable corridor
- Bathymetry and backscatter data only
- 12nm territorial sea limit

Seabed Features

- A2 – Uncertain origin of possible archaeological interest

NOTE: Not to be used for Navigation

Date	21/12/2016
Projection	Transverse Mercator
Spheroid	GRS 1980
Datum	ETRS 1989 UTM Zone 31N
Data Source	
File Reference	Y:\PROJECTS_Edinburgh\112870\Graphics_Office\Report_figs\technical report\2016_12_08\Fig9b.mxd
Created By	KF/KL
Reviewed By	LT/VL
Approved By	AB

km
0 0.425 0.85 1.7 2.55 3.4

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Figure 9c
Seabed features of archaeological potential

Legend

Submarine cable corridor

Seabed Features

A2 – Uncertain origin of possible archaeological interest

NOTE: Not to be used for Navigation

Date	21/12/2016
Projection	Transverse Mercator
Spheroid	GRS 1980
Datum	ETRS 1989 UTM Zone 31N
Data Source	
File Reference	Y:\PROJECTS_Edinburgh\112870\Graphics_Office\Report_figs\technical report\2016_12_08\Fig09c.mxd
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0 0.425 0.85 1.7 2.55 3.4 km

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Figure 9d
Seabed features of archaeological potential

Legend

- Submarine cable corridor
- Archaeological Exclusion Zones
- Bathymetry and backscatter data only

Seabed Features

- A1 – Anthropogenic origin of archaeological interest
- A2 – Uncertain origin of possible archaeological interest
- Wreck extents

NOTE: Not to be used for Navigation

Date	21/12/2016
Projection	Transverse Mercator
Spheroid	GRS 1980
Datum	ETRS 1989 UTM Zone 31N
Data Source	
File Reference	Y:\PROJECTS_Edinburgh\112870\Graphics_Office\Report_figs\technical report\2016_12_08\Fig09d.mxd
Created By	KF/KL
Reviewed By	LT/VL
Approved By	AB

0 0.425 0.85 1.7 2.55 3.4 km

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Figure 9e
Seabed features of archaeological potential

Legend

Submarine cable corridor

Bathymetry and backscatter data only

Seabed Features

A2 – Uncertain origin of possible archaeological interest

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Date	21/12/2016
Projection	Transverse Mercator
Spheroid	GRS 1980
Datum	ETRS 1989 UTM Zone 31N
Data Source	
File Reference	Y:\PROJECTS_Edinburgh\112870\Graphics_Office\Report_figs\technical report\2016_12_08\Fig09e.mxd
Created By	KF/KL
Reviewed By	LT/VL
Approved By	AB

km
0 0.5 1 2 3 4

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Figure 9f
Seabed features of archaeological potential

Legend

Submarine cable corridor

Seabed Features

A2 – Uncertain origin of possible archaeological interest

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Date	21/12/2016
Projection	Transverse Mercator
Spheroid	GRS 1980
Datum	ETRS 1989 UTM Zone 31N
Data Source	
File Reference	Y:\PROJECTS_Edinburgh\112870\Graphics_Office\Report_figs\technical report\2016_12_08\Fig09f.mxd
Created By	KF/KL
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0 0.5 1 2 3 4 km

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Figure 9g
Seabed features of archaeological potential

Legend

Submarine cable corridor

Seabed Features

A2 – Uncertain origin of possible archaeological interest

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Projection	Transverse Mercator
Spheroid	GRS 1980
Datum	ETRS 1989 UTM Zone 31N
Data Source	
File Reference	Y:\PROJECTS_Edinburgh\112870\Graphics_Office\Report_figs\technical report\2016_12_08\Fig09g.mxd
Created By	KF/KL
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0 0.75 1.5 3 4.5 6 km

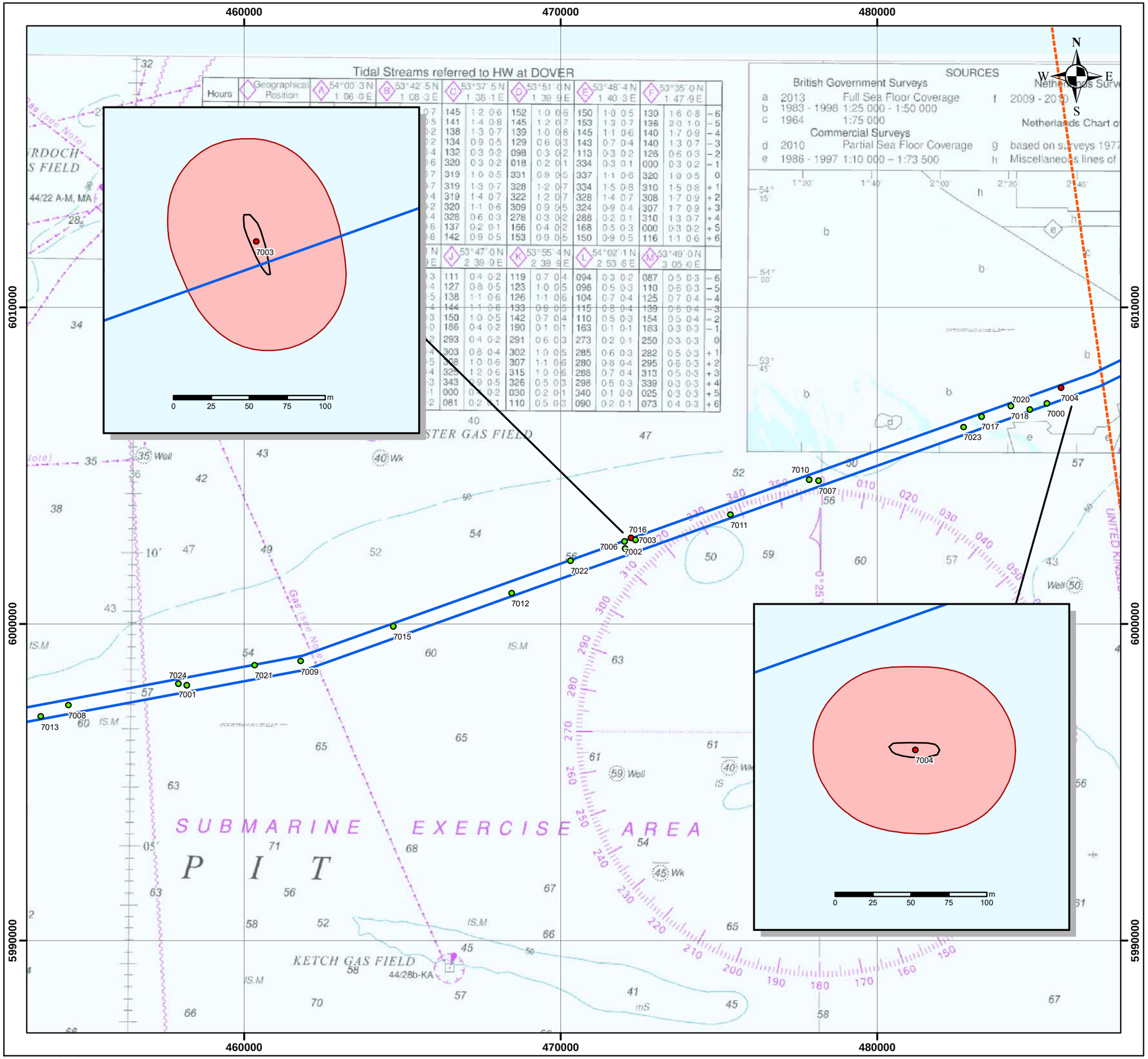

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Figure 9h
Seabed features of archaeological potential

Legend

- Submarine cable corridor
- Median Line
- Archaeological Exclusion Zones

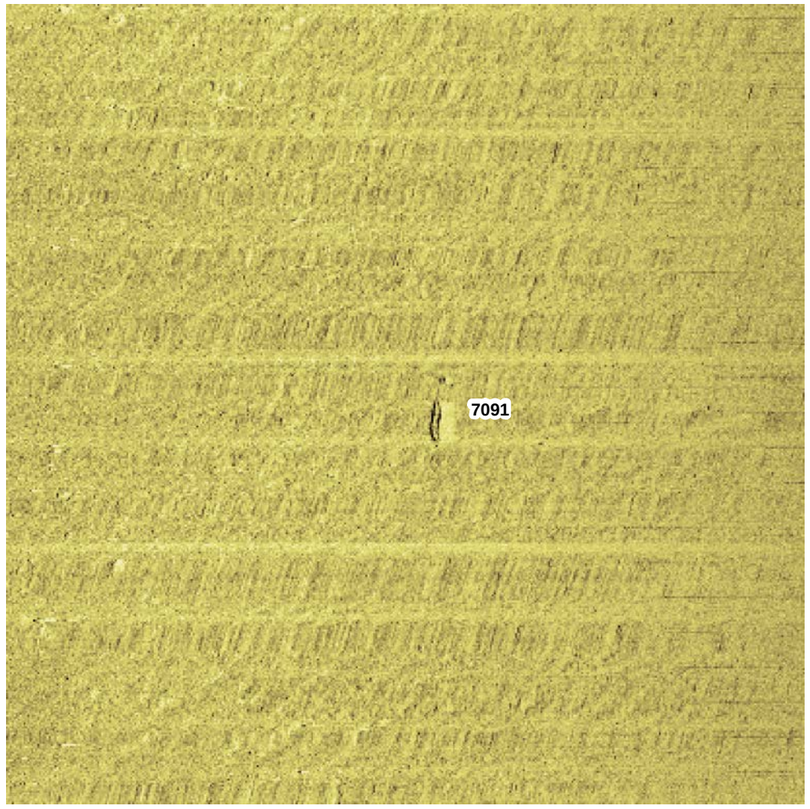
Seabed Features

- A1 – Anthropogenic origin of archaeological interest
- A2 – Uncertain origin of possible archaeological interest
- Wreck extents

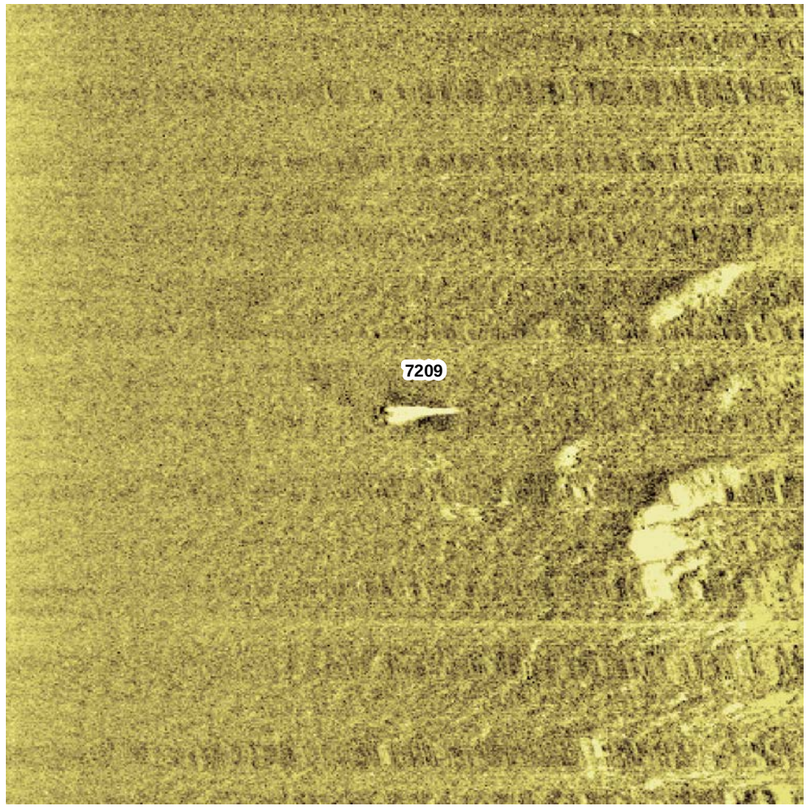
NOTE: Not to be used for Navigation

Date	21/12/2016
Projection	Transverse Mercator
Spheroid	GRS 1980
Datum	ETRS 1989 UTM Zone 31N
Data Source	
File Reference	Y:\PROJECTS_Edinburgh\112870\Graphics_Office\Report_figs\technical report\2016_12_08\Fig09h.mxd
Created By	KF/KL
Reviewed By	LT/VL
Approved By	AB

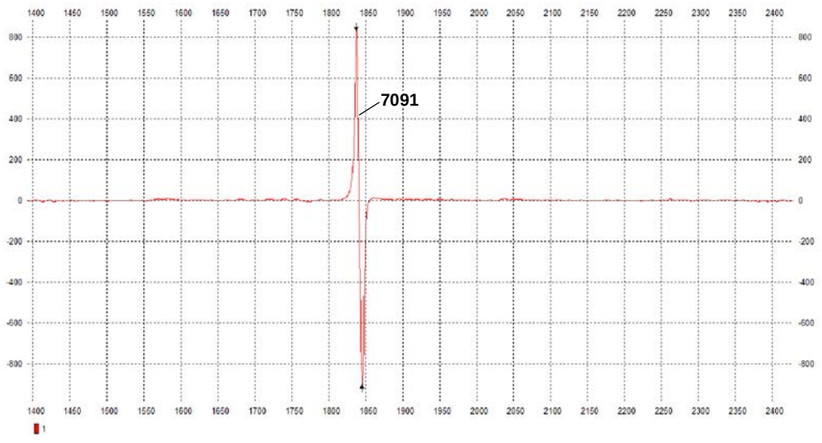
0 0.75 1.5 3 4.5 6 km



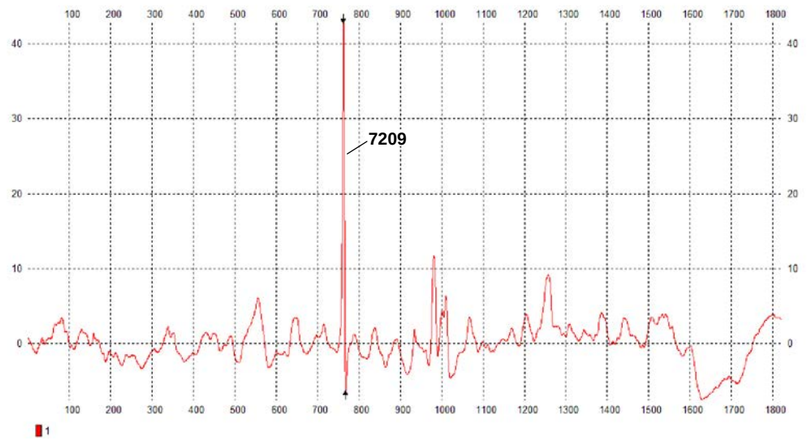
Sidescan sonar image of ferrous debris **7091**, 6.4 m x 0.8 m x 0.3 m



Sidescan sonar image of ferrous debris **7209**, 3.4 m x 0.7 m x 0.9 m



Magnetic profile of ferrous debris **7091** measuring 1782 nT



Magnetic profile of ferrous debris **7209** measuring 50 nT

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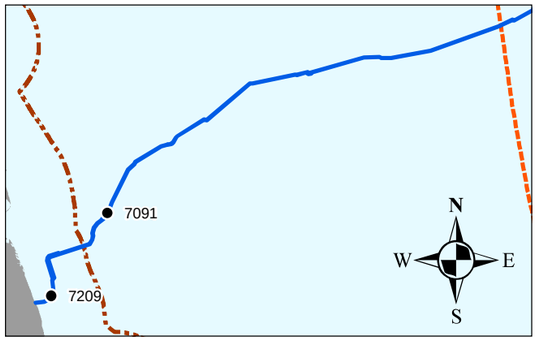
Figure 10a.
Data examples of seabed anomalies

Legend

- Submarine cable corridor
- Median Line
- 12nm territorial sea limit
- Seabed anomaly



NOTE: Not to be used for Navigation

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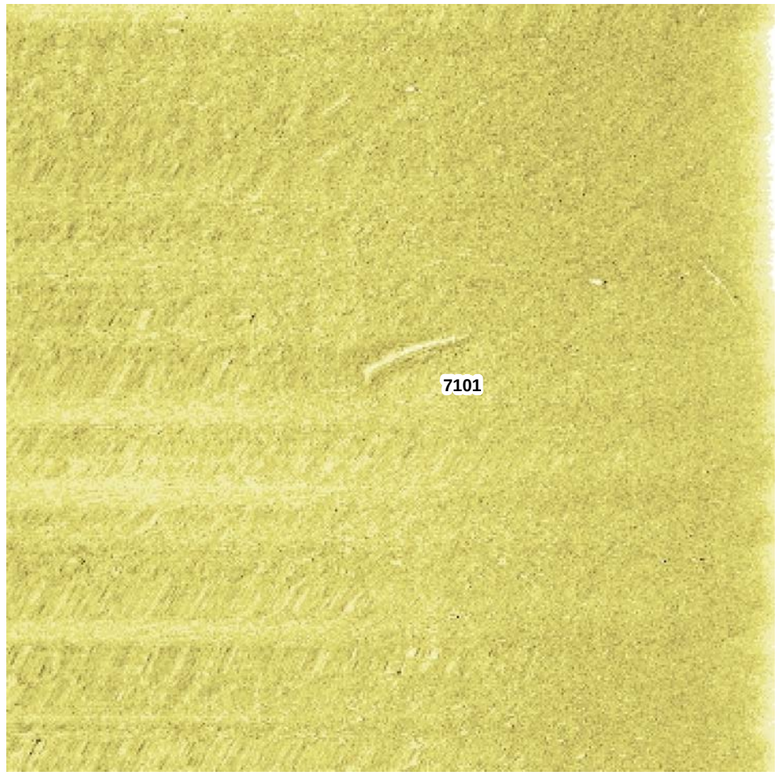
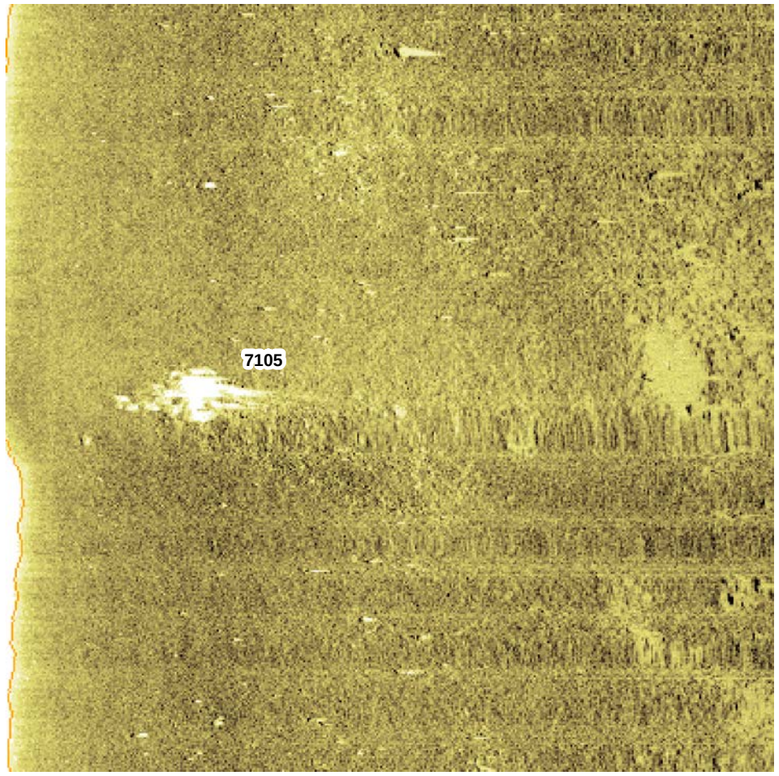
Spheroid	GRS 1980
Datum	ETRS 1989 UTM Zone 31N
Data Source	
File Reference	Y:\PROJECTS_Edinburgh\112870\Graphics_Office\Report_figs\technical report\2016_12_21\Fig10a.mxd
Created By	KF/KL
Reviewed By	LT/VL
Approved By	AB

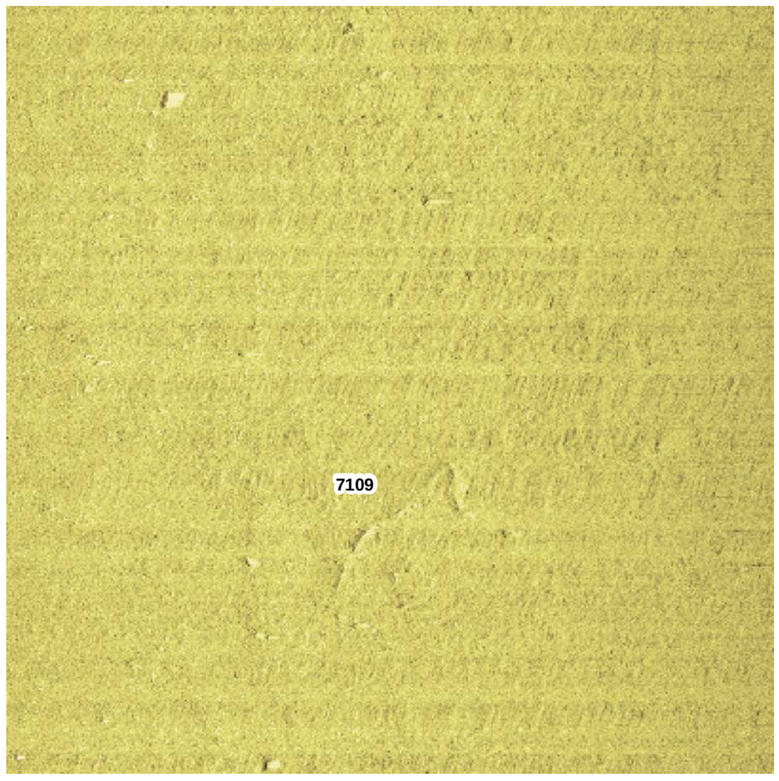
km
0 10 20 40 60 80 Inset only



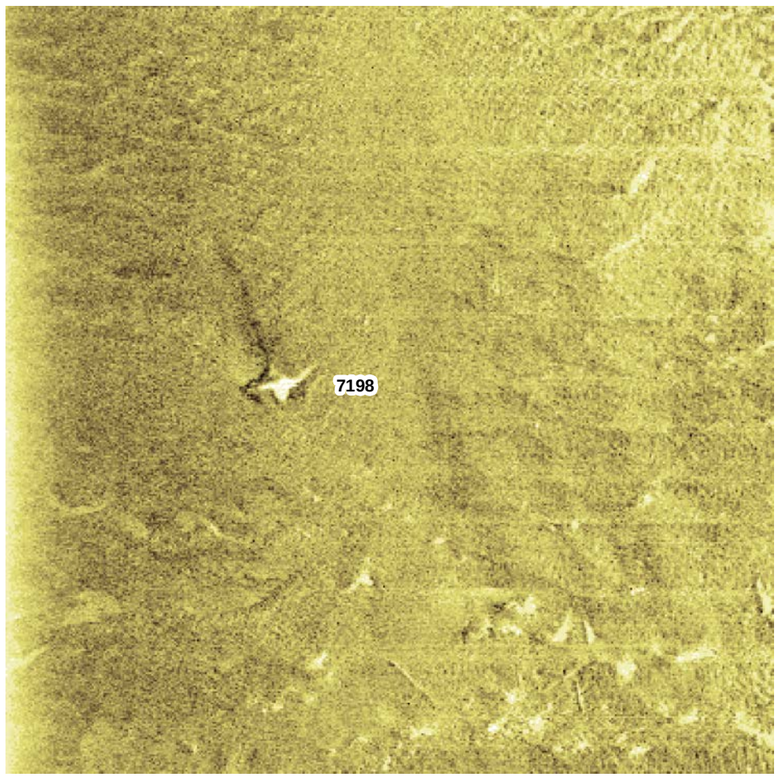
Sidescan sonar image of linear bright reflector **7101**, 10.9 m x 1.1 m x 0 m



Sidescan sonar image of debris field **7105**, 11.6 m x 8.3 m x 1.1 m



Sidescan sonar image of debris **7109**, 18.5 m x 0.4 m x 0.1 m



Sidescan sonar image of dark reflector **7198**, 4.3 m x 1.1 m x 0.8 m

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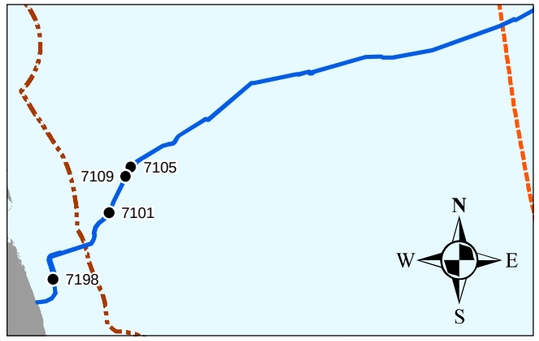
Figure 10b.
Data examples of seabed anomalies

Legend

- Submarine cable corridor
- Median Line
- 12nm territorial sea limit
- Seabed anomaly



NOTE: Not to be used for Navigation

Date	21/12/2016
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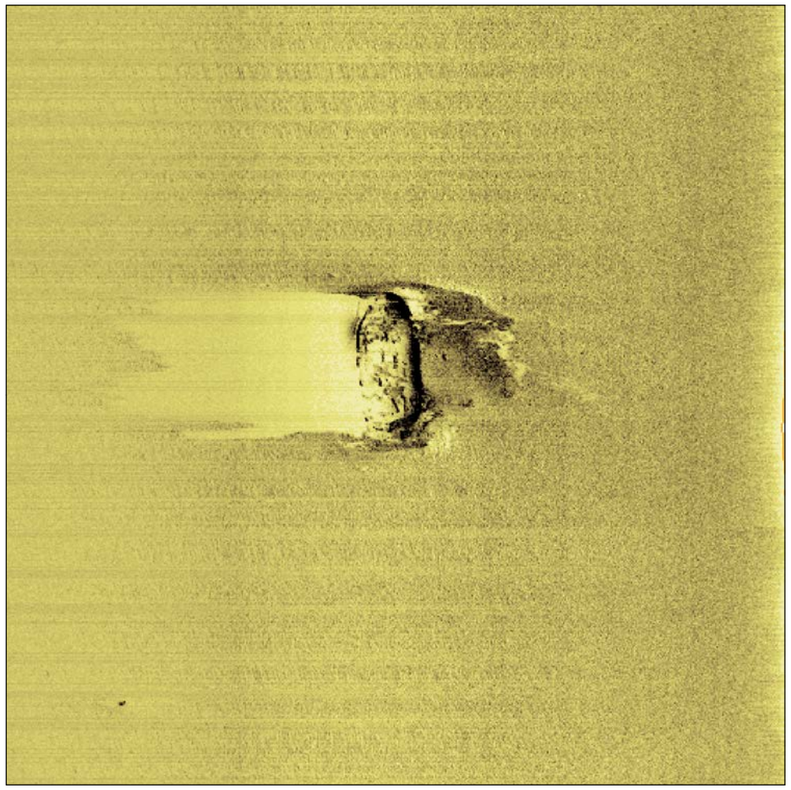
Spheroid	GRS 1980
Datum	ETRS 1989 UTM Zone 31N
Data Source	
File Reference	Y:\PROJECTS_Edinburgh\112870\Graphics_Office\Report_figs\technical report\2016_12_21\Fig10b.mxd
Created By	KF/KL
Reviewed By	LT/VL
Approved By	AB

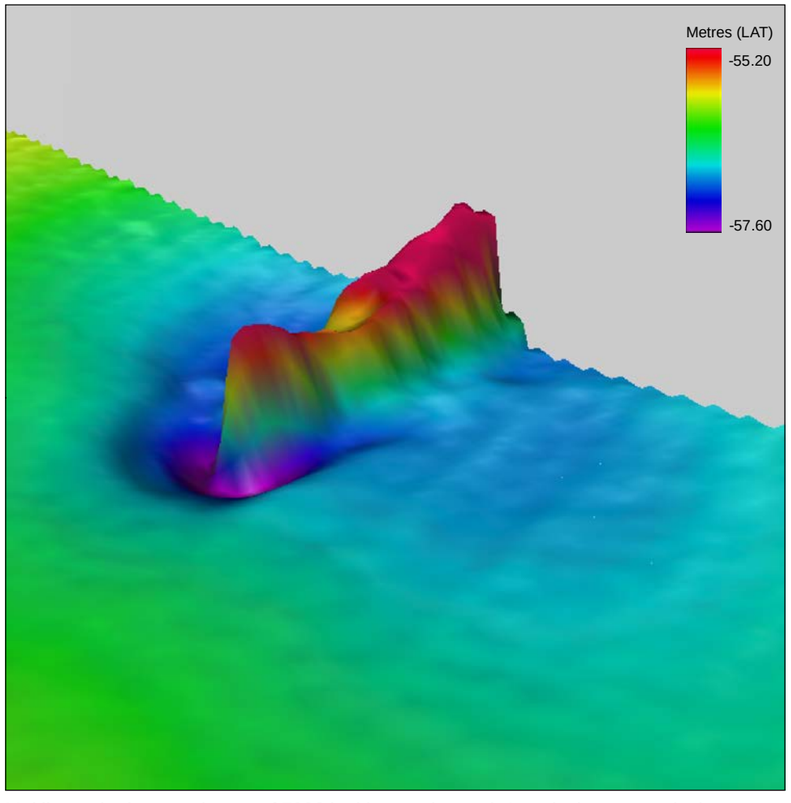
Valued Quality. Delivered.

km
0 10 20 40 60 80 Inset only

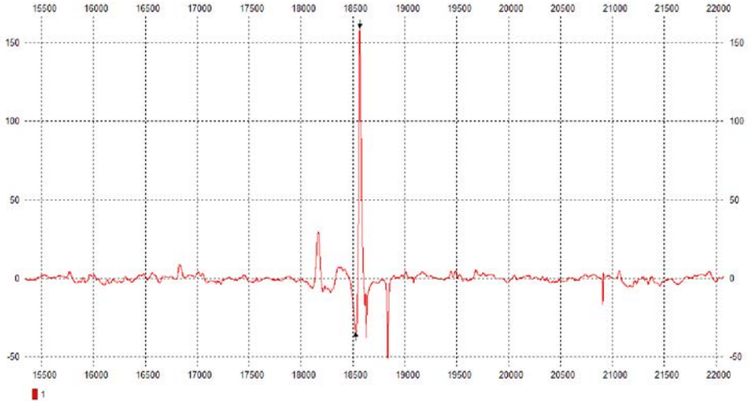
Location		472230E 6002721N
Geophysical survey dimensions and notes		Unrecorded wreck with dimensions of 42.7 m x 10 m x 3.7 m. Appears in the bathymetry data as an upright wreck, aligned 160/340, approximately SE/NW, surrounded by scour. The deepest visible scour occurs around the SE end and reaches approximately 1.9 m below the adjacent seabed. The general seabed depth is approximately 55.8 m. Only approximately half of the wreck was covered by the bathymetry data as it lies at the edge of the survey area. The last 10 m of the SE end of the wreck lies within the submarine cable corridor. No outlying debris visible in the bathymetry data. In the sidescan sonar data the wreck appears somewhat broken up and scattered. It is surrounded by a seafloor disturbance with dimensions of 51.4 m x 21.4 m, which may contain debris. Has a large magnetic anomaly of 198 nT associated with it. The nearest line of magnetic data to the wreck however lies 20 m away from the SE end of the wreck and the wreck would have a much larger anomaly directly over it. An area of bright reflectors observed in the sidescan data extending to the east of the wreck may represent fishing nets or other such material snagged on the remains. There is a 50 m AEZ around the extents of this wreck, which extends 60 m into the submarine cable corridor.
Build	**Type**	Unknown
	Construction	Unknown
	Dimensions	Unknown
	Shipyard	Unknown
Loss	**Cause**	Unknown
Extent of Survival		The wreck appears to lie upright and there is still significant height remaining. However, the wreck is broken up and partially scattered. Scouring around the wreck has exposed the sides of the vessel to environmental processes. An adjacent seafloor disturbance may contain debris. There is the possibility for buried debris around the wreck to be present.



Sidescan sonar image of **7003**, 42.7 m x 10 m x 3.7 m



Multibeam bathymetry image of **7003** looking northwest (x4 vertical exaggeration)



Magnetic profile of **7003** measuring 198 nT

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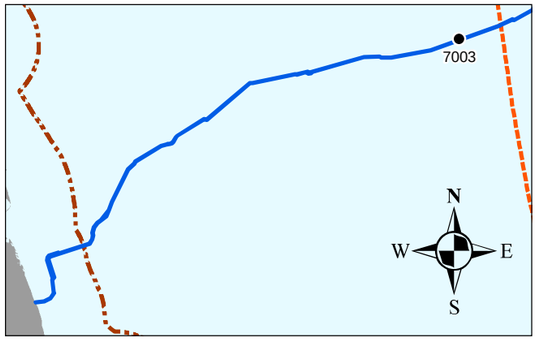
Sheet 1. Unknown wreck

Legend

- Submarine cable corridor
- Median Line
- 12nm territorial sea limit
- Wreck



NOTE: Not to be used for Navigation

Date	21/12/2016
Projection	Transverse Mercator
Spheroid	GRS 1980
Datum	ETRS 1989 UTM Zone 31N
Data Source	
File Reference	Y:\PROJECTS_Edinburgh\112870\Graphics_Office\Report_figs\technical report\2016_12_21\Wrecksh1.mxd
Created By	KF/KL
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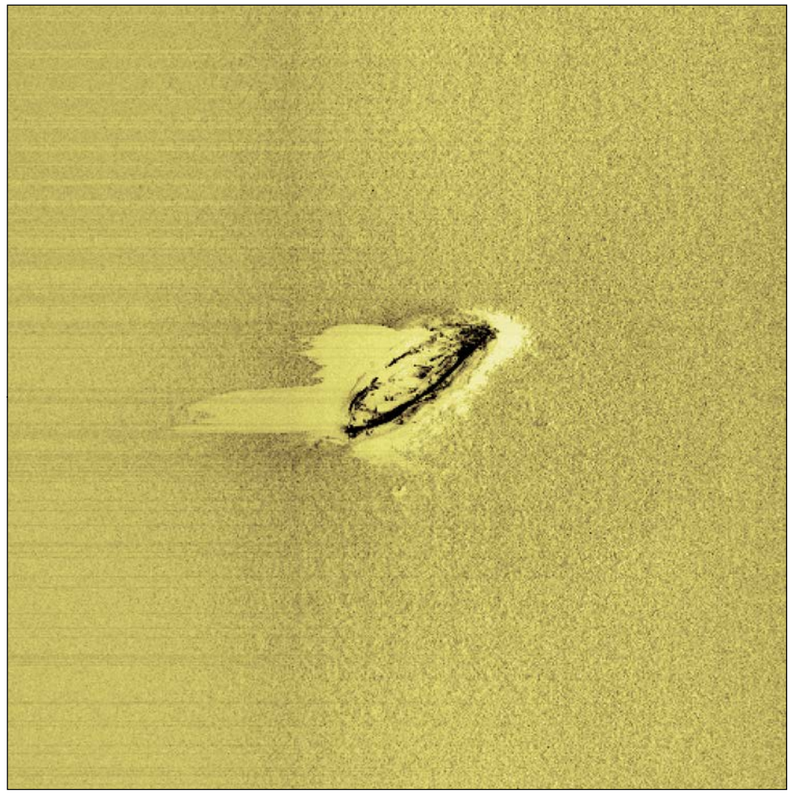
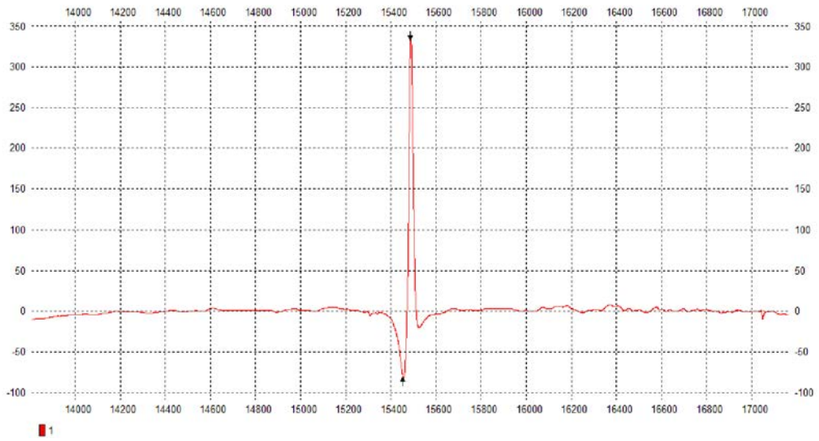
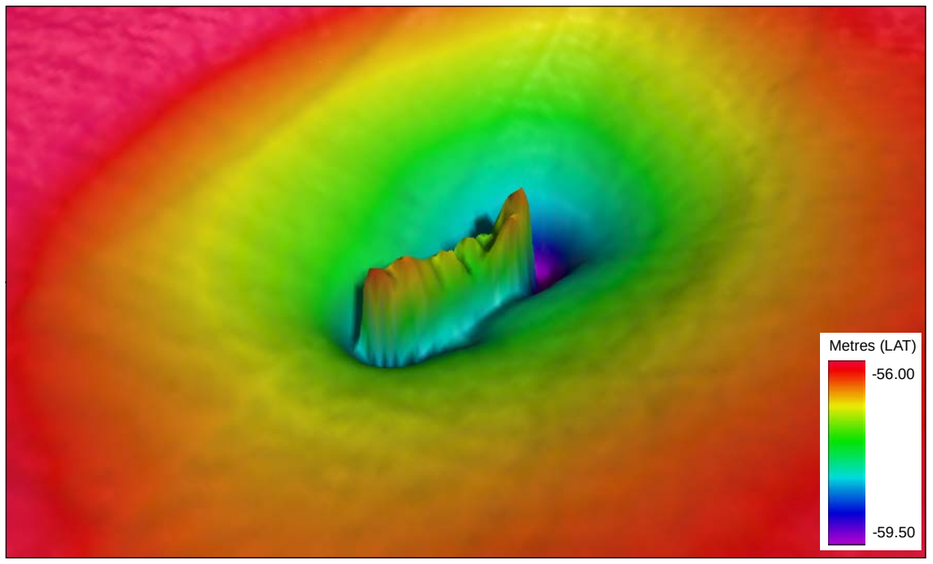
Location		485810E 6007463N
Geophysical survey dimensions and notes		Upright wreck with dimensions of 33.6 m x 10 m x 3.6 m. The wreck appears mostly intact and is oriented 090/270, E/W. No internal structure is clearly seen. The ends of the wreck are the highest points of the wreck. It therefore appears that much of the superstructure may be missing. Some possible seafloor disturbance (44.5 m x 22.1 m) to sediment surrounds the wreck. A bright reflector feature and also four linear dark reflectors of possible associated debris are present. The wreck is surrounded by a large scour orientated 065/245, NE/SW, and with a maximum depth of 3.9 m. The wreck itself lies mostly below the adjacent seabed at the bottom of the scour. There is a large dipole of 425 nT associated with the wreck indicating significant ferrous content. The wreck is also observed as an indistinct mound within a depression in the pinger data. Strong reflectors are observed below the seabed at this location and are indicative of buried structure. There is a 50 m AEZ around the extents of this wreck, the entirety of which lies within the submarine cable corridor.
Build	**Type**	Unknown
	Construction	Unknown
	Dimensions	Unknown
	Shipyard	Unknown
Loss	**Cause**	Unknown
Extent of Survival		The remains of the wreck appear mostly intact with some adjacent debris. There is an area of disturbed seafloor around the wreck and it is possible that debris may be buried nearby. The scouring around the wreck has exposed the sides of the wreck but it is likely that the lower part of the wreck remains below the sediment.



Sidescan sonar image of **7004**, 33.6 m x 10 m x 3.6 m



Magnetic profile of **7004** measuring 425 nT



Multibeam bathymetry image of **7004** looking northeast (x6 vertical exaggeration)

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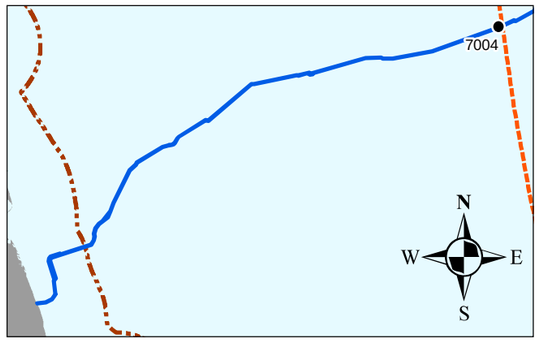
Sheet 2. Unknown wreck

Legend

- Submarine cable corridor
- Median Line
- 12nm territorial sea limit
- Wreck



NOTE: Not to be used for Navigation

Date	21/12/2016
Projection	Transverse Mercator
Spheroid	GRS 1980
Datum	ETRS 1989 UTM Zone 31N
Data Source	
File Reference	Y:\PROJECTS_Edinburgh\112870\Graphics_Office\Report_figs\technical report\2016_12_08\Wrecksh2.mxd
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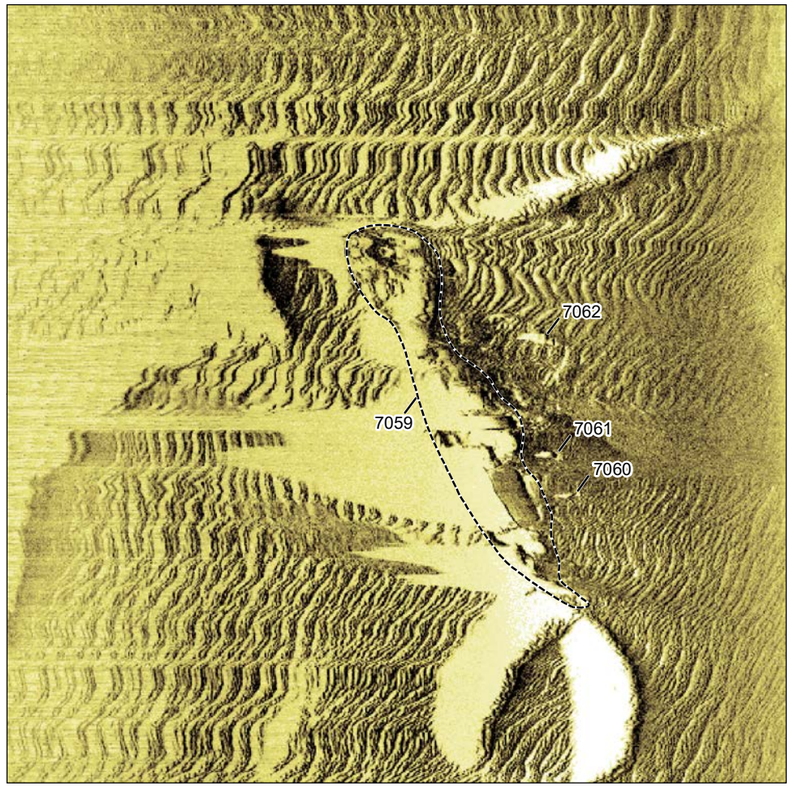
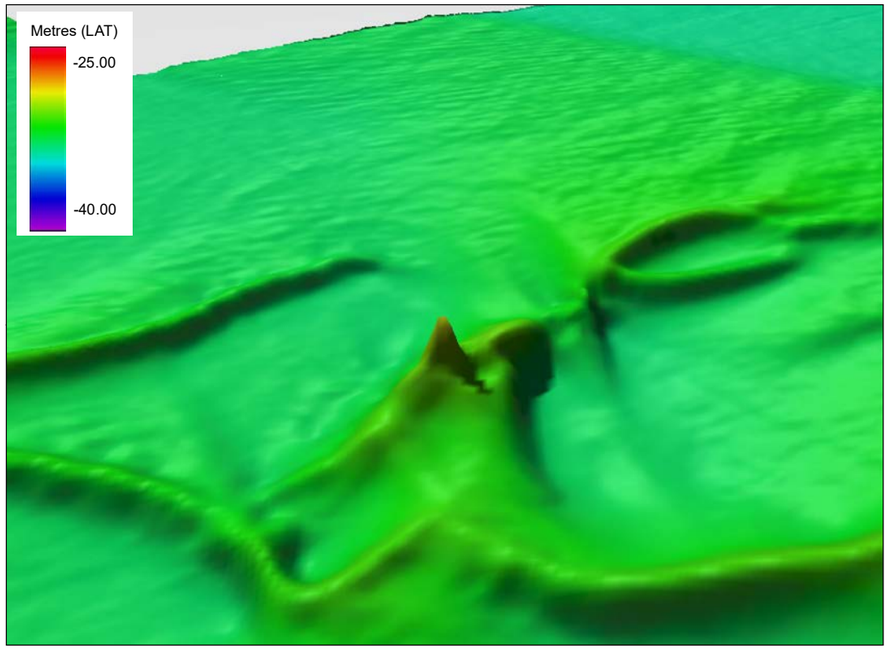
Location		362548E 5962994N
Geophysical survey dimensions and notes		Large wreck measuring 82.6 m x 20 m x 4.1 m and oriented 045/225, NE/SW. The extent is difficult to determine as shadows obscure much of the wreck structure in the sidescan sonar data and it is mostly very low lying so it is hard to distinguish from the surrounding sediment in the bathymetry data. Appears broken up and mostly buried in an area of sandwaves. The wreck appears to have caused localised changes to the surrounding seabed with sediment build-up occurring around the wreck. May be some scouring near the SW end. In the bathymetry data the wreck has a distinct peak at its centre. Three small objects of debris are situated adjacent to the wreck on the NW side – **7060** to **7062**. A medium dipole of 122 nT is associated with the wreck, indicating ferrous content. The nearest line of magnetometer data is 40 m away and a much larger magnetic anomaly would be recorded directly over the wreck. There is a 50 m AEZ around the extents of this wreck, the entirety of which lies within the submarine cable corridor.
Build	**Type**	Trawler (British)
	Construction	One boiler, triple expansion engine of 51hp, single shaft. Hull material not specified.
	Dimensions	32 m x 6.4 m x 3.3 m (draught), 176 gross tons
	Shipyard	Built by Cook, Welton & Gemmel, Beverley
Loss	**Cause**	Mined and sunk on 23 September 1914
Extent of Survival		The wreck appears broken up and mostly buried. Some debris is observed adjacent to the wreck and there is also likely to be further buried debris surrounding the wreck.



Sidescan sonar image of wreck **7059**, 82.6 m x 20 m x 4.1 m, and adjacent debris **7060** to **7062**

Magnetic profile of **7059** measuring 122 nT



Multibeam bathymetry image of **7059** looking north (x3 vertical exaggeration)

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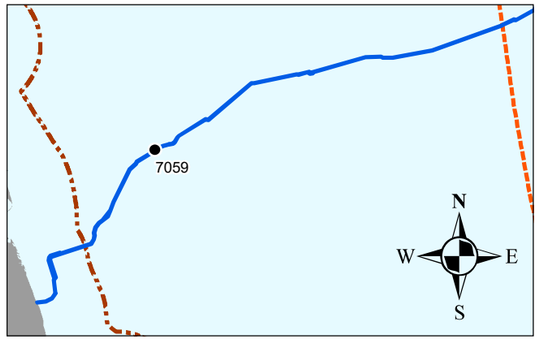
Sheet 3. *Rebono* (Probably)

Legend

- Submarine cable corridor
- Median Line
- 12nm territorial sea limit
- Wreck



NOTE: Not to be used for Navigation

Date	21/12/2016
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Datum	ETRS 1989 UTM Zone 31N
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