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Immingham Eastern Ro-Ro Terminal

Marine Archaeology Technical Report

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wessexarchaeology



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Summary

Wessex Archaeology has been commissioned by Associated British Ports (ABP) ('the client'), to produce a marine archaeological technical report for the proposed marine works relating to Immingham Eastern Ro-Ro Terminal (IERRT), Port of Immingham, North East Lincolnshire. The site is centred on NGR 520892 416180 (TA 20892 16180).

This technical report is prepared in support of the Environmental Statement (ES) for the IERRT project. This report comprises a marine archaeological baseline study of the proposed development, based on an archaeological assessment of geophysical and geotechnical data, gathered as part of the project surveys, a walkover survey of the site, together with a review of records held by national and local inventories and secondary sources relating to the marine and intertidal historic environment of the region. This archaeological baseline also includes an assessment of the value and sensitivity of any identified marine or intertidal archaeological receptors within the development and additional 500 m buffer Archaeological Study Area.

The marine proposed works comprise the installation of an approach jetty (with possible inclusion of vessel impact protection measures), floating pontoons, finger piers, berthing infrastructure and linkspan bridge; capital dredging; and, the disposal of dredge material.

Two possible wrecks were identified in the desk-based assessment.

Geophysical data were assessed to identify features of paleogeographic potential within the study area. A total of 25 features were identified across the study area.

Geophysical data were also assessed to identify features of archaeological potential relating to maritime and aviation activity. A total of 102 anomalies were identified across the study area.

Within the study area, no anomalies have been given an A1 archaeological classification, which are defined as features of anthropogenic origin of archaeological interest.

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This project was commissioned by Associated British Ports (ABP), and Wessex Archaeology is grateful to ABPmer consultants in this regard.

Wessex Archaeology would like to thank the National Record of the Historic Environment for supplying sites and monuments data, the United Kingdom Hydrographic Office for supplying the known wreck and obstruction data, and North East Lincolnshire Historic Environment Record for supplying the corresponding Historic Environment Record data. Geophysical data was provided by ABP.



Immingham Eastern Ro-Ro Terminal, Port of Immingham, North East Lincolnshire

Marine Archaeology Technical Report

1 INTRODUCTION

1.1 Project Background

1.1.1 Wessex Archaeology has been commissioned by Associated British Ports (ABP) ('the client'), to produce a marine archaeological technical report for the proposed marine works relating to Immingham Eastern Ro-Ro Terminal (IERRT), Port of Immingham, North East Lincolnshire (Figure 1). The site is centred on NGR 520892 416180 (TA 20892 16180).

1.1.2 This technical report is prepared in support of the Environmental Statement (ES) for the proposed IERRT project. A Preliminary Environmental Information Report (PEIR) has previously been submitted (ABPmer 2022a).

1.1.3 This technical report comprises a marine archaeological baseline study of the proposed development, based on an archaeological assessment of geophysical and geotechnical data, gathered as part of the project surveys, a walkover survey of the site, together with a review of records held by national and local inventories and secondary sources relating to the marine and intertidal historic environment of the region. This archaeological baseline also includes an assessment of the value and sensitivity of any identified marine or intertidal archaeological receptors within the development and additional 500 m buffer Archaeological Study Area (ASA).

1.1.4 The marine proposed works comprise the installation of a jetty with possible inclusion of vessel impact protection structure, floating pontoons, finger piers and linkspans, capital dredging and the disposal of dredge material.

1.1.5 An assessment of the proposed development on the setting of terrestrial heritage receptors within 5 km of the development was also undertaken and reported on separately (Wessex Archaeology 2022). The setting assessment has concluded through the application of the industry standard Historic England stepped process and through professional judgement and experience that there will be no harm to any of the designated heritage receptors identified during the refinement process.

1.2 Development Proposal

Marine Infrastructure

1.2.1 The proposed marine works will consist of the creation of:

- An open piled approach jetty;
- The linkspan between the approach jetty and the floating pontoons;



- Two floating pontoons with an overall depth up to 9.35 m;
- Two 264 m finger piers;
- A short linkspan between the two pontoons; and
- The possible inclusion of vessel impact protection structure adjacent to the approach jetty.

Capital Dredge

1.2.2 The proposed development will require a capital dredge of the new berthing area. The maximum spatial extent of the dredge is currently estimated at being approximately 70,000 m². The berthing area will be dredged to a maximum of 9 m below Chart Datum (CD). The area beneath the floating pontoons will be dredged to 6 m below CD.

1.2.3 It is estimated that about 190,000 m³ of material in total will be removed. This is likely to constitute approximately 40,000 m³ of boulder clay, alongside 150,000 m³ of sand/silt (alluvium) *in situ*.

Disposal of Dredge Material

1.2.4 It is currently estimated that about 40,000 m³ of boulder clay, alongside 150,000 m³ of sand/silt (alluvium) *in situ* is likely to require disposal in the estuary. It is envisaged that the licenced marine disposal sites HU056 (Holme Channel) and HU060 (Clay Huts) will be used to dispose of material.

1.3 Scope of Document

1.3.1 The purpose of this assessment is to determine, as far as possible from existing information and survey data, the nature, extent and significance of the known and potential marine archaeological resource within the boundary of the proposed IERRT project.

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 project area to subsequently inform the ES. The objectives of the assessment are as follows:

- To provide details of relevant legislation, national and local planning policy, and best practice guidance;
- To assess the geophysical survey datasets provided by the client in order to identify any buried palaeolandscape features of possible archaeological potential; confirm the presence of known or previously located marine sites of archaeological potential and to comment on their apparent character; and identify, locate and characterise hitherto unrecorded marine sites of archaeological potential;
- To compare the geophysical interpretation with desk-based assessments, historical data, known archaeological sites and previous investigations in the

vicinity of the project area to outline the known and potential marine archaeological resource;

- To assess the significance of the known and potential marine archaeological resource through weighted consideration of their valued components; and
- To recommend mitigation measures for any potential archaeological or cultural heritage receptors newly identified within the project area, including the addition of new Archaeological Exclusion Zones (AEZ) where necessary within the project area.

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 licence, 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 regards to multiple copying and electronic dissemination of the report.

2 LEGISLATION, GUIDANCE AND POLICY

2.1 Introduction

2.1.1 The following section provides a summary of the national, regional and local planning and legislative framework that governs the treatment of the marine historic environment in the planning process. Further details can be found in Annex 2.

2.1.2 Historic England (HE) is responsible for the archaeological resource within England's Territorial Waters, up to the 12 nautical mile (nm) limit. The Marine Management Organisation (MMO) is responsible for licencing, regulating and planning marine activities in English territorial waters to ensure they are carried out in a sustainable way.

2.2 Marine Legislation

2.2.1 Within English territorial waters the following relevant legislation applies:

- **The Marine and Coastal Access Act 2009 and the Planning Act 2008.** The legislation relevant to marine development within English territorial waters. Whilst the MCAA regulates marine licensing for works at sea, section 149A of the Planning Act 2008 enables an applicant for a Development Consent Order (DCO) to include within the Order a Marine Licence which is deemed to be granted under the provisions of the MCAA;
- **Protection of Wrecks Act 1973 Sections 1 and 2.** It is an offence to carry out certain activities in a defined area surrounding a wreck that has been designated, unless a licence for those activities has been obtained from the Government. There are no protected wrecks within the footprint of the proposed development;

- **Ancient Monuments and Archaeological Areas Act 1979.** It is a criminal offence to carry out any works on, or near to, a Scheduled Monument without Scheduled Monument Consent. Both terrestrial and maritime sites, including wrecks, may be designated under this Act. There are no scheduled ancient monuments within the footprint of the proposed development;
- **Protection of Military Remains Act 1989.** This Act provides protection for the wreckage of military aircraft and designated military vessels. The Act provides for two types of protection: ‘protected places’ and ‘controlled sites’. Military aircraft are automatically protected, although vessels have to be specifically designated. The primary reason for designation is to protect as a ‘war grave’ the last resting place of servicemen; however, the Act does not require the loss of the vessel to have occurred during the war. There are no protected places or controlled sites within the footprint of the proposed development; and
- **Treasure Act 1996.** All information required by the Treasure Act (i.e., finder, location, material, date, associated items etc.) will be reported to the coroner within 14 days. Items falling under the Treasure Act will be removed from the site by the Retained Archaeologist and stored in a secure location, pending a decision by the coroner
- **Merchant Shipping Act 1995.** All wreck material recovered from UK waters must be declared to the Receiver of Wreck who acts to settle questions of ownership and salvage. ‘Wreck’ refers to all items of flotsam, jetsam, derelict, and lagan found in or on the shores of the sea or any tidal water;
- **Planning (Listed Buildings and Conservation Areas) Act 1990 (as amended).** Works affecting Listed Buildings are subject to additional planning controls. The Act requires authorities to have regard to the fact that there is a Conservation Area when exercising any of their functions under the Planning Acts and to pay special attention to the desirability of preserving or enhancing the character or appearance of Conservation Areas.

2.2.2 Marine heritage receptors may be designated under the Protection of Wrecks Act 1973 and the Ancient Monuments and Archaeological Areas Act 1979. Military wrecks and aircraft remains may be protected under the Protection of Military Remains Act 1986. Ownership of any wreck remains is determined in accordance with the Merchant Shipping Act 1995.

2.3 International conventions

2.3.1 The United Nations Educational, Scientific and Cultural Organisation (UNESCO) Convention on the Protection of the Underwater Cultural Heritage was concluded in 2001 and is a comprehensive attempt to codify the law internationally with regards to underwater cultural heritage. The UK has not ratified the Convention, but 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 02 January 2009 having been ratified by 20 member states. It has since been ratified or accepted by an additional 60 member states.

2.4 Policy

National Policy Statement for Ports (NPSfP)

2.4.1 As the proposed development is a nationally significant infrastructure proposal (NSIP), the NPSfP provides a framework for decisions on proposals for new port developments. The NPSfP recognises the importance of the historic environment and that the construction, operation and decommissioning of port infrastructure has the potential to result in adverse impacts on it (Department for Transport 2012, Section 5.12). Therefore, the significance of heritage assets and the extent of the impact of the proposed development on the significance of any heritage assets has to be understood (Department for Transport 2012, Section 5.12.9). Both designated heritage assets and undesignated heritage assets have to be considered, and the setting of a heritage asset also has to be taken into account.

2.4.2 The NPSfP advises that an ES should include:

- a description of the significance of the heritage assets affected by the proposed development and the contribution of their setting to that significance;
- appropriate desk-based assessment and, where such desk-based research is insufficient to properly assess the interest, a field evaluation;
- consideration of the possibility of damage to buried features from underwater disposal of dredged material; and
- an assessment of the extent of the impact of the proposed development on the significance of any heritage assets affected (Department for Transport 2012, Section 5.12).

2.4.3 The NPSfP also advises that the assessment should take account of other relevant UK policies and plans, including the Marine Policy Statement (MPS) and any existing marine plans provided for by the MCAA 2009 (Department for Transport 2012, Section 4.1.1).

UK Marine Policy Statement (MPS)

2.4.4 UK Marine Policy Statement (MPS) was adopted in 2011 by all UK Administrations as part of a new system of marine planning being introduced across UK seas (HM Government, 2011). The statement was intended to facilitate and support the formulation of Marine Plans, ensuring that marine resources are used in a sustainable way in line with high level marine objectives.

2.4.5 Under the MCAA, England 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 receptors. Marine plans must also be in accordance with other UK national policy, including the National Planning Policy Framework (NPPF) (Ministry of Housing, Communities and Local Government, 2021).

2.4.6 As part of the NPPF (Ministry of Housing, Communities and Local Government, 2021), a core planning principle is to conserve heritage receptors in a manner appropriate to their significance, so that they can be enjoyed for their contribution to the quality of life of this and future generations (Ministry of Housing, Communities and Local Government, 2021, 55).

2.4.7 Section 16 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.

East Inshore Marine Plan

2.4.8 The Marine Management Organisation (MMO) have divided the inshore and offshore waters around England into 11 plan areas for which marine plans are to be produced. The proposed development is within the East Inshore Marine Plan Area which has been adopted as of April 2014 (DEFRA, 2014).

2.4.9 The East Inshore Marine Plan Policy SOC2 states that proposals that may affect heritage receptors should demonstrate, in order of preference:

- (a) that they will not compromise or harm elements which contribute to the significance of the heritage asset;
- (b) how, if there is compromise or harm to a heritage asset, this will be minimised;
- (c) how, where compromise or harm to a heritage asset cannot be minimised, it will be mitigated against; or
- (d) the public benefits for proceeding with the proposal if it is not possible to minimise or mitigate or compromise the harm to the heritage asset.

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, 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, 2002);
- *Code for Practice for Seabed Development* (Joint Nautical Archaeology Policy Committee (JNAPC) 2006);
- *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* (Department for Environment, Food and Rural Affairs (DEFRA, 2009);
- *Environmental Archaeology: A Guide to the Theory and Practice of Methods, from Sampling and Recovery to Post-excavation* (second edition) (English Heritage (now Historic England), 2011);
- *Ships and Boats: Prehistory to Present – Designation Selection Guide* (Historic England, 2012);
- *Marine Geophysics Data Acquisition, Processing and Interpretation Guidance Notes* (Bates et al 2013);
- *Standard and guidance for archaeological field evaluation* (ClfA 2014a);
- *Standard and Guidance for Historic Environment Desk-based Assessment* (Chartered Institute for Archaeologists 2014b);
- *Standard and guidance for nautical archaeological recording and reconstruction* (ClfA 2014c);
- *Dredging and Port Construction: Interaction with Features of Archaeological or Heritage Interest, Guidance Document No 124-2014* (PIANC 2014);
- *Geoarchaeology: Using Earth Sciences to Understand the Archaeological Record* (English Heritage (now Historic England), 2015a);
- *Managing Significance in Decision-Taking in the Historic Environment: Good Practice Advice in Planning Note 2* (Historic England 2015b);
- *Preserving Archaeological Remains: Decision-taking for Sites under Development* (Historic England, 2016a);
- *The Assessment and Management of Marine Archaeology in Port and Harbour Development* (Historic England 2016b);
- *Deposit Modelling and Archaeology. Guidance for Mapping Buried Deposits* (Historic England 2020).

3 METHODOLOGY

3.1 Study Area

3.1.1 The marine study area for this assessment is the area over which potential direct and indirect effects of the proposed IERRT project were predicted to occur on marine heritage receptors during the construction and operational phases.

3.1.2 The study area therefore comprises the proposed development area of IERRT project below Mean High Water Springs (MHWS) (Figure 1). This encompasses all direct impacts from construction and dredging. A further 500 m buffer zone beyond the area of the proposed development has been included in order to capture relevant proximate heritage receptors in the assessment that could be affected indirectly. This area is known as the Archaeological Study Area (ASA).

3.1.3 The area of geophysical data coverage (survey boundary) is smaller than the ASA (Figure 6).

3.2 Walkover Survey Methodology

3.2.1 An intertidal walkover survey was conducted on 23 February 2022, within the intertidal zone of the proposed application site by Wessex Archaeology maritime archaeologists.

3.2.2 The overall environment of the survey area did not allow for a fully representative interpretation of the site due to safety concerns. The sediment of the intertidal zone was too loosely compacted to allow a closer inspection of the sites.

3.2.3 Features identified during the walkover survey are listed in Annex 7.

3.3 Archaeological Desk-based Assessment

Key themes

3.3.1 The methodology follows the best practice professional guidance outlined by the Chartered Institute for Archaeologists' (CIfA) *Standard and Guidance for Historic Environment Desk-Based Assessment* (2014b).

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

- Seabed prehistory (for example, palaeochannels and other features that contain prehistoric sediment, and derived Palaeolithic artefacts e.g. handaxes);
- Seabed features, including maritime sites (such as shipwrecks and associated material including cargo, obstructions and fishermen's fasteners) and aviation sites (aircraft crash sites and associated debris);
- Intertidal heritage receptors; and
- Historic seascape character.

3.3.3 The setting of designated heritage receptors is considered in a separate report as set out in Appendix 15.2 to the ES (Wessex Archaeology 2022).

Data Sources

3.3.4 Current baseline conditions have been determined by a desk-based review of available information.

3.3.5 The main desk-based sources of information that have been reviewed to inform the current baseline description within the vicinity of the proposed development include:

- United Kingdom Hydrographic Office (UKHO) wreck database (acquired 28 July 2021);
- Historic England's National Record of the Historic Environment (NRHE), (acquired 21 October 2021);
- North East Lincolnshire Historic Environment Records (NLHER) (now defunct) (acquired 09 April 2020);
- Various online resources including the British Geological Survey (BGS) Geology of Britain Viewer;
- Historical maps and Ordnance Survey maps;
- Admiralty Charts; and
- Relevant primary and secondary sources in Wessex Archaeology's own library 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 study area were reviewed.

3.3.6 Site specific surveys that have been undertaken to underpin the assessments include:

- An intertidal walkover survey was conducted on 23 February 2022; and
- A setting assessment was conducted on 24 February 2022 (Wessex Archaeology 2022).

Data Structure

3.3.7 This report is supported by a Geographic Information System (GIS) using ArcGIS 10.6.1, incorporating the positional information of the various data sources listed above, allowing the data to be spatially analysed. The data were subsequently compiled into gazetteers of the maritime and aviation resources within the study area; these were used to inform the assessment of geophysical data.

3.3.8 Within this assessment, the gazetteer is compiled and presented in British National Grid (BNG), with heights calculated as distance above Ordnance Datum (Newlyn), as defined by OSGM15 and OSTN15.

3.3.9 Information relating to the marine heritage receptors that did not include location or positional information were also used to inform the marine archaeological baseline assessment where relevant.

Chronology

3.3.10 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 BCE (Before Common Era), BP (Before Present) or AD (Anno Domini) within the text. BCE refers to calibrated radiocarbon chronology that can be considered equivalent to calendar years. BP dates are used for periods of time older than circa 10,000 years ago.

3.3.11 A list of the main archaeological periods of the British Isles referred to in the text, along with their broadly defined dates, are presented in Annex 1, which reflects the archaeological record documented from coastal and marine contexts.

Seabed Prehistory

3.3.12 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.

3.3.13 The geophysical data obtained for the study area was reviewed to identify deposits of geoarchaeological interest and were compiled to form a gazetteer as part of the seabed prehistory baseline. These records were each given a unique identifier beginning with 75000 continuing sequentially (Annex 3) and were added to the project GIS.

Seabed Features: Maritime and Aviation Sites

3.3.14 The sources of data for maritime and aviation archaeology listed above have been collated and summarised in order to develop a baseline of marine archaeology for the study area, and the potential for encountering unknown shipwreck and aircraft crash sites (see Section 5). Sources of data relevant to maritime and aviation archaeology are the UKHO, NRHE and Humber HER.

3.3.15 The data obtained were reviewed and those located within the study area were extracted and compiled to form a gazetteer as part of the known maritime and aviation baseline. These records were each given a unique identifier beginning with 2000 continuing sequentially (Annex 4).

3.3.16 For the purpose of this assessment, records with duplicate positions between datasets were amalgamated. The presented co-ordinates were derived from the most precise dataset (typically the UKHO). These are based on hydrographic survey data presented in World Geodetic System (WGS) 1984 datum. These co-ordinates were projected from WGS84 into BNG eastings and northings using the Quest Geodetic Calculator.

3.3.17 Data from the NRHE and HER is provided in two spatial formats, points and polygons. All points and polygons below the MHWS mark that intersect the study area have been included within the assessment, however, it should be noted that co-ordinates given for the polygon records is the centroid generated using ArcGIS 10.6.1, which may lie outside the study area.

3.3.18 The research for maritime and aviation archaeology was then augmented by the archaeological assessment of geophysical survey data comprising sub-bottom profiler (SBP), sidescan sonar (SSS), magnetometer (Mag.) and multibeam echosounder (MBES) data sets. These records were each given a unique identifier beginning with 7000, continuing sequentially (Annex 5) were added to the project GIS. The gazetteer of known seabed anomalies (Annex 4) was retained, as most of the records are outside the area of geophysical coverage, but still within the ASA.

3.3.19 Data relating to Recorded Losses were also extracted from the NRHE, HER and UKHO data 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. Recorded Losses are often grouped by area into Maritime Named Locations by the NRHE, and the positional data of these records is unreliable and serves only to provide an indication of the types of vessels that passed through the area and the wrecking incidents that are known to have occurred in the general region. Whilst the remains of these vessels and aircraft are expected to exist somewhere on the seafloor, their location is unknown. As such, they signify the potential maritime and aviation resource.

3.3.20 Details regarding maritime Recorded Losses, whose Named Location happens to be located within the ASA, are presented in a gazetteer format (Annex 6). These records have retained their original identification assigned by the UKHO, NRHE or HER for ease of cross referencing. The gazetteer does not include positional data due to the inaccuracies therein.

3.3.21 The baseline assessment of maritime and aviation archaeology was further supplemented by a review of relevant primary and secondary source material 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 ASA (English Heritage, 2002; Wessex Archaeology, 2008a).

Intertidal Archaeology

3.3.22 Sites in the intertidal area are included in the gazetteer in Annex 4. Features identified during the walkover survey are included in Annex 7.

Historic Seascape Characterisation

3.3.23 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). 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.).

3.3.24 Seascape assessment reflects the holistic approach to landscape assessment as defined in the European Landscape Convention, extending it to the sea. Seascape Character Areas include coastal land, intertidal and marine environments up to the territorial limit (12 NM). Historic Seascape Characterisation (HSC) is the identification and interpretation of the historic dimension of the present day coastal and marine environment.

This is done by mapping and describing the historic cultural influences which define present seascape perceptions across all of England's marine areas and coastal land.

3.3.25 The baseline summary for character of the historic seascape within the study area was assessed using the results of the East Yorkshire to Norfolk Historic Seascape Characterisation undertaken by the University of Newcastle (Aldred 2014) with a methodology developed through the England's Historic Seascapes Programme (Merritt & Dellino-Musgrave, 2009). The HSC include ArcGIS shapefiles of the character areas and reports including a regional and national assessment of the historic seascape character types.

3.4 Geophysical and Geotechnical Methodology

Coordinate system

3.4.1 The survey data were acquired in ETRS89 UTM 30N and converted to OSGB 36 using the OSTN15 transformation by ABPmer. The data were provided to Wessex Archaeology in OSGB 36 British National Grid, and the results have been presented using this coordinate system.

Data sources

3.4.2 A number of data sources were consulted during this assessment, including:

- Geophysical survey datasets acquired by ABPmer;
- Offshore core logs acquired by Coastline Marine Services in 2021 on behalf of ABPmer and provided to Wessex Archaeology;
- Recorded wreck and obstruction data acquired via the United Kingdom Hydrographic Office (UKHO);
- Relevant background mapping from the area (British Geological Survey (BGS) 1989, admiralty charts received from UKHO);
- Lincolnshire Historic Environment Record (HER) and National Record of the Historic Environment (NRHE) monument and site records; and
- Client supplied survey reports (ABPmer 2022b).

Technical specifications

3.4.3 Geophysical data were acquired by ABPmer on 23 – 31 January 2022 onboard the survey vessel *Wessex Explorer*, at approximately 10 - 20 m line spacing, and processed by CM-Geomatics Ltd in February 2022. Further details on the equipment used is in Table 1.

Table 1 Summary of survey equipment

Survey Company	Survey Vessel	Data Type	Equipment	Data Format
ABPmer	Wessex Explorer	SBP	Applied Acoustics CSP-300 High voltage Boomer system	.sgy
			A towed Applied Acoustics high voltage plate catamaran (source) towed from port stern quarter with an Applied Acoustics AH360/8 Hydrophone (receive) towed from an outrigger	.sgy
		MBES	Norbit iWBMSH (pole mount port side)	.xyz
		SSS	Edgetech 4125 bow mount (400 / 900 kHz, 50 m range)	.xtf
		Mag.	Geometrics G-882 (single towed centre stern)	.xls
		Positioning	Fugro StarFix DGNSS	N/A

Processing

3.4.4 A number of datasets were assessed over the study area, each dataset was processed separately using the following software (Table 2).

Table 2 Software used for geophysical assessment

Dataset	Processing Software	Interpretation and rationalisation
SBP	CodaOctopus Survey Engine v5.11	ArcMap v10.6
MBES	QPS Fledermaus v8	
SSS	CodaOctopus Survey Engine v5.11	
Mag.	WA Proprietary Software	

3.4.5 The SBP and MBES data were used as the primary datasets for the palaeographic assessment and SSS, MBES and Mag. datasets were used for the seabed features assessment.

3.4.6 The SBP data were processed using CodaOctopus Survey Engine 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 sedimentary boundaries and shallow geological features that might be of archaeological interest.

3.4.7 The SBP 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 1,600 ms⁻¹. This is a standard estimate for shallow, unconsolidated sediments.

3.4.8 The SBP data can also be used to identify small reflectors, which may indicate buried material such as a wreck site covered by sediment. The position and dimensions of any such objects are noted in a gazetteer, and an image acquired of each anomaly for future reference. It should be noted that anomalies of this type are rare, as the sensors must pass directly over such an object in order to detect an anomaly.



3.4.9 For the SBP assessment, 25% of the lines were initially assessed. Where features of interest were identified, additional lines were then interpreted in order to more accurately map the extents of these features.

3.4.10 The MBES data were analysed to identify any unusual seabed structures that could be shipwrecks or other anthropogenic debris. The data were gridded at 0.2 m and analysed using QPS Fledermaus software, which enables a 3-D visualisation of the acquired data and geo-picking of seabed anomalies. The MBES data were also used in the palaeogeographic assessment.

3.4.11 The high frequency .xtf SSS data files were processed using CodaOctopus Survey Engine Sidescan+ software. This allowed the data to be replayed with various gain settings in order to optimise the quality of the images. The data were 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.

3.4.12 A mosaic of the SSS is produced during this process to assess the quality of the sonar towfish positioning. This process allows the position of anomalies to be checked between different survey lines and for the positioning to be further refined if necessary.

3.4.13 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 be unrelated individual features, define the edges of a buried but intact feature, or may be all that remains as a result of past impacts from, for example, dredging or fishing. Assessment is made of such groups of anomalies during data interpretation to determine which of these alternatives is the most likely.

3.4.14 The Mag. data were processed using Wessex Archaeology's proprietary software in order to identify any discrete magnetic contacts which could represent buried metallic debris or structures such as wrecks.

3.4.15 The software enables both the visualisation of individual lines of data and gridding of data to produce a magnetic anomaly map. The data were first smoothed to try and eliminate any spiking. A trend was then fitted to the resulting data, and the trend values subtracted from the smoothed values. This was carried out to remove natural variations in the data (such as diurnal variation in magnetic field strength and changes in geology). The processed data were then gridded to produce a map of magnetic anomalies, and individual anomalies tagged based on the grid and individual profile lines. Images are taken in a similar process to that of the SSS data.

3.4.16 For the purposes of this assessment, any identified magnetic anomalies have been classified depending on their amplitude as small (5 nT to 49 nT), medium (50 nT to 99 nT), large (100 – 499 nT) or very large (>500 nT).

Data quality

3.4.17 Once processed, the geophysical data sets were individually assessed for quality and their suitability for archaeological purposes, and rated using the following criteria (Table 3).

Table 3 Criteria for assigning data quality rating

Data quality	Description
Good	Data which are clear and unaffected or only slightly affected by weather conditions, sea state, background noise or data artefacts. Seabed datasets are suitable for the interpretation of upstanding and partially buried wrecks, debris fields, and small individual anomalies. The structure of wrecks is clear, allowing assessments on wreck condition to be made. Subtle reflectors are clear within SBP data. These data provide the highest probability that anomalies of archaeological potential will be identified.
Average	Data which are moderately affected by weather conditions, sea state and noise. Seabed datasets are suitable for the identification of upstanding and partially buried wrecks, the larger elements of debris fields and dispersed sites, and larger individual anomalies. Dispersed and/or partially buried wrecks may be difficult to identify. Interpretation of continuous reflectors in SBP data is problematic. These data are not considered to be detrimentally affected to a significant degree.
Below Average	Data which are affected by weather conditions, sea state and noise to a significant degree. Seabed datasets are suitable for the identification of relatively intact, upstanding wrecks and large individual anomalies. Dispersed and/or partially buried wrecks, or small isolated anomalies may not be clearly resolved. Small palaeogeographic features, or internal structure may not be resolved in SBP data.
Variable	This category contains datasets where the individual lines range in quality. Confidence of interpretation is subsequently likely to vary within the study area.

3.4.18 The quality of the SBP data has been rated as 'Variable' using the above criteria. A very strong seabed reflector is present across the majority of the site which has caused widespread acoustic blanking. This has affected the interpretation of the data within the blanked areas and affected the interpretation of continuous reflectors across the site, despite the relatively short line spacing. Where the data are visible, the data are affected by shallow sea state to some degree, meaning the subtle change between shallower reflectors is not always clear. Penetration varies across the lines from a general depth of between approximately 8-17 m, meaning the full extents of the deeper features are not always visible on some lines. It cannot be guaranteed that all palaeogeographic features of interest have been identified within the study area – however, it is accepted that the limitations are mainly due to unavoidable environmental conditions at the site.

3.4.19 The MBES data were rated as 'Good' using the above criteria. The data quality and resolution of 0.2 m was found to be of a good standard and suitable for archaeological assessment of objects and debris over 0.2 m in size.

3.4.20 The SSS data have been rated as 'Variable' using the above criteria table. The shallow nature of the survey in places as well as the proximity to port infrastructure led to some areas of the survey, notably the southern and eastern areas, to be of below average quality. Here, some data stretching, obscuring by jetty footings and significant (up to 10 m) positioning errors may have concealed the presence of some features and obscured details. The northern and western extents, however, were of good quality. Overall, the data are considered suitable archaeological assessment.

3.4.21 The Mag. data have been rated as 'Average' using the above criterial table. Some areas of increased magnetic response were present due to geological and known modern anthropogenic features, particularly the infrastructure around the survey edges. The data were suitable for archaeological interpretation, but the larger responses due to these known features may mask smaller responses in these areas.

Anomaly grouping and discrimination

3.4.22 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 thereby overstating the number of archaeological features in the exploration area.

3.4.23 To address this fact the anomalies were grouped together; allowing one ID number to be assigned to a single object for which there may be, for example, a UKHO record, a MBES anomaly, and multiple SSS anomalies.

3.4.24 Once all the geophysical anomalies and desk-based information have been grouped, they are classified further: a discrimination flag is added to the record in order to discriminate against those which are not thought to be of an archaeological concern. For anomalies located on the seabed, these flags are ascribed as follows (Table 4).

3.4.25 The classification 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.

3.4.26 Any anomalies located outside of the defined study areas, either previously recorded in known databases (e.g. UKHO) or identified during this geophysical assessment, are deemed beyond the scope of the current assessment and are subsequently not included in this report.

Table 4 Criteria discriminating relevance of identified features to proposed scheme

Overview classification	Discrimination	Criteria	Data type
Archaeological	P1	Feature of probable archaeological interest, either because of its palaeogeography or likelihood for producing palaeoenvironmental material	SBP, MBES
Archaeological	P2	Feature of possible archaeological interest	SBP, MBES
Archaeological	A2_h	Anomaly of likely anthropogenic origin but of unknown date; may be of archaeological interest or a modern feature	MBES, SSS, Mag.
Archaeological	A2_l	Anomaly of possible anthropogenic origin but interpretation is uncertain; may be anthropogenic or a natural feature	MBES, SSS, Mag.
Archaeological	A3	Historic record of possible archaeological interest with no corresponding geophysical anomaly	MBES, SSS, Mag.

Geotechnical cores

3.4.27 A total of 10 vibrocores were acquired during a geotechnical survey undertaken in October 2021 (Figure 2). The core logs were provided to Wessex Archaeology to enhance the palaeogeographic interpretation.

3.5 Impact Assessment Criteria

Receptor Sensitivity

3.5.1 In order to assess the potential impacts of a development upon marine cultural heritage, the conceptual approach known as the 'source-pathway-receptor' model is adopted. 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 receptors). For the significance of any given impact to be fully understood and for appropriate mitigation to be proposed, the sensitivity of any marine cultural heritage receptors that may be impacted need to be considered. This section outlines how the sensitivity of marine heritage receptors 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 Cultural heritage and marine archaeology receptors cannot typically adapt, tolerate, or recover from physical impacts resulting in material damage or loss caused by development. Consequently, the sensitivity of each receptor is predominantly quantified only by its value.

Value of a Receptor

3.5.4 Based on Historic England's *Conservation Principles, Policies and Guidance for the Sustainable Management of the Historic Environment*, the significance of a historic receptor "embraces all the diverse cultural and natural heritage values that people associate with it, or which prompt them to respond to it" (English Heritage 2008, 21).

3.5.5 Within this document, value is weighed by consideration of the potential for the receptor to demonstrate the following value criteria:

- Evidential value – deriving from the potential of a place to yield evidence about past human activity;
- Historical value – deriving from the ways in which past people, events and aspects of life can be connected through a place to the present. It tends to be illustrative or associative;
- Aesthetic value – deriving from the ways in which people draw sensory and intellectual stimulation from a place; and,
- Communal value – deriving from the meanings of a place for the people who relate to it, or for whom it figures in their collective experience or memory. Communal values are closely bound up with historical (particularly associative) and aesthetic values but tend to have additional and specific aspects.

3.5.6 With regards to assessing the value of shipwrecks, the following criteria listed in English Heritage's *Ships and Boats: Prehistory to Present – Designation Selection Guide* (English Heritage 2012) can be used to assess a receptor in terms of its value:

- Period;
- Rarity;
- Documentation;
- Group value;
- Survival/condition; and
- Potential.

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



3.5.8 The value of known archaeological and cultural heritage receptors were assessed on a four-point scale using professional judgement informed by criteria provided in Table 5 below.

Table 5 Criteria to assess the archaeological value of marine receptors

Value	Definition
High	<ul style="list-style-type: none">• Best known, only example or above average example and / or significant or high potential to contribute to knowledge and understanding and / or outreach. Receptors with a demonstrable international or national dimension to their importance are likely to fall within this category;<ul style="list-style-type: none">○ 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; and○ Known submerged prehistoric sites and landscapes with the confirmed presence of largely in situ artefactual material or palaeogeographic features with demonstrable potential to include artefactual and/or palaeoenvironmental material, possibly as part of a prehistoric site or landscape.
Medium	<ul style="list-style-type: none">• Average example and / or moderate potential to contribute to knowledge and understanding and / or outreach;<ul style="list-style-type: none">○ 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; and○ Prehistoric deposits with moderate potential to contribute to an understanding of the palaeoenvironment.
Low	<ul style="list-style-type: none">• Below average example and / or low potential to contribute to knowledge and understanding and / or outreach;<ul style="list-style-type: none">○ 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; and○ Prehistoric deposits with low potential to contribute to an understanding of the palaeoenvironment.
Negligible	<ul style="list-style-type: none">• Poor example and / or little or no potential to contribute to knowledge and understanding and / or outreach. Receptor with little or no surviving archaeological interest.

3.5.9 Furthermore, 'On the Importance of Shipwrecks' (Wessex Archaeology, 2006) report suggests importance can also be assessed through the BULSI system, incorporates

the following criteria: build, use, loss, survival and investigation; this is described further below.

3.5.10 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 (Wessex Archaeology, 2008b), proposed a composite timeline that considers wrecks in five distinct date ranges. The timeline considers the broad chronology of shipbuilding, thus drawing out generalisations regarding the age and special value of sites. The timeline is summarised as follows:

- Pre- 1500 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;
- 1500 to 1815: this encompasses the Tudor period in England and the Stuart periods in Scotland and Britain, the Wars of the Three Kingdoms, the Anglo-Dutch Wars and later the American Independence and French Revolutionary Wars. Wreck and vessel remains from this date are also quite rare, and can be expected to be of special value;
- 1816 to 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 to 1945: this period encompasses the First World War, the Interwar years and the Second World War. 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.

3.5.11 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.

3.5.12 Wrecks dating from 1816 to the present day are more plentiful amongst known wrecks. The 'Marine Class Description and Principles of Selection' project (Wessex Archaeology, 2008b) 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, 2011) 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 (Wessex Archaeology, 2008b) and historical thematic studies.

3.5.13 The 'Early Ships and Boats Prehistory to 1840' provided further information about earlier vessels (Wessex Archaeology, 2013). 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. These are summarised thus:

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

3.5.14 The perceived value of each marine archaeological receptor is generally assessed and assigned on a site-by-site basis, depending on the criteria listed in Table 5. The UK Marine Policy Statement (HM Government 2011) describes a heritage receptor as holding a degree of significance. Significance relates to the heritage interest of a receptor that may be archaeological, architectural, artistic or historic.

3.5.15 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 Assumptions and Limitations

Archaeological Data

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

3.6.2 The records held by the UKHO, NRHE, HER and the other sources used in this appraisal are not a record of all surviving cultural heritage receptors, 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.

4 MARINE ARCHAEOLOGICAL ASSESSMENT: PALAEOGEOGRAPHY

4.1 Geological Baseline and Archaeological Potential

4.1.1 The site lies on an industrialised section of the Killingholme Marshes on the Humber at Immingham. This low-lying area is known as the Outmarsh.

4.1.2 The underlying solid geology is Upper Cretaceous Chalk. Locally there are two formations: Flamborough Chalk and Burnham Chalk. The younger Flamborough Chalk has identifiable bedding surfaces, distinct marl bands and is without flint. The underlying Burnham Chalk, which subcrops along the eastern part of the site, is thinly bedded and laminated and contains continuous flint bands. The Port of Immingham is located at a point where the Burnham Chalk Formation is not covered by the Flamborough Chalk Formation (see BGS 1:50,000 Bedrock Geology mapping).

4.1.3 The chalk surface is characterised by a highly fractured zone created by glacial and periglacial processes, and overlain by Pleistocene deposits of Glacial Till. These glacial and post-glacial sequences are subsequently overlain by fine-grained (Clay and Silt) Tidal Flat Deposits.

4.1.4 Beyond areas of industrial development, the Outmarsh comprises Holocene peats, estuarine alluvium, and tidal flat deposits of sands, silts, and clays (Ellis et al., 2001).

4.2 Palaeogeographic Assessment Results

4.2.1 Following the SBP and vibrocore log assessments, the shallow stratigraphy of the study area was divided into five units as described below in Table 6.

Table 6 Shallow stratigraphy and archaeological potential of palaeolandscape features and deposits within the study area

Unit	Unit Name	Geophysical Characteristics ⁽¹⁾	Sediment Type ⁽²⁾	Archaeological Potential
5	Interbedded seabed muds, silts and clays and possible peat (Holocene; MIS 1)	Generally observed as a thick high amplitude reflector across the site.	Muddy silts with some organic material present such as reeds and other plant material, possible peat layers.	Potential to contain <i>in situ</i> and derived archaeological material, and palaeoenvironmental material.
4	Fine-grained deposits (Late Devensian to Early Holocene; MIS 2-1)	Small shallow infilled channels with either seismically transparent fill, or fill characterised by sub-parallel internal reflectors. Also comprises a basal high amplitude reflector.	Soft to firm black brown clayey silts with organic material (including peat) deposits.	Potential to contain <i>in situ</i> and derived archaeological material, and palaeoenvironmental material.



Unit	Unit Name	Geophysical Characteristics ⁽¹⁾	Sediment Type ⁽²⁾	Archaeological Potential
3	Sands; silts and organic sand (Late Devensian to Early Holocene; MIS 2 to MIS 1)	Cut and fill or overlying features with acoustically transparent or acoustically chaotic fill, or characterised by dipping reflectors.	Layer of firm/dense brown clayey fine sand infilling channels or hollows.	Potential to contain <i>in situ</i> and derived archaeological and palaeoenvironmental material. Basal contact may cover old land surfaces.
2	Channel deposits (Late Devensian to early Holocene; MIS 2-1)	Thick unit characterised by layered sub-parallel internal reflectors with a distinct basal reflector and a lower irregular distinct basal reflector with generally chaotic fill. Not well identified within the geophysical data.	Not sampled, but likely fluvial deposits.	Potential to contain <i>in situ</i> and derived archaeological material, and palaeoenvironmental material.
1	Glacial till (Late Devensian; MIS 5d - 2)	Acoustically unstructured unit.	Stiff, gravelly, sandy clay.	Unlikely to be of archaeological potential as deposited under an ice sheet, although upper layers could have been a land surface.
⁽¹⁾ Based on geophysical data				
⁽²⁾ Based on vibrocore data				

4.2.2 The oldest shallow geological unit identified within the study area is interpreted to be glacial till, identified within a number of the vibrocores as stiff gravelly and sandy clay and visible in the SBP data as an acoustically unstructured unit. As an interpreted glacial deposit, this unit will have been deposited within an environment uninhabitable by humans and, as such, Unit 1 is not considered of archaeological potential. However, the upper surface of the till, where preserved, could have been a surface upon which later artefacts may have been deposited.

4.2.3 Unit 1 is seen to be either incised by a number of channels and cut and fill features or overlain by a number of deposits. A total of 25 palaeogeographic features of archaeological potential have been identified within the SBP data across the study area. These features are discussed below, individually described in gazetteer format in Annex 3, and their distribution is illustrated in Figure 2. These features have been numbered in order of their distribution across the site (generally north-west to south-east), however, these features are discussed below in order of their interpreted relative stratigraphy and age (oldest to youngest).

4.2.4 Unit 2 has been identified as a possibly complex channel system cutting into Unit 1 across the extents of the study area. This comprises two fairly large channel features which have been identified across the central western extents to the eastern extents of the site (features **75007**, **75008**, **75012** and **75013**). As terrestrial landscape features, these

are considered to be of high archaeological potential. A number of individual cut and fills were also identified which are less certain and are considered to be of lower archaeological potential. This unit was not sampled by the vibrocores acquired.

4.2.5 Features **75007** and **75012** are identified as two lower cut and fills, oriented generally north-west to south-east with a distinct, irregular basal reflector and an acoustically chaotic fill (Figure 3; **75012**). These are interpreted as older channel systems and are possibly associated, although the full extents could not be traced with any degree of confidence due to acoustic blanking on intervening survey lines, and no penetration by the SBP at the lower depths. It is possible that these features are connected but this is difficult to ascertain and so they have been left as separate.

4.2.6 Features **75008** and **75013** are identified as two distinct cut and fill features, orientated generally north-west to south-east and appear to cut into the lower channel features (**75007** and **75012**) and into the interpreted till. These features have fill characterised by a distinct basal reflector with sub-horizontal parallel reflectors, indicating layered sediments, possibly indicating it was deposited in a low-energy environment (Figure 3; **75013**). A high amplitude reflector (**75015**) is seen at the base of channel feature **75013**, identified close to the base of the south-eastern edge, and may represent organic material either related to an earlier stage of fill or a separate unit. These are interpreted as more recent channel deposits, indicating the channel system identified within the study area is probably multi-phase, with subsequent phases cutting into earlier channels.

4.2.7 Cut and fill feature **75011** has been identified between **75008** and **75012** on a north-west to south-east alignment and at a similar depth. However, this has been kept as an individual feature as it is not possible to ascertain whether they are connected as an entire channel feature due to acoustic blanking on intervening lines.

4.2.8 A separate cut and fill feature (Figure 2; 75000) has been identified in the north-western extents of the study area on a north-west to south-east alignment, also at a similar depth. This may represent the north-western edge of channel 75013, but this cannot be ascertained due to acoustic blanking in the data.

4.2.9 Two internal reflectors (75003 and 75024) were also identified at a similar depth. Feature 75003 is identified as a distinct, dipping reflector within generally acoustically unstructured sediments and may be interpreted as the edge of a channel feature cutting into interpreted till, identified in the north-west of the study area.

4.2.10 Feature 75024 (Figure 5) is identified in the north-east of the study area and is interpreted as a possible internal reflector within generally acoustically unstructured sediments, or may indicate a cut with an irregular base into interpreted till on a similar alignment to channel feature 75008 and 75013.

4.2.11 Unit 3 comprises deposits of generally acoustically chaotic reflectors with a generally distinct basal reflector and some visible dipping internal reflectors. This unit appears to overlay Units 1 and 2 and may form cut and fill features at certain locations. It is generally overlain by the seabed sediments of Unit 5, though is overlain by Unit 4 in



certain locations. This unit has been identified in vibrocores VC-01, VC-02, VC-03 and VC-08 as silty, clayey sands.

4.2.12 Unit 3 has been found to contain a number of individual palaeogeographic features. Feature 75018 has been identified as an extensive area of acoustically chaotic reflectors across the south-eastern extents of the study area, overlaying the more parallel reflectors of channel features 75008 and 75013, and the interpreted till.

4.2.13 Three separate cut and fill features were identified across the site with a fill of similar chaotic reflectors (75001, 75002 and 75017). These are features which could not be traced any distance as coherent palaeochannels and, as such, are interpreted as simple cut and fills. It is possible that they are the remnants of eroded upper palaeochannel system; however, as their nature is less certain, they are considered of lower archaeological potential.

4.2.14 Unit 4 has been identified as a layer of fine grained deposits, as identified in a number of vibrocores. This unit is characterised by a high amplitude basal reflector with some parallel horizontal internal reflectors in places, and overlain by more chaotic reflectors. This unit is identified within the south-eastern extents of the study area and generally overlays Units 1 and 3 below the seabed sediments of Unit 5.

4.2.15 Unit 4 has also been found to contain a number of individual palaeogeographic features. Feature 75019 has been identified as a large area of fine grained deposits along the south-western edge of the study area (Figure 4). This feature is characterised by a high amplitude basal reflector overlying interpreted till and overlain by more chaotic reflectors. Vibrocore VC-07, located 40 m south-west, indicates the presence of soft brown muddy silts becoming black brown clayey silts with organic material in this area, and it is interpreted to correspond to this feature.

4.2.16 Three cut and fill features (**75009**, **75014**, **75022**) have been identified with similar characteristic reflectors. Feature **75009** overlays the south-eastern extents of channel feature **75008**; feature **75014** overlays the chaotic unit overlaying the extents of channel feature **75013**; and feature **75022** generally overlays interpreted till in the south-eastern extents of the study area, and the chaotic sands of Unit 3.

4.2.17 Three shallow features (75004, 75005 and 75023) identified as high amplitude reflectors have been identified across the study area and have tentatively been ascribed to this unit. Features 75004 and 75005 have been identified on one line only and are located along the north extents of the study area and feature 75023 has been identified as a larger area of high amplitude reflectors, located in the north-eastern extents of the site, overlaying unit 3.

4.2.18 Five features (75006, 75010, 75016, 75020 and 75021) have been identified across the study area. These are characterised by isolated high amplitude reflectors which cannot be traced any distance and so have been interpreted as isolated, individual features which may indicate the presence of organic material at these locations, such as peat. These features have not been ascribed to a unit.

4.2.19 In the SBP data, a generally thick, high amplitude reflector is visible across the entirety of the study area, indicating that the site is covered by organic deposits such as peats or sediments containing a relatively high organic content (e.g. organic silts and/or clays). An area of irregular seabed has been identified within the MBES and SSS data sets, which potentially indicates peat outcropping at the seabed. Possible peat has been identified in vibrocores VC-04, VC-07 and VC-10, which align with this possible outcrop. The remaining vibrocores indicate the high amplitude seabed reflectors to be muddy silts, potentially with a high organic content.

4.2.20 Dating would need to be carried out on these peat deposits to determine their age, but their presence above what is interpreted to be Devensian till suggests they are potentially Mesolithic in age. As such, these peat deposits are potentially of high archaeological and palaeoenvironmental potential.

4.3 Value

4.3.1 The values of different types of prehistoric heritage receptors are shown in Table 7.

Table 7 Value of seabed prehistory heritage receptors

Receptor Type	Description	Value
<i>In-situ</i> 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.	
Submerged landscape features (without associated archaeological material)	Other known submerged palaeo-landscape features and deposits likely to date to periods of prehistoric archaeological interest with the potential to contain in situ material.	Medium
Isolated Prehistoric finds	Isolated discoveries of prehistoric archaeological material discovered within secondary contexts.	Medium
Palaeo-environmental evidence	Isolated examples of palaeo-environmental material	Low
	Palaeo-environmental material associated with specific palaeo-landscape features or archaeological material	



5 MARINE ARCHAEOLOGICAL ASSESSMENT: MARITIME AND AVIATION SITES

5.1 Introduction

5.1.1 The following section is based on records of known shipwrecks, aircraft crash sites and obstructions combined with recent archaeological assessment of geophysics data.

5.2 Designated Sites

5.2.1 There are no sites within the study area 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 principal statutes that could be used to protect marine archaeological sites.

5.3 Known Maritime and Aviation Sites

5.3.1 There are two known wreck sites within the study area (including the 500 m buffer zone) (Figure 6; Annex 4). Wreck **2003** was listed as dead in 2004, i.e. it has not been detected by repeated surveys, although wreck material still may exist at this location. This consists of the possible remains of a craft recorded between 1991 and 1999. Record **2006** is an unknown wreck, shown on Humber 8, April 2009 ed (Figure 6). Wreck **2006** was within the geophysical survey extent, and was not visible. Wreck **2003** was outside the geophysical survey extent, so its condition is unknown.

5.3.2 A number of sites relate to port infrastructure and include the jetties and dolphins associated with the 20th century port (**2008, 2009, and 2012**).

5.3.3 There are also a number of anomalies in the area that are as yet unidentified. Anomaly **2010** was observed in bathymetry in 2013 and measures 2 x 1 m with a height of 0.5 m. Anomaly **2011** consists of a submerged obstruction that was struck by a vessel in 1957. This measured 17.5 x 10.7 m with 1 m in height, but was amended to dead in 2013, although archaeological material still may exist at this location. Five anomalies (**2001, 2002, 2004, 2005 and 2007**) are seen on aerial photography possibly consisting of the remains of further jetty and dolphin structures (Figure 6).

5.4 Geophysical Seabed Features Assessment

5.4.1 The geophysical data were assessed to identify features of archaeological potential relating to maritime and aviation activity. Due to the proximity of the area to the modern port workings, many of the objects identified may represent modern features and as such would not be of interest from an archaeological perspective. However, this cannot be confirmed without visual inspection and all features in this report have the potential to be of archaeological interest; as such, they have been retained as a precautionary measure.

5.4.2 The results of this assessment are collated in gazetteer format detailed in Annex 5 and illustrated in Figure 6.

5.4.3 A total of 102 features have been identified as being of possible archaeological potential within the study area and are discriminated as shown in Table 8.

Table 8 Anomalies of archaeological potential within the study area

Archaeological discrimination	Number of anomalies	Interpretation
A2_h	26	Anomaly of likely anthropogenic origin but of unknown date; may be of archaeological interest or a modern feature
A2_l	76	Anomaly of possible anthropogenic origin but interpretation is uncertain; may be anthropogenic or a natural feature
Total	102	

5.4.4 Furthermore, these anomalies can be classified by probable type, which can further aid in assigning archaeological potential and importance (Table 9).

5.4.5 A total of 26 anomalies have been classified as A2_h, which are features or areas with a higher probability of being anthropogenic in origin. However, due to the nature of the survey area and the recent maritime activity within the port it is likely that most features are modern in origin.

5.4.6 A total of 76 anomalies have been classified as A2_l, which are possibly of anthropogenic origin but also may be natural features. In particular, the areas contained inside the debris fields are likely to be comprised of both natural and anthropogenic features, although it is likely that the latter are modern. Objects which appear more likely to be anthropogenic within these areas have been tagged independently in addition to the debris fields and classified A2_h or A2_l as appropriate.

5.4.7 Some example images of anomalies identified in this survey can be found in Figure 7.

5.4.8 The high prevalence of anomalies alongside the jetties and edges of the port, namely in the southern and eastern regions of the survey area, suggests that many of the detected features are indeed likely to be related to more recent activities.

Table 9 Types of anomalies identified

Anomaly classification	Definition	Number of anomalies
Dark reflector	Individual objects or areas of high reflectivity, displaying some anthropogenic characteristics. Precise nature is uncertain	27
Debris	Distinct objects on the seabed, generally exhibiting height or with evidence of structure, that are potentially anthropogenic in origin.	18
Debris field	A discrete area containing numerous individual debris items that are potentially anthropogenic, and can include dispersed wreck sites for which no coherent structure remains	26
Magnetic	No associated seabed surface expression, and have the potential to represent possible buried ferrous debris or buried wreck sites	16
Mound	A mounded feature with height not considered to be natural. Mounds may form over wreck sites or other debris.	9
Rope/chain	Curvilinear dark reflectors, often with a small amount of height, indicating rope or chain (if ferrous).	4
Seabed disturbance	An area of disturbance without individual, distinct objects. Potentially indicates wreck debris or other anthropogenic features buried just below the seabed.	2
Total		102

5.5 Maritime Archaeological Potential

5.5.1 The assessment of potential for the discovery of shipwreck and shipwreck-derived material within the study area draws on the results of the geophysical survey and desk-based research combined with further research of the wider area.

5.5.2 As an island nation, the UK has a long maritime history with potential for the archaeological evidence of maritime sites from the late Mesolithic through to the present day. The Humber is one of the largest estuaries in Britain with a rich and nationally important archaeological, geological and palaeoenvironmental record. It has been, and still is, a significant transport, trade and communication route. Maritime sites are defined for the purposes of this assessment as either wrecks (seagoing vessels or aircraft) and/or material that has been accidentally or deliberately lost overboard from a vessel or aircraft. The proposed development lies close to some of the historic shipping routes for British vessels travel along the east coast, with vessels stopping at intermediate ports, including Port of Hull, Grimsby, New Holland and North Killingholme Haven. The main drivers for these routes were the trade in coal, ship building, the steel industry, and the fishing industry.

5.5.3 Maritime archaeological finds from the medieval period and earlier will be of national interest and will hold special significance. Any post medieval finds would also be of special interest, but such finds are more common than those of earlier dates. More examples of boats and ships exist from the modern period; therefore, more discrimination would be required to determine the importance of any remains discovered. Due to the considerable changes in shipbuilding during this period, any remains discovered showing evidence of this could be considered as being of particular interest. The losses attributed to the two

World Wars have been considered as significant due to the magnitude of the loss endured by all countries involved and for their potential to be categorised as war graves under the Protection of Military Remains Act 1986.

Recorded Losses

5.5.4 Recorded Losses are predominantly reported to have stranded in coastal areas, around Stallingborough or off Immingham. In general, documented losses paint a vibrant picture of the types of voyages being undertaken within the Humber. The losses across the area generally represent 19th and early 20th century vessels, consisting of a cargo sailing vessel, two fishing ketches and a trawler (Annex 6).

5.5.5 Table 10 shows the distribution of these documented losses according to the date of loss for those records whose position fall within the study area.

Table 10 Maritime recorded losses, summary by date

Date	Number of records
Post-medieval	0
19th Century	4
Modern	1
Unknown	0
Total	5

Overview of Archaeological Potential

5.5.6 There is potential for the presence of archaeological material of maritime nature spanning from the Mesolithic period to the present day within the study area. The key areas of potential are summarised in Table 11 below, which have been based on the approach outlines in Section 3.5 above.

Table 11 Summary of key areas of maritime potential

Period	Summary
Pre-1500 AD	Low 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.
	Low 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.
	Low 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



	<p>northern European methods.</p> <p>Low 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.</p> <p>Low 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.</p>
1500 to 1815	<p>Medium 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.</p> <p>Medium potential for post-medieval shipwrecks associated with the expansion of transoceanic communications and the opening up of the New World.</p> <p>Medium 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.</p> <p>Medium potential for post-medieval shipwrecks associated with continuing local trade and marine exploitation including the transport of goods associated with the agricultural revolution.</p>
1816 to 1913	<p>Higher 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.</p> <p>Higher potential for the discovery of shipwrecks demonstrating a diverse array of vernacular boat types evolved for use in specific environments.</p> <p>Higher potential for wrecks associated with large scale worldwide trade, the fishing industry or coastal maritime activity including marine exploitation.</p>
1914 to 1945	<p>Higher 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</p>

	requirements. A large number of vessels dating to this period were lost as a result of enemy action.
Post-1945	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, losses 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 Maritime Archaeological Value

5.6.1 The present assessment of the value of known and potential archaeology within the study area is based on data from the UKHO, NRHE and the HER's, and archaeological assessment of the geophysical survey data. This assessment is based on the criteria for appraising archaeological value, as set out in Table 5, and based on available guidance (English Heritage (now Historic England), 2012).

5.6.2 Each wreck should be assessed on a case-by-case basis, to consider the full range of criteria for appraising value (such as period, rarity, documentation, group value, survival/condition, potential, build, use, loss, and investigation), however it is also possible to provide a broad assessment of the sites, based on date categories defined by the Marine Class Description and Principles of Selection (Wessex Archaeology, 2008b).

5.6.3 As there is insufficient information to assess the value of each possible known wreck (**2003** and **2006**) they should be assumed to be of high value, in accordance with the precautionary approach.

5.6.4 Due to these anomalies being located close to shore within a known currently busy and active area all the A2 anomalies have the potential to be modern debris, but without visual inspection this cannot be confirmed, and so all have been retained as a precaution.

5.6.5 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, in accordance with the precautionary approach.

5.6.6 The other known features largely relate to 20th century port infrastructure. These features are of low archaeological value.

5.7 Aviation Archaeological Potential

5.7.1 Although there are currently no known aircraft crash sites located within the study area there is the potential for the discovery of previously unknown aircraft material, particularly in relation to Second World War.

5.7.2 A guidance note published by English Heritage (now Historic England) entitled Military Aircraft Crash Sites (English Heritage (now Historic England), 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 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.

5.7.3 There is the 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.

5.7.4 The regular use of aircraft over the battlefields of the Western Front by the end of the First World War, 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 the raids on the UK mainland during the First World War (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.

5.7.5 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 bi-planes of the early 20th century had been replaced by high-powered monoplanes made of aluminium by 1939 (Wessex Archaeology, 2009: 65).

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

5.7.7 During the Second World War 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 the Second World War with hostile aircraft activity particularly concentrated off the east and south coasts of England (Wessex Archaeology, 2008b:16). There are at least five airfields in the near vicinity of the proposed development that date to the Second World War, including RAF North Killingholme, RAF Kirmington, RAF Elsham Wolds, RAF Grimsby and RAF North Coastes. These combined both training and active airfields with corresponding levels of loss through accidents or battle damage both overland and on the journey to and from the European mainland.



5.7.8 The Aircraft Crash Sites at Sea project (Wessex Archaeology, 2008a) considered a selection of sources which may be considered to indicate the potential for aircraft remains of this period to exist within the study area. 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 during the Second World War (Wessex Archaeology, 2008a:18).

5.7.9 After the Second World War, 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, 2008a:66), and civilian losses are likely to have been reported and recorded.

Recorded Losses

5.7.10 The only recorded loss relating to an aircraft is a Halifax MK III, that ditched off Immingham in October 1944 (Annex 6).

Overview of Archaeological Potential

5.7.11 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 to the Second World War. Discoveries may occur anywhere within the study area, but potential may increase nearer the coastlines in the vicinity of coastal defence networks protecting the strategically important military and civil infrastructure on England's east coast.

5.7.12 The key areas of aviation potential that may be uncovered within the study area are summarised in Table 12.

Table 12 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 the First World War.
	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 Second World War 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.
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.

5.8 Aviation Archaeological Value

5.8.1 The present assessment of the value of known and potential archaeology within the study area is based on data from the UKHO, NRHE and HER and the archaeological assessment of geophysical survey data. This assessment is based on the criteria for assessing archaeological value as set out in Section 3.5 and within Table 5, and based on available guidance (Wessex Archaeology, 2011).

5.8.2 No remains of any aircraft are currently known to be located within the study area. Remains of aircraft which crashed while in military service are automatically protected under the Protection of Military Remains Act 1986. There were a significant number of airfields in the region during the Second World War, therefore it may be assumed that any aircraft material identified during future phases of the works will be of high value.

5.8.3 It is conceivable that any of the 102 unidentified geophysical anomalies could be identified as aircraft crash sites, and subsequently are presently considered of high archaeological value.

5.8.4 Isolated aircraft finds are considered as being of medium archaeological value as they may provide insight into patterns of historical aviation across the study area or indicate the presence of uncharted aircraft crash sites.

6 MARINE ARCHAEOLOGICAL ASSESSMENT: INTERTIDAL HERITAGE RECEPTORS

6.1.1 Seven records (**2001**, **2002**, **2003**, **2004**, **2005**, **2006** and **2007**) are located within the intertidal zone. Some of these records relate to coastal infrastructure, such as dolphins associated with the 20th century port (Annex 4).

6.1.2 An intertidal walkover survey was conducted on 23 February 2022, within the intertidal zone of the proposed application site. From the above seven sites, only four were observed: two octagonal obstructions (**2002** and **2005**) and two obstructions (**2004** and **2007**). Access to these receptors was not possible due to the condition of the terrain consisting of mudflats, and from a health and safety perspective it was decided not to go beyond the revetment along the shoreline.

6.1.3 The observed obstructions, which appear to be made of concrete, are likely to be remnants of the 20th century reinforced concrete mooring Dolphins (Figure 8). These are a fixed structure dug into the seabed. Through documentation received from the ABPmer, a notice to mariners issued in 1983 draws attention to the debris deposited on the foreshore *'Mariners are advised that debris recovered from the demolished mooring dolphins at the Immingham Oil Terminal has been deposited on the foreshore above Low Water mark between the Fison's effluent outfall (situated approximately 800 metres downstream of the Immingham Tower 'A') and the root of the Immingham Oil Terminal jetty'* (Notice to mariners H.108/1983).

6.1.4 A set of rock-cut stairs (**1001**) were observed during the walkover survey. These are likely to have been built during the construction of the dock in the early 20th century and are built into the sea wall, providing access to/from the shoreline (Figure 8).

6.1.5 The overall environment of the survey area did not allow for a fully representative interpretation of the site due to safety concerns. The sediment of the intertidal zone was too loosely compacted to allow a closer inspection of the sites.

6.2 Value

6.2.1 The known intertidal features largely represent port infrastructure dating to the 20th century. These are likely to be of low-medium archaeological value. Higher value features, such as wreck material, may be identified in the intertidal zone in the future.

7 HISTORIC SEASCAPE CHARACTER

7.1.1 The Port of Immingham, also known in the past as Immingham Dock, is today a major port on the east coast of England, located on the south bank of the Humber Estuary west of Grimsby. The port was established by the Humber Commercial Railway and Dock Company in association with the Great Central Railway, and the works were permitted by the Humber Commercial Railway and Dock Act of 1904 (subsequently modified in 1908, 1909 and 1913). Construction began in 1906 and by 1912 the dock was completed, acting as a port for the export of coal from the Derbyshire and Yorkshire coalfields. The Port facilities linked with the railways which were present at Grimsby, run by the Great Central Railway (Grace's Guide, 2020).

7.1.2 During the first decade of the 20th century the shipbuilding industry dominated the coasts of the North East of England. After the First World War trade declined, as did demands for shipping services and new ships. The onset of rearmament before the Second World War helped to revive the industry for a while, but the shipping and shipbuilding industries were severely damaged by bombing during the war itself. Many shipyards needed extensive overhauling, as did numerous ports and inland waterways, and merchant fleets suffered heavy losses. Reconstruction after the Second World War fundamentally changed the traditional economic and transport patterns of the North Sea region. Nevertheless, coal and timber remained the most important North Sea cargoes well into the 1950s.

7.1.3 During the latter part of First World War and all through Second World War coastal convoys used the East Coast War Channels (Firth 2014), coal being a major component of the cargoes carried, essential to help keep industries in southern Britain, particularly war industries, operational. The types of losses associated with the world wars include merchant vessels that might have sailed in the escorted convoys or sailed independently, lost to a variety of enemy threats including surface vessels, submarines, and mines. During the Second World War, there was a significant loss of aircraft along the east coast because of the relative proximity of German-held airfields on the other side of the North Sea. During both wars, large numbers of steam trawlers and drifters were bought or hired by the Admiralty to supplement the Royal Navy with significant losses due to enemy action. The most notable naval action within the region was probably the 1914 German raid on Scarborough, Whitby, and Hartlepool (Massie, 2004, 319–321).

7.1.4 During the First World War, the Port of Immingham was a submarine base for British D class submarines and was later used for cruise ships in the 1930s, accommodating vessels of the Orient Steam Navigation Company, White Star Line and Blue Star Line calling at the port. The Second World War saw further use for the Port, as a naval base and headquarters for the Royal Navy. In addition, a number of anti-aircraft batteries (heavy anti-aircraft battery Humber H21 & H22) were located around the dock during the war.

7.1.5 The dock was considerably expanded during the second half of the 20th century, with east and west jetties and the addition of several deep-water jetties for bulk cargo. The latter half of the century saw the construction of the Immingham Oil Terminal jetty on the banks of the Humber east of the dock entrance in 1969, and the Immingham Bulk Terminal commissioned in 1970 for the export of coal and import of steel constructed to the west of the dock entrance. In 1985 the Immingham Gas Jetty was opened, handling Liquid Petroleum Gas. Several extensions, terminals and roll-on/roll-off berths have been added during the 21st century, improving the port infrastructure and facilities to cater for the export of bulk goods.

7.1.6 This HSC undertaken by the University of Newcastle lists a number of character types in the study area, which give an impression of human interaction in the area over a number of time periods (Table 13, Aldred 2014). The study also identifies a probable palaeolandscape component in the Mesolithic (10,000 BC to 4,000 BC), as part of the land mass that bridged England with what is now main land Europe.

Table 13 Primary Cultural Processes in the study area

Zone	Broad Character Types	Character Sub-Types	
Coastal and Conflated	Cultural topography	Mudflats	
	Communications	Railway	
	Industry		Industrial production (unspecified)
			Hydrocarbon refinery
			Hydrocarbon pipeline
	Ports and docks		Wet dock
			Working pier
	Navigation		Daymark
		Buoyage	
		Wreck Hazard	
Sea-surface	Navigation	Buoyage	
		Navigation route	
		Navigation channel (active)	
Water Column	Navigation	Buoyage	
		Hazardous water	
	Fishing	Bottom trawling	
Sea-floor	Industry	Hydrocarbon pipeline	
	Navigation	Wreck hazard	
Sub sea-floor	Industry	Hydrocarbon pipeline	
	Cultural topography	Fine sediment plains	

8 ENVIRONMENTAL APPRAISAL AND RECOMMENDATIONS

8.1 High-level Environmental Appraisal

8.1.1 Archaeological receptors relating to seabed prehistory, maritime and aviation archaeology have been identified within the proposed development, as has the potential for further receptors to be discovered. The proposed development has the potential to physically and adversely impact known and potential archaeological receptors within the construction footprint and area of effect of indirect physical effects such as changes in seabed sediment regimes, scour etc.

8.1.2 Mitigation measures are to be secured through a Written Scheme of Investigation (WSI). The final WSI will need to take account of any relevant matters emerging through the ongoing detailed design process and any relevant matters emerging through the examination of the IERRT DCO application.

8.1.3 Recommendations for appropriate mitigation (both specific to identified impacts or general) are set out below.

8.2 Palaeogeographic features

8.2.1 The assessment of the geophysical data within the study area resulted in the identification of a total of 25 features of palaeogeographic interest. These are summarised as follows:

- a total of 11 features, comprising channel features and deposits of organic material were assigned an P1 archaeological rating;

- a total of 14 features comprising simple cuts and fills, and other deposits were assigned an P2 archaeological rating.

8.2.2 In addition to the individual palaeogeographic features, a layer of potential peat and/or organic sediments was also identified within the study area.

8.2.3 For the purposes of the detailed design of the marine elements of the project, further ground investigation work is programmed to take place. Appropriate archaeological advice has been provided on how that investigation can provide samples of benefit to ongoing archaeological considerations.

8.2.4 A geoarchaeological assessment of any future marine borehole logs obtained as part of this detailed design ground investigation should be undertaken, especially in respect of any logs that contain organic deposits for dating purposes. This will aid in refining the interpretation and therefore help determine the archaeological potential of the area.

8.2.5 As there is the potential for peat to be present at the surface within the dredge area, it is also recommended that any deposits of archaeological or palaeoenvironmental interest recovered during the proposed works be reported to a suitably qualified archaeological contractor via a pre-agreed reporting protocol.

8.3 Seabed features

8.3.1 The assessment of the geophysical data within the study area resulted in a total of 102 anomalies identified as being of possible archaeological interest. These are summarised as follows:

- a total of 26 were assigned an A2_h archaeological rating; and
- a total of 76 were assigned an A2_l archaeological rating.

8.3.2 Due to these anomalies being located close to shore within a known currently busy and active area all the A2 anomalies have the potential to be modern debris, but without visual inspection this cannot be confirmed, and so all have been retained as a precaution.

8.3.3 For features assigned A2_l and A2_h archaeological discrimination rating, no AEZs are recommended at this time. Avoidance of impacts to these features is recommended in the first instance. Where this is not possible, it is recommended that, should any objects of archaeological potential be recovered during the proposed dredging programme, they be reported to the retained archaeological contractor via a pre-agreed reporting protocol.

8.4 General Recommendations

Avoidance

8.4.1 The primary mitigation for the protection of known archaeological receptors is avoidance. This is achieved through the implementation and monitoring of Archaeological Exclusion Zones (AEZs), which are proposed for identified high value seabed features of anthropogenic origin (i.e. A1 classified geophysical anomalies).



8.4.2 No A1 geophysical anomalies have been identified, therefore no AEZs are recommended at present.

8.4.3 Appropriately sized AEZs, should they be required due to future discoveries, are established around receptors which have been considered to be of high archaeological potential, in consultation with the Archaeological Curators. AEZs may be recommended in the future as further information is obtained. These areas would be out of bounds to installation and/or maintenance activities and to anchoring. Monitoring of any AEZs to ensure there is no disturbance to them will be part of this mitigation.

Reduction

8.4.4 Reduction of impact can be achieved by means of appropriate mitigation identified through potential opportunities for further investigation of receptors (e.g. during pre-installation surveys which may include visual survey methods and UXO assessment).

8.4.5 Further investigations would mean that anomalies can either have their archaeological value removed, if they prove to be of non-anthropogenic nature or modern, or their value as archaeological receptors confirmed. If their value is confirmed, mitigation in the form of either avoidance (which may be enacted by the implementation of an AEZ) or through remedying or offsetting measures as identified through a Written Scheme of Investigation (WSI) which includes a Protocol for Archaeological Discoveries.

Remedying and Offsetting

8.4.6 In cases where avoidance is either inappropriate or impossible, the damage to archaeological receptors should be offset. In the case of seabed prehistoric receptors, this can be achieved by undertaking a palaeoenvironmental assessment of deposits with High geoarchaeological potential, principally peat deposits. Pollen and macrofossil assessment, supported by radiocarbon dating, will provide information on age and vegetation history of the terrestrial environment, providing a landscape context to any prehistoric activity within the area.

8.4.7 Recovery of artefacts and/or other archaeological receptors should be a final resort, when all other mitigation has failed. Any recovery should be completed under the supervision of an appropriately qualified and experienced marine archaeologist. If required, recovery methods will be identified through a WSI. Due to the vast differences in practice and implementation between these methods, each will be covered by a specific Method Statement agreed in consultation with the Archaeological Curator, should be implemented.

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ANNEXES

Annex 1: Terminology

Glossary

The terminology used in this assessment follows definitions contained within Annex 2 of NPPF:

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 assets	World Heritage Sites, Scheduled Monuments, Listed Buildings, Protected Wreck Sites, Registered Park and Gardens, Registered Battlefields and Conservation Areas designated under the relevant legislation.
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 assets include designated heritage assets and assets identified by the local planning authority (including local listing).
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.



Value	An aspect of worth or importance.
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Chronology

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

Prehistoric		Historic	
Palaeolithic	970,000 – 9500 BCE	Romano-British	AD 43 – 410
Lower Palaeolithic	970,000 – 300,000 BCE	Saxon	AD 410 – 1066
Middle Palaeolithic	00,000 – 40,000 BCE	Medieval	AD 1066 – 1500
Upper Palaeolithic	40,000 – 10,000 BCE	Post-medieval	AD 1500 – 1800
Late Upper Palaeolithic	12,000 – 9500 BCE	19th Century	AD 1800 – 1899
Early Post-glacial	9500 – 8500 BCE	Modern	1900 – present day
Mesolithic	8500 – 4000 BCE		
Neolithic	4000 – 2400 BCE		
Bronze Age	2400 – 700 BCE		
Iron Age	700 BCE – AD 43		



Annex 2: Legislation, Policy and Guidance

Designation	Associated Legislation	Overview
World Heritage Sites	-	The UNESCO World Heritage Committee inscribes World Heritage Sites for their Outstanding Universal Value (OUV) – <i>cultural and/ or natural significance which is so exceptional as to transcend national boundaries and to be of common importance for present and future generations of all humanity</i> . England protects its World Heritage Sites and their settings, including any buffer zones or equivalent, through the statutory designation process and through the planning system. The National Planning Policy Framework sets out detailed policies for the conservation and enhancement of the historic environment, including World Heritage Sites, through both plan-making and decision-taking.
Scheduled Monuments and Areas of Archaeological Importance	<i>Ancient Monuments and Archaeological Areas Act 1979</i>	Under the <i>Ancient Monuments and Archaeological Areas Act 1979</i> , the Secretary of State (DCMS) can schedule any site which appears to be of national importance because of its historic, architectural, traditional, artistic or archaeological interest. The historic town centres of Canterbury, Chester, Exeter, Hereford and York have been designated as Archaeological Areas of Importance under Part II of the <i>Ancient Monuments and Archaeological Areas Act 1979</i> . Additional controls are placed upon works affecting Scheduled Monuments and Areas of Archaeological Importance under the Act. The consent of the Secretary of State (DCMS), as advised by Historic England, is required for certain works affecting Scheduled Monuments.
Listed Buildings	<i>Planning (Listed Buildings and Conservation Areas) Act 1990</i>	In England, under Section 1 of the <i>Planning (Listed Buildings and Conservation Areas) Act 1990</i> , the Secretary of State is required to compile lists of buildings of special architectural or historic interest, on advice from English Heritage/ Historic England. Works affecting Listed Buildings are subject to additional planning controls administered by Local Planning Authorities. Historic England is a statutory consultee in certain works affecting Listed Buildings. Under certain circumstances, Listed Building Consent is required for works affecting Listed Buildings.



Designation	Associated Legislation	Overview
Conservation Areas	<i>Planning (Listed Buildings and Conservation Areas) Act 1990</i>	A Conservation Area is an area which has been designated because of its special architectural or historic interest, the character or appearance of which it is desirable to preserve or enhance. In most cases, Conservation Areas are designated by Local Planning Authorities. Section 72 (1) of the <i>Planning (Listed Buildings and Conservation Areas) Act 1990</i> requires authorities to have regard to the fact that there is a Conservation Area when exercising any of their functions under the Planning Acts and to pay special attention to the desirability of preserving or enhancing the character or appearance of Conservation Areas. Although a locally administered designation, Conservation Areas may nevertheless be of national importance and significant developments within a Conservation Area are referred to Historic England.
Registered Parks and Gardens and Registered Battlefields	<i>National Heritage Act 1983</i>	The Register of Parks and Gardens was established under the <i>National Heritage Act 1983</i> . The Battlefields Register was established in 1995. Both Registers are administered by Historic England. These designations are non-statutory but are, nevertheless, material considerations in the planning process. Historic England and The Garden's Trust (formerly known as The Garden History Society) are statutory consultees in works affecting Registered Parks and Gardens
Protected Wreck Sites	<i>Protection of Wrecks Act 1973</i>	The <i>Protection of Wrecks Act 1973</i> allows the Secretary of State to designate a restricted area around a wreck to prevent uncontrolled interference. These statutorily protected areas are likely to contain the remains of a vessel, or its contents, which are of historical, artistic or archaeological importance.
Protected Places and Controlled Sites	<i>Protection of Military Remains Act 1986</i>	The <i>Protection of Military Remains Act 1986</i> provides protection for designated military vessels and for all aircraft that crashed while in military service. The Act provides two types of protection: Protected Places (wrecks designated by name and can be designated even if the location of the site is not known) and Controlled Sites (sites designated by location – covers wrecks within the last 200 years). It is illegal to disturb sites or remove anything from sites. Protected Places can be visited by divers, but the rule is look but don't touch. For Controlled Sites it is illegal to conduct any operations (including diving or excavation) within the Controlled Site unless licensed to do so by the Ministry of Defence.



Other relevant legislation

Legislation	Overview
<i>Merchant Shipping Act 1995</i>	This Act sets out the procedures for determining the ownership of underwater finds that turn out to be '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. This Act is administered by the Maritime and Coastguard Agency.
<i>Marine and Coastal Areas Act 2009 (Marine Policy Statement 2011)</i>	Marine licensing and marine planning made the responsibility of the Marine Management Organisation (MMO). England's inshore and offshore waters have been divided into 11 plan areas, for which marine plans are being produced by the MMO.
<i>UNESCO Convention on the Protection of the Underwater Cultural Heritage</i>	The UNESCO Convention was concluded in 2001, and is a comprehensive attempt to codify the law internationally, with regards to underwater cultural 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.



Guidance

Policy	Overview
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.
NPPF Section 12 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 Section 12 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 Section 12 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. Significance can be harmed or lost through alteration or destruction of the heritage asset or development within its setting. As heritage assets are irreplaceable, any harm or loss should require clear and convincing justification. Substantial harm to or loss of a grade II listed building, park or garden should be exceptional. Substantial harm to or loss of designated heritage assets of the highest significance, notably scheduled monuments, protected wreck sites, battlefields, grade I and II* listed buildings, grade I and II* registered parks and gardens, and World Heritage Sites, should be wholly exceptional.
NPPF Section 12 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 Section 12 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 Section 12 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 Section 12 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 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. However, the ability to record evidence of our past should not be a factor in deciding whether such loss should be permitted.
National Policy Statement for Ports Section 5.12	The NPSfP recognises the importance of the historic environment and that the construction, operation and decommissioning of port infrastructure has the potential to result in adverse impacts on it. Therefore, the significance of heritage assets and the extent of the impact of the proposed development on the significance of any heritage assets has to be understood. Both designated heritage assets and undesignated heritage assets have to be considered, and the setting of a heritage asset also has to be taken into account.



Annex 3: Palaeogeographic features of archaeological potential

ID	Classification	Archaeological discrimination	Depth range (mbSB) from	Depth range (mbSB) to	Description	Interpreted unit	Associated vibrocores	Vibrocore recovery depth (mbSB)
75000	Cut and fill	P2	5.7	15.4	Distinct high amplitude basal reflector which appears to indicate as possible cut into interpreted till. Fill appears chaotic, although some internal reflectors with higher amplitude visible. Identified on only one line so may be an isolated feature. May be the north-west edge of channel feature 75013 tagged at south-east end of line, or may be an internal reflector of the underlying till. No vibrocores were acquired within the extents of this feature.	2 (possibly)	-	-
75001	Cut and fill	P2	1.6	4.7	Shallow cut and fill feature cut into generally unstructured unit interpreted as till. Fill appears chaotic and overlain by high amplitude reflectors at the seabed. Not very clear due to blanking. Possibly one of two close together with 75002, but seen only on one line. No vibrocores were acquired within the extents of this feature.	3	-	-
75002	Cut and fill	P2	1.9	4.3	Shallow cut and fill feature into generally unstructured unit interpreted as till. Fill appears chaotic and overlain by high amplitude reflectors at the seabed. Not very clear due to blanking. Possibly one of two close together with 75001, but seen only on one line. No vibrocores were acquired within the extents of this feature.	3	-	-
75003	Internal reflector	P2	4.3	11	Distinct, dipping reflector identified within an area of generally acoustically transparent sediment. Could be an internal reflector, but may be the edge of a channel feature. No vibrocores were acquired within the extents of this feature.	2 (possibly)	-	-
75004	High amplitude reflector	P1	2.9	3.6	Top of high amplitude reflector which may indicate the presence of organic deposits. Overlays unstructured reflectors which may be possible till. Overlain by small, very chaotic reflectors, though not an obvious cut and fill feature. No vibrocores were acquired within the extents of this feature.	4 (possibly)	-	-
75005	High amplitude reflector	P2	2.5	4.2	High amplitude reflector which appears to overlay an acoustically unstructured area. Located directly below, and seems independent of, high amplitude reflectors at the seabed. Many hyperbolae visible, indicating possible buried features in the area which are likely to be boulders. May represent possible organic material or may represent the top of till. No	4 (possibly)	-	-



ID	Classification	Archaeological discrimination	Depth range (mbSB) from	Depth range (mbSB) to	Description	Interpreted unit	Associated vibrocores	Vibrocore recovery depth (mbSB)
					vibrocores were acquired within the extents of this feature.			
75006	High amplitude reflector	P2	7.6	11.8	Isolated, distinct, high amplitude reflector on an almost vertical alignment (dipping) within more chaotic reflectors. More distinct than others visible within the profile. May indicate possible organic material or may be an internal feature. No vibrocores were acquired within the extents of this feature.	-	-	-
75007	Channel	P1	5.7	16.8	An irregular high amplitude reflector which may represent the base of an older channel cut into interpreted till, with a more chaotic fill, which has then been cut into and overlain by another newer channel system with a fill unit of parallel internal reflectors. The visible extents are aligned north-west to south-east, but the full extents are not clear due to blanking caused by high amplitude reflectors at the seabed; the south-east edge is generally visible, but the location of the north-east edge is uncertain. Initially interpreted as high amplitude reflectors and cut and fill on other lines, but all appear to be this same horizon. Potentially links to 75012, but not definitively seen on intervening lines. No vibrocores were acquired within the extents of this feature.	2	-	-
75008	Channel	P1	2	14.3	Cut and fill feature, interpreted as a channel cutting into possible older channel system (65000), and also more broadly cutting into interpreted till, aligned generally north-west to south-east. The basal reflector is slightly higher in amplitude, with faint and poorly developed internal reflectors although there are some generally uniform, parallel reflectors in places which may indicate layered sediments. Appears overlain or cut into by a more chaotic unit interpreted as silty sands. The possible north-west and south-east edges have been identified but it is not certain due to blanking caused by high amplitude reflectors at the seabed. The north-east and south-west extents are uncertain. Potentially links to 75013, but not definitively seen on intervening lines. No vibrocores were acquired within the extents of this feature.	2	-	-
75009	Cut and fill	P2	1.7	5.5	Isolated possible cut and fill feature characterised by a distinct basal reflector with chaotic internal reflectors. Extents not very clear due to blanking. Possibly cuts into till, although may be a fill within a depression at the top surface of the till. High amplitude reflectors at the top of the till are also visible. Below	5	-	-



ID	Classification	Archaeological discrimination	Depth range (mbSB) from	Depth range (mbSB) to	Description	Interpreted unit	Associated vibrocores	Vibrocore recovery depth (mbSB)
					the very high amplitude reflectors indicating the seabed. No vibrocores were acquired within the extents of this feature.			
75010	High amplitude reflector	P1	3.2	4.7	Top of a high amplitude feature which may indicate the presence of organic deposits. Within an area of generally blanked chaotic reflectors but interpreted as within channel 75008 based on other lines. Possibly overlain in part to the north-east by cut and fill feature 75009, and overlain by high amplitude seabed reflectors to the south-west. No vibrocores were acquired within the extents of this feature.	-	-	-
75011	Cut and fill	P2	2.4	6.1	Shallow cut and fill feature into interpreted till with a higher amplitude basal reflector. Shallower to north-west and deeper towards south-east. No obvious parallel reflectors in the fill as seen in other lines. Secondary cut with chaotic fill also visible to the south-east. Not definitively associated with 75008 and 75013. Vibrocore VC-09 sampled the feature towards north-west extents which shows boulder clay at approximately -3.5 m and very clayey silt between -2.5 and -3.5 m. Only identified on one line, but may relate to 75008 and 75013, though this is not certain due to blanking from the seabed reflectors.	2 (possibly)	VC-09	4.6
75012	Channel	P1	8.9	14.7	An irregular high amplitude reflector which possibly indicates the basal reflector of an older channel system cutting into interpreted till. Fill appears to be slightly chaotic and is possibly cut by a secondary channel system with a fill unit of parallel internal reflectors. The visible extents are aligned generally north-west to south-east, but the full extents are not clear due to blanking caused by high amplitude reflectors at the seabed; the edge of the channel is generally visible to the north-east and east, but the locations of the north-western, southern and western edges are uncertain. Initially interpreted as high amplitude reflectors on other lines, but all appear to be this same horizon. Potentially links to 75007, but not definitively seen on intervening lines. This unit was not penetrated by vibrocore VC-08.	2	-	-
75013	Channel	P1	1.5	12.8	Cut and fill feature, interpreted as a channel, with a high amplitude basal reflector and internal generally uniform parallel internal reflectors which indicate possible laminated deposits. Seems to cut into a possible older irregular channel system (75012), and also visible as possibly cutting a broader channel	2	-	-



ID	Classification	Archaeological discrimination	Depth range (mbSB) from	Depth range (mbSB) to	Description	Interpreted unit	Associated vibrocores	Vibrocore recovery depth (mbSB)
					into interpreted till at the north and eastern extents. Full extents not very clear due to blanking caused by high amplitude reflectors at the seabed. An edge is visible at the eastern extents, and possibly the north-east extents, but the south, west and north-eastern extents are uncertain. Appears overlain by a more generally chaotic layer interpreted as possible sands, which may also form a shallow cut and fill feature at points. Potentially links with 75008 and 75011 but not definitively seen on intervening lines due to blanking. This unit was not penetrated by vibrocore VC-08.			
75014	Cut and fill	P2	0.9	4.5	Possible cut and fill feature characterised by a distinct basal reflector and fill of more chaotic reflectors. Cuts into chaotic possible sands (feature 75018), and in places cuts into upper parallel reflectors of channel 75013. Identified in VC-02 as organic deposits comprising muddy, sandy, clayey, silts, visible down to -3.5 m towards the north-west. Identified in VC-08 as slightly sandy muddy silts in the central extents down to -1.5 m. Extents not very clear and may extend. Overlain by high amplitude reflectors at the seabed.	4	VC-02, VC-08	3.80, 3.65
75015	High amplitude reflector	P1	10.2	11	Thin, straight linear high amplitude reflector identified above the basal reflector of secondary channel 75013 under parallel reflectors. May indicate presence of possible organic deposits such as peat. This feature was not penetrated by vibrocore VC-08.	2	-	-
75016	High amplitude reflector	P2	9.4	11	Isolated high amplitude reflector within more chaotic reflectors, which may indicate the presence of organic material. May be an internal feature or may be related to a nearby hyperbola but very distinct and so retained as an individual feature. No vibrocores were acquired within the extents of this feature.	-	-	-
75017	Cut and fill	P2	2.4	4.4	Isolated shallow cut and fill feature cut into generally unstructured unit interpreted as till, seen only on one line. Fill appears chaotic and overlain by high amplitude reflectors at the seabed. Not very clear due to blanking. No vibrocores were acquired within the extents of this feature.	3 (possibly)	-	-
75018	Chaotic unit	P2	1.4	8.4	Extensive unit of chaotic reflectors with some dipping visible, potentially characteristic of sands, and identified in vibrocores VC-03 and VC-08 as silty, clayey sands. Has a higher	3	VC-03, VC-08	3.15, 3.65



ID	Classification	Archaeological discrimination	Depth range (mbSB) from	Depth range (mbSB) to	Description	Interpreted unit	Associated vibrocores	Vibrocore recovery depth (mbSB)
					amplitude basal reflector in places which appears to overlay the more parallel reflectors of the channel features 75008 and 75013 in the north-west and may cut into these channel features in certain locations. The north-west extents are groundtruthed as clayey fine sands by VC-08 from -1.5 m to sample depth of -3.65 m. Also visible in the data as overlaying a wider area of interpreted till towards the south-east, and this is groundtruthed by VC-03, showing that this unit directly overlies till at this location between -0.5 and -1.5 m. The full extents very unclear due to blanking from high amplitude reflectors at the seabed, and because these are very shallow sediments in places, making the distinction between the chaotic reflectors and seabed sediments difficult to distinguish. Appears to be overlain in places by higher amplitude shallow fill and shallow cut and fill features (75009, 75014, 75019, 75022 and 75023) which are also identified in certain vibrocores as silts and clays, different from the general very high amplitude seabed reflectors identified in the vibrocores as muddy silts.			
75019	Fine grained deposits	P1	1.5	4.9	High amplitude reflector overlying an unstructured unit interpreted as till, indicating the possible presence of organic material. Appears overlain by chaotic reflectors, which is then in turn overlain by a thinner seabed reflector. Nearest vibrocore is VC-07 located 40 m south-west which identifies soft brown muddy silts down to -2.5 m becoming black brown clayey silts with organic material present between -2.5 to -4.8 m.	4	-	-
75020	High amplitude reflector	P2	5.8	8.4	Top of an isolated high amplitude feature, indicating the possible presence of organic deposits, within an unstructured unit interpreted as till. May be associated with channel features 75007, 75008, 75012 and 75013, but blanking means extents of the feature are not certain. No vibrocores were acquired within the extents of this feature.	-	-	-
75021	High amplitude reflector	P1	5.9	6.8	Isolated high amplitude reflector which potentially may represent organic deposits. May be related to the channel units, but this cannot be determined due to blanking within the data. No vibrocores were acquired within the extents of this feature.	-	-	-
75022	Cut and fill	P1	1.1	4.1	Possible cut into interpreted till with a distinct basal reflector	4	-	-



ID	Classification	Archaeological discrimination	Depth range (mbSB) from	Depth range (mbSB) to	Description	Interpreted unit	Associated vibrocores	Vibrocore recovery depth (mbSB)
					with internal parallel reflectors at the base, suggesting possible laminated deposits and overlain with more chaotic reflectors. Full extents may not be visible due to blanking. Overlain by very high amplitude reflectors at the seabed. No vibrocores were acquired within the extents of this feature.			
75023	High amplitude reflector	P1	1.3	4.4	Shallow high amplitude reflector indicating the possible presence of organic material. May form the basal reflector of a shallow feature which possibly cuts into or overlays the chaotic reflectors interpreted as sands (75018), and is overlain by the high amplitude reflectors at the seabed. May be associated with 75014 but cannot be sure as not definitively seen on intervening lines. No vibrocores were acquired within the extents of this feature.	4 (possibly)	-	-
75024	Internal reflector	P2	5.7	10.1	Isolated reflector within an area of generally acoustically unstructured sediments. Could be an internal reflector, but may indicate a cut with an irregular base into interpreted possible till. No vibrocores were acquired within the extents of this feature.	2 (possibly)	-	-



Annex 4: Known shipwrecks and obstructions on the seabed within the ASA

ID	External References	Type	Description	BNG Easting	BNG Northing
2001	UKHO 65126; HER MNL1473	Obstruction	Octagonal obstruction shown on aerial photography	520,764.57	415,966.48
2002	UKHO 65127; HER MNL1473	Obstruction	Octagonal obstruction shown on aerial photography	520,787.58	416,015.30
2003	UKHO 8576	Wreck	Possible remains of craft recorded between 1991 and 1999. No details are known and it was listed as dead in 2004	520,807.85	415,999.12
2004	UKHO 65124	Obstruction	Rectangular obstruction shown on aerial photography	520,823.54	415,903.05
2005	UKHO 65128; HER MNL1473	Obstruction	Octagonal obstruction shown on aerial photography	520,825.62	415,994.01
2006	UKHO 73629	Wreck	Shown on Humber 8, April 2009 Edition.	520,831.86	416,009.02
2007	UKHO 65125	Obstruction	Cigar shaped obstruction shown on aerial photography	520,833.42	415,905.16
2008	UKHO 8505	Dolphin/Foul Ground	Remains of a Dolphin damaged or destroyed in 1973 following a collision. Dispersed to seabed level in 1984.	520,884.10	416,594.76
2009	UKHO 67016	Dolphins/Poles/Posts/Piles	Western Dolphin, Immingham Terminal - Lifted in 1975	520,920.46	416,595.69
2010	UKHO 79895	Foul ground	Observed in bathymetry in 2013. Measures 2 x 1 m with a height of 0.5 m.	521,180.79	416,806.46
2011	UKHO 8508; HOB UID 908343	Mound/foul ground	A submerged obstruction that was struck by a vessel in 1957. Measured 17.5 m by 10.7 m and 1 m in height. Amended dead in 2013.	521,230.09	416,776.19
2012	HER MNL2430	Twentieth century jetty	Eastern Jetty, Immingham Docks	520050 (Polygon)	416586 (Polygon)



Annex 5: Seabed features of archaeological potential

ID	Classification	Easting	Northing	Archaeological discrimination	Length (m)	Width (m)	Height (m)	Least Depth (m LAT/CD)	Magnetic amplitude (nT)	Description	Anomaly type	External references
7001	Rope/chain	520274	416507	A2_l	5.9	0.2	0	-	-	A short, sinuous, curvilinear dark reflector with no distinct shadow. No anomalous features were identified in the Mag. data at this location, though this feature is located within a large magnetic response associated with port infrastructure and therefore smaller anomalies may be masked. This position is not covered by the MBES data. Interpreted as a possible length of rope or chain.	SSS	-
7002	Debris	520279	416486	A2_h	7.8	1.8	0.4	-12.7	-	An elongate mound with evenly sloped sides and a rounded top. Some possible slight scour to the south extending for 0.8 m. Located in an area of level seabed with other frequent anomalies. No anomalous features were identified in the Mag. data at this location, though this feature is located within a large magnetic response associated with port infrastructure and therefore smaller anomalies may be masked. This feature was identified in the SSS inside debris field 7012. It is a more distinct anomaly than others within the area. Interpreted as possible debris.	MBES	-
7003	Mound	520283	416488	A2_h	1.2	0.8	0.3	-13.2	-	A rounded mound with an irregular top and evenly sloping sides. There is some encircling scour extending for 0.9 m. Located in an area of level seabed with other frequent anomalies. No anomalous features were identified in the SSS or Mag. data at this location, though this feature is located within a large magnetic response associated with port infrastructure and therefore	MBES	-



ID	Classification	Easting	Northing	Archaeological discrimination	Length (m)	Width (m)	Height (m)	Least Depth (m LAT/CD)	Magnetic amplitude (nT)	Description	Anomaly type	External references
										smaller anomalies may be masked. This feature was identified in the SSS inside debris field 7012. It is a more distinct anomaly than others within the area. Interpreted as a possible natural feature or may be possible debris.		
7004	Mound	520297	416484	A2_h	3.9	1.5	0.2	-13.8	-	An elongate mound with irregularly sloped sides and an uneven top. There is some encircling scour, primarily extending to the south-east for 1 m. Located in an area of level seabed with other frequent anomalies. No anomalous features were identified in the Mag. data at this location, although within a large magnetic response from the port edge and so smaller anomalies relating to individual ferrous debris may be masked. This feature was identified in the SSS inside debris field 7012. It is a more distinct anomaly than others within the area. Interpreted as a possible natural feature or may be possible debris.	MBES	-
7005	Debris field	520307	416475	A2_h	13.3	3.4	0.5	-14.1	-	Two distinct elongate mounds at an obtuse angle to one another, the largest measures 4.2 x 0.9 x 0.2 m. There is a rounded mound to the immediate north of these measuring 1.5 x 1.2 x 0.5 m. There are some more slightly irregular areas of seabed surrounding these mounds which could indicate possible anomalies with little seabed expression. Scour is visible to the north extending for 3 m. Located in an area of level seabed with other frequent anomalies. No anomalies were identified in the Mag. data at this location. A large magnetic response from the port edge occurs here and so smaller anomalies	MBES	-



ID	Classification	Easting	Northing	Archaeological discrimination	Length (m)	Width (m)	Height (m)	Least Depth (m LAT/CD)	Magnetic amplitude (nT)	Description	Anomaly type	External references
										relating to this feature may be masked. This feature is located inside large debris field 7012 and is a more distinct anomaly than others within the area. Interpreted as a more distinct area of debris.		
7006	Mound	520307	416481	A2_l	3.1	1.5	0.2	-13.9	-	A sub-rounded mound with unevenly sloping sides and a rounded top. There is some slight encircling scour extending for 0.7 m. Located in an area of level seabed with other frequent anomalies. No anomalous features were identified in the Mag. data at this location, although within a large magnetic response from the port edge and so smaller anomalies relating to individual ferrous debris may be masked. This feature was identified in the SSS inside debris field 7012. It is a more distinct anomaly than others within the area. Interpreted as a possible natural feature or may be possible debris.	MBES	-
7007	Debris	520311	416459	A2_h	5.5	2.3	0.1	-12.6	-	Two elongate mounds adjacent to one another, with the largest to the north and measuring 4.3 x 0.8 x 0.1 m, and the smallest measuring 2.3 x 0.8 x 0.1 m. No visible scour. Located in an area of level seabed with other frequent anomalies. No anomalous features were identified in the Mag. data at this location, although within a large magnetic response from the port edge and so smaller anomalies relating to individual ferrous debris may be masked. This feature was identified in the SSS within debris field 7012. It is a more distinct anomaly than others within the area. Interpreted as possible	MBES	-



ID	Classification	Easting	Northing	Archaeological discrimination	Length (m)	Width (m)	Height (m)	Least Depth (m LAT/CD)	Magnetic amplitude (nT)	Description	Anomaly type	External references
										debris.		
7008	Debris	520317	416467	A2_h	9.1	3	0.3	-13.6	-	An elongate mound with a level top and evenly sloped sides. No distinct scour is visible. Located in an area of level seabed with other frequent anomalies. No anomalous features were identified in the Mag. data at this location, although within a large magnetic response from the port edge and so smaller anomalies relating to individual ferrous debris may be masked. This feature was identified in the SSS within debris field 7012. It is a more distinct anomaly than others within the area. Interpreted as possible debris.	MBES	-
7009	Debris field	520332	416462	A2_h	13	4.4	0.1	-14	-	An elongate mound with an uneven top and unevenly sloping sides. Two smaller elongate mounds lie either side of the main mound. Located in an area of level seabed with other frequent anomalies. No anomalies were identified in the Mag. data at this location. A large magnetic response from the port edge occurs here and so smaller anomalies relating to this feature may be masked. This feature is located inside large debris field 7012 and is interpreted as a more distinct area of debris.	MBES	-
7010	Mound	520350	416437	A2_h	4.7	1.4	0.1	-11.4	-	An elongate mound with evenly sloping sides and a rounded top. No distinct scour. Located in an area of level seabed with other frequent anomalies. No anomalous features were identified in the Mag. data at this location, although within a large magnetic response from the port edge and so smaller anomalies relating to individual ferrous debris may be masked. This	MBES	-



ID	Classification	Easting	Northing	Archaeological discrimination	Length (m)	Width (m)	Height (m)	Least Depth (m LAT/CD)	Magnetic amplitude (nT)	Description	Anomaly type	External references
										feature was identified in the SSS within debris field 7012. It is a more distinct anomaly than others within the area. Interpreted as a possible natural feature or may be possible debris.		
7011	Mound	520354	416436	A2_h	3.8	1.1	0.2	-11.5	-	An elongate mound with evenly sloping sides and a rounded top. No distinct scour. Located in an area of level seabed with other frequent anomalies. No anomalous features were identified in the Mag. data at this location, although within a large magnetic response from the port edge and so smaller anomalies relating to individual ferrous debris may be masked. This feature was identified in the SSS within debris field 7012. It is a more distinct anomaly than others within the area and has been highlighted separately. Interpreted as a possible natural feature or may be possible debris.	MBES	-
7012	Debris field	520367	416445	A2_l	186.2	45.5	0.7	-12.8	-	A large, discrete area comprising indistinct but anomalous linear features at various orientations, along with multiple rounded and sub-rounded dark reflectors with tapered shadows. Some of the more indistinct features may be natural, but it is not possible to distinguish from the SSS and MBES data alone. Some areas within the feature are more textured and have a higher reflectivity. Identified as an area of irregularly shaped mounds of varying sizes and shapes, most of which are fairly indistinct, in the MBES data. This whole area is associated with a large magnetic response from the port edge and so smaller anomalies relating to individual ferrous debris may be	MBES, SSS	-



ID	Classification	Easting	Northing	Archaeological discrimination	Length (m)	Width (m)	Height (m)	Least Depth (m LAT/CD)	Magnetic amplitude (nT)	Description	Anomaly type	External references
										masked. Interpreted as a possible debris field and some of the more distinct anomalies have also been identified individually.		
7013	Debris	520401	416415	A2_h	11.8	0.8	0.4	-12.4	-	An elongate mound, slightly curved, with evenly sloping sides and rounded top. No distinct scour is visible. Located in an area of level seabed with other frequent anomalies. No anomalous features were identified in the Mag. data at this location. This feature was identified in the SSS inside debris field 7012. It is a more distinct anomaly than others within the area so has been highlighted separately. Interpreted as possible linear debris.	MBES	-
7014	Mound	520434	416399	A2_l	3.1	1.4	0.3	-13.4	-	A subrounded mound with unevenly sloping sides and a rounded top, although the north-west end appears more irregular. Some slight encircling scour is visible that extends for 0.8 m. No anomalous features were identified in the Mag. data at this location. This feature was identified in the SSS inside debris field 7012. It is a more distinct anomaly than others within the area so has been highlighted separately. Interpreted as a possible natural feature or may be possible debris.	MBES	-
7015	Dark reflector	520388	416512	A2_l	1.3	0.7	0.3	-11.2	-	A small, sub-rounded dark reflector, possibly hollow, and with a small shadow. Also identified in the MBES dataset as a rounded mound with irregularly sloping sides and pointed top. Encircling scour is visible extending primarily to the south for 0.8 m. Isolated in an area of featureless seabed. No anomalous features were identified in the Mag. data at this location.	MBES, SSS	-



ID	Classification	Easting	Northing	Archaeological discrimination	Length (m)	Width (m)	Height (m)	Least Depth (m LAT/CD)	Magnetic amplitude (nT)	Description	Anomaly type	External references
										Interpreted as a possible natural feature or may be possible non-ferrous debris.		
7016	Dark reflector	520437	416477	A2_l	1.5	0.6	0.2	-11.3	-	Small, angular dark reflector, which appears possible hollow, with an indistinct pointed shadow. Also identified in the MBES dataset as a rounded mound with evenly sloping sides and a slight depression in the centre. Encircling scour extends for 0.9 m. Isolated in an area of featureless seabed. No anomalous features were identified in the Mag. data at this location. Interpreted as a possible natural feature or may be possible non-ferrous debris.	MBES, SSS	-
7017	Debris field	520447	416376	A2_l	31.6	12.7	0.1	-10.6	-	Clusters of distinct, straight and slightly curved linear dark reflectors at varying orientations, with very indistinct short shadows, surrounded by less distinct features. Also identified in the MBES dataset as an area of irregular seabed comprising five mounds with very little seabed expression, the largest of which measures 2.4 x 1.2 x 0.1 m. Located adjacent to the footings of the jetty. Not directly covered by Mag. data and the large magnetic response associated with the jetty is also likely to mask any smaller responses from this feature. Interpreted as a possible debris field.	MBES, SSS	-
7018	Debris	520486	416366	A2_h	7.4	1.6	0.3	-14.1	-	An elongate mound with evenly sloping sides and a rounded top. No distinct scour and located at the western edge of a large natural depression. No anomalous features were identified in the SSS or Mag. data at this location, although this feature is located within a large magnetic response associated with the pier and therefore smaller	MBES	-



ID	Classification	Easting	Northing	Archaeological discrimination	Length (m)	Width (m)	Height (m)	Least Depth (m LAT/CD)	Magnetic amplitude (nT)	Description	Anomaly type	External references
										anomalies may be masked. Located within debris field 7021 and included separately to highlight. Interpreted as possible non-ferrous debris.		
7019	Dark reflector	520486	416403	A2_I	2.1	0.4	0.2	-	-	A short, straight, linear dark reflector with a short shadow. No anomalous features were identified in the MBES or Mag. data at this location. Interpreted as a possible natural feature or may be possible debris.	SSS	-
7020	Dark reflector	520490	416374	A2_I	3.2	0.6	0.1	-	-	A straight, narrow, linear dark reflector with a very short shadow. Some additional slight dark reflectors are visible in the surrounding area. No anomalous features were identified in the MBES or Mag. data at this location, although this feature is located within a large magnetic response associated with the pier and therefore smaller anomalies may be masked. Interpreted as a possible natural feature or may be possible debris.	SSS	-
7021	Debris field	520494	416362	A2_I	28.7	12.6	0.5	-	-	An area comprising clusters of distinct, straight and curved linear dark reflectors, with very indistinct short shadows. These features are much more obviously debris than surrounding indistinct features. No anomalous features were identified in the Mag. or MBES data at this location. Located next to the footings of the jetty and the associated large Mag. response from this may mask any smaller response from this feature. Interpreted as a possible debris field.	SSS	-
7022	Debris field	520505	416337	A2_I	20.3	13.1	0.6	-12.2	-	An area of irregularly shaped mounds with the largest measuring 2.5 x 1.4 x 0.5 m. No anomalous features were identified in the SSS data at this	MBES	-



ID	Classification	Easting	Northing	Archaeological discrimination	Length (m)	Width (m)	Height (m)	Least Depth (m LAT/CD)	Magnetic amplitude (nT)	Description	Anomaly type	External references
										location. Not directly covered by Mag. data and the large magnetic response associated with the jetty is also likely to mask any smaller responses from this feature. Interpreted as a possible debris field.		
7023	Dark reflector	520508	416385	A2_l	1.9	0.8	0.4	-	-	A distinct, rectangular, very dark reflector with a small, rounded shadow. No anomalous features were identified in the MBES or Mag. data at this location, although this feature is located within a large magnetic response associated with the pier and therefore smaller anomalies may be masked. Interpreted as a possible natural feature or may be possible debris.	SSS	-
7024	Dark reflector	520516	416375	A2_l	1.4	1	0.2	-	-	A small, triangular dark reflector with a short shadow. No anomalous features were identified in the MBES or Mag. data at this location, although this feature is located within a large magnetic response associated with the pier and therefore smaller anomalies may be masked. Interpreted as a possible natural feature or may be possible debris.	SSS	-
7025	Debris	520532	416422	A2_h	11.3	2.2	0.4	-10.8	-	A long, rectangular dark reflector which tapers slightly to the south. A short shadow is visible at the southern end. Also identified in the MBES dataset as an elongate mound with evenly sloping sides and a rounded top on a north-west to south-east alignment. Scour is visible to the east extending for 1.3 m. No anomalous features were identified in the Mag. data at this location. Interpreted as possible debris. One of a pair of objects with 7026, approximately 10 m to the northeast.	MBES, SSS	-



ID	Classification	Easting	Northing	Archaeological discrimination	Length (m)	Width (m)	Height (m)	Least Depth (m LAT/CD)	Magnetic amplitude (nT)	Description	Anomaly type	External references
7026	Debris	520536	416432	A2_h	4.9	1	0.2	-10.5	-	A narrow, slightly irregular, linear dark reflector with an indistinct, short shadow. Also identified in the MBES dataset as an elongate mound with a jagged top and evenly sloping sides. Some encircling scour extending for 0.8 m. No anomalous features were identified in the Mag. data at this location. Interpreted as possible debris. One of a pair of objects with 7025 approximately 10 m to the southwest.	MBES, SSS	-
7027	Dark reflector	520546	416366	A2_l	8.1	1.3	0.1	-	-	An elongate, broad dark reflector possibly comprised of two parallel curvilinear features, with a possible short shadow. The immediate seabed has a higher reflectivity suggesting slight disturbances in this area. No anomalous features were identified in the MBES or Mag. data at this location, although this feature is located within a large magnetic response associated with the pier and therefore smaller anomalies may be masked. Interpreted as a possible natural feature or may be possible debris.	SSS	-
7028	Debris field	520539	416319	A2_h	46	11.3	0.9	-10.3	-	Very indistinct area with some rounded and some linear dark reflectors, some with indistinct shadows. Three elongate mounds adjacent to one another are visible in the MBES dataset. The tops of the mounds appear irregular and the their sides are unevenly sloped, with no scour visible. Located alongside the jetty footings. Not directly covered by Mag. data and the large magnetic response associated with the jetty is also likely to mask any smaller responses from this feature. Interpreted as a possible debris field.	MBES, SSS	-



ID	Classification	Easting	Northing	Archaeological discrimination	Length (m)	Width (m)	Height (m)	Least Depth (m LAT/CD)	Magnetic amplitude (nT)	Description	Anomaly type	External references
7029	Seabed disturbance	520621	416344	A2_l	14.7	8.6	0.3	-10.3	-	Small area of indistinct, slightly irregular dark reflectors with some very indistinct shadows. Also identified in the MBES dataset as an area of relatively sharply undulating seabed that follows an approximate north to south alignment. There appears to be some possible scour to the north and around the southern end, extending for a maximum of 1.3 m. No anomalous features were identified in the Mag. data at this location. Interpreted as a possible natural feature or may be a possible debris.	MBES, SSS	-
7030	Magnetic	520634	416397	A2_h	-	-	-	-	734	A very large, sharp asymmetric dipole with peak and trough on one profile line in the Mag. data. Also visible on other profile lines. No anomalous features were identified in the SSS or MBES data at this location. Interpreted as possible ferrous debris either buried or with no surface expression.	Mag.	-
7031	Magnetic	520665	416415	A2_h	-	-	-	-	110	A large asymmetric dipole with peak and trough on one profile line in the Mag. data. No anomalous features were identified in the SSS or MBES data at this location. Interpreted as possible ferrous debris either buried or with no surface expression.	Mag.	-
7032	Magnetic	520715	416320	A2_l	-	-	-	-	20	A small, broad asymmetric dipole with peak and trough on one profile line in the Mag. data. No anomalous features were identified in the SSS or MBES data at this location. Interpreted as possible ferrous debris either buried or with no surface expression.	Mag.	-
7033	Mound	520673	416258	A2_l	6.4	2.6	0.5	-10.2	-	A distinct elongate mound on an approximate north to south alignment. The southern end is more proud of the	MBES	-



ID	Classification	Easting	Northing	Archaeological discrimination	Length (m)	Width (m)	Height (m)	Least Depth (m LAT/CD)	Magnetic amplitude (nT)	Description	Anomaly type	External references
										seabed, and also follows the slope of the small seabed rise this feature is located at the base of. This anomaly has a rounded top and gently sloping sides. No anomalous features were identified in the SSS or Mag. data at this location. Interpreted as a possible natural feature or may be possible debris.		
7034	Magnetic	520808	416336	A2_l	-	-	-	-	22	A small, broad asymmetric dipole with peak and trough on one profile line in the Mag. data. No anomalous features were identified in the SSS or MBES data at this location. Interpreted as possible ferrous debris either buried or with no surface expression.	Mag.	-
7035	Magnetic	520822	416229	A2_l	-	-	-	-	264	A large asymmetric dipole with peak and trough on one profile line in the Mag. data. No anomalous features were identified in the SSS or MBES data at this location. Interpreted as possible ferrous debris either buried or with no surface expression. Located 12 m west of smaller magnetic anomaly 7036 and may be related.	Mag.	-
7036	Magnetic	520834	416232	A2_l	-	-	-	-	20	A small, broad asymmetric dipole with peak and trough on one profile line in the Mag. data. No anomalous features were identified in the SSS or MBES data at this location. Interpreted as possible ferrous debris either buried or with no surface expression. Located 12 m east of large magnetic anomaly 7035 and may be related.	Mag.	-
7037	Magnetic	520836	416260	A2_h	-	-	-	-	117	A large symmetric dipole with peak and trough on one profile line in the Mag. data. No anomalous features were identified in the SSS or MBES data at this location. Interpreted as possible	Mag.	-



ID	Classification	Easting	Northing	Archaeological discrimination	Length (m)	Width (m)	Height (m)	Least Depth (m LAT/CD)	Magnetic amplitude (nT)	Description	Anomaly type	External references
										ferrous debris either buried or with no surface expression.		
7038	Magnetic	520847	416167	A2_I	-	-	-	-	34	A small asymmetric dipole with peak and trough on one profile line in the Mag. data. No anomalous features were identified in the SSS or MBES data at this location. Interpreted as possible ferrous debris either buried or with no surface expression.	Mag.	-
7039	Dark reflector	520842	416070	A2_I	2.9	0.6	0.1	-	-	A short, wide, linear dark reflector with a distinct, rounded shadow. No anomalous features were identified in the MBES or Mag. data at this location. Interpreted as a possible natural feature or may be possible non-ferrous debris.	SSS	-
7040	Dark reflector	520863	416084	A2_I	5	0.3	0	-	-	A short, slightly broad linear dark reflector with rounded ends, and a distinct, rounded shadow. No anomalous features were identified in the MBES or Mag. data at this location. Located adjacent to debris field 7041. Interpreted as a possible natural feature or may be possible non-ferrous debris.	SSS	-
7041	Debris field	520868	416087	A2_I	19.7	18	0.1	-	-	A cluster of wider, straight, linear dark reflectors with various orientations, some with distinct and irregular shadows. These are located along an interpreted natural disturbance identified in the MBES data. No anomalous features were identified in the Mag. data at this location. Interpreted as a possible debris field.	SSS	-
7042	Rope/chain	520871	416049	A2_I	5.8	0.4	0.2	-	-	A short, slightly curved, linear dark reflector with a very short shadow consistent along its length. No anomalous features were identified in the MBES or Mag. data at this location. Interpreted as a possible length of rope	SSS	-



ID	Classification	Easting	Northing	Archaeological discrimination	Length (m)	Width (m)	Height (m)	Least Depth (m LAT/CD)	Magnetic amplitude (nT)	Description	Anomaly type	External references
										or chain.		
7043	Dark reflector	520882	416079	A2_l	3.5	0.8	0.1	-	-	A short, straight, linear dark reflector with a slightly rounded short shadow. No anomalous features were identified in the MBES data and this location was not covered by Mag. data so it is not possible to ascertain whether ferrous material is present. Interpreted as a possible natural feature or may be possible debris.	SSS	-
7044	Debris field	520884	416035	A2_l	22.5	8.4	0.3	-	-	A cluster of very distinct rounded dark reflectors that appear hollow and have shadows. No anomalous features were identified in the MBES or Mag. data at this location. Interpreted as a possible non-ferrous debris field.	SSS	-
7045	Debris field	520889	416096	A2_l	15.4	11.1	0.2	-	24	A small area of distinct linear dark reflectors with shadows, clustered at the edge of an area of higher reflectivity. Associated with a small, complex asymmetric dipole with peak and trough on one profile line on the Mag. dataset. No anomalous features were identified in the MBES data at this location. Interpreted as a possible debris field with some ferrous content.	SSS, Mag.	-
7046	Magnetic	520887	416159	A2_l	-	-	-	-	9	A small, broad symmetric dipole with peak and trough on one profile line in the Mag. data. No anomalous features were identified in the SSS or MBES data at this location. Interpreted as possible ferrous debris either buried or with no surface expression.	Mag.	-
7047	Debris	520896	416128	A2_h	7.2	0.5	0.5	-	-	A long, straight and slightly irregular linear dark reflector with shadow. Also visible in the MBES dataset as a straight linear mound. No anomalous features were identified in the Mag.	SSS	-



ID	Classification	Easting	Northing	Archaeological discrimination	Length (m)	Width (m)	Height (m)	Least Depth (m LAT/CD)	Magnetic amplitude (nT)	Description	Anomaly type	External references
										data at this location. Interpreted as possible non-ferrous debris.		
7048	Dark reflector	520899	416060	A2_l	2.7	0.3	0	-	-	A short, straight, linear dark reflector with a short shadow. No anomalous features were identified in the MBES or Mag. data at this location. Interpreted as a possible natural feature or may be possible non-ferrous debris.	SSS	-
7049	Magnetic	520900	416050	A2_l	-	-	-	-	14	A small, broad symmetric dipole with peak and trough on one profile line in the Mag. data. No anomalous features were identified in the SSS or MBES data at this location. Interpreted as possible ferrous debris either buried or with no surface expression.	Mag.	-
7050	Debris	520906	416184	A2_h	16.8	2.3	0.5	-	128	A long, curved linear dark reflector in an arc shape, with a distinct, jagged shadow. Also visible in the MBES dataset as a highly irregular rounded mound with curved linear features orientated northwest-southeast attached. Associated with a large positive monopole with peak and trough on one profile line in the Mag. dataset. Interpreted as possible ferrous debris.	SSS, Mag.	-
7051	Magnetic	520937	416223	A2_h	-	-	-	-	126	A large, sharp asymmetric dipole with peak and trough over two profile lines in the Mag. data. No anomalous features were identified in the SSS or MBES data at this location. Interpreted as possible ferrous debris either buried or with no surface expression. Debris feature 7052 is located 13 m to the southeast and may be associated.	Mag.	-
7052	Debris	520943	416211	A2_h	10.7	2.5	0.1	-	-	Approximately rectangular feature with a dark reflector around the perimeter, varying in width up to 0.5 m, and no internal features, although a distinct,	SSS	-



ID	Classification	Easting	Northing	Archaeological discrimination	Length (m)	Width (m)	Height (m)	Least Depth (m LAT/CD)	Magnetic amplitude (nT)	Description	Anomaly type	External references
										very narrow shadow is visible. An adjacent straight linear feature is visible and may be attached. Located in an area of highly textured seabed but is distinct. Visible in the MBES dataset as a straight, linear mound which is variable in height. No anomalous features were identified in the Mag. data at this location but magnetic anomaly 7051 is located 13 m to the northwest and may be associated. Interpreted as possible debris.		
7053	Dark reflector	520948	416140	A2_I	5.2	0.6	0.3	-	-	A wide, curvilinear dark reflector with a large shadow, surrounded by smaller, angular but indistinct dark reflectors. Also visible in the MBES dataset as a linear mound. No anomalous features were identified in the Mag. data at this location. Interpreted as a possible natural feature or may be possible debris.	SSS	-
7054	Dark reflector	520955	416118	A2_I	5.3	0.3	0.1	-	-	A short linear dark reflector with a slightly rounded irregular shadow. Visible in the MBES dataset as a sub-rounded mound with a short, narrow linear feature protruding approximately 2 m to the south. No anomalous features were identified in the Mag. data at this location. Interpreted as a possible natural feature or may be possible debris.	SSS	-
7055	Dark reflector	520960	416128	A2_I	5.8	0.3	0.1	-	-	A short, curved, linear dark reflectors with a short shadow. No anomalous features were identified in the MBES or Mag. data at this location. Interpreted as a possible natural feature or may be possible debris.	SSS	-
7056	Magnetic	520979	416104	A2_I	-	-	-	-	11	A small, broad symmetric dipole with peak and trough on one profile line in	Mag.	-



ID	Classification	Easting	Northing	Archaeological discrimination	Length (m)	Width (m)	Height (m)	Least Depth (m LAT/CD)	Magnetic amplitude (nT)	Description	Anomaly type	External references
										the Mag. data. No anomalous features were identified in the SSS or MBES data at this location. Interpreted as possible ferrous debris either buried or with no surface expression.		
7057	Debris field	520987	416087	A2_l	7.5	3.9	0.3	-	-	A small, compact area of angular and short, curvilinear dark reflectors with shadows. Also visible in the MBES dataset as a small cluster of rounded mounds. No anomalous features were identified in the Mag. data at this location. Interpreted as a possible debris field.	SSS	-
7058	Debris field	520938	416065	A2_h	16.2	10.8	0.5	-	-	Two large elongate dark reflectors, the largest measuring 12.0 x 0.5 m, surrounded by clusters of rounded, elongate and angular dark reflectors with shadows. Visible in the MBES dataset as a single linear mound surrounded by smaller irregular mounds. No anomalous features were identified in the Mag. data at this location but not all this feature is covered by the Mag. data. Interpreted as a possible debris field.	SSS	-
7059	Debris field	520974	416004	A2_l	62.4	12	0.9	-	-	An elongate area of higher reflectivity encompassing multiple irregular, angular and curvilinear dark reflectors with angular shadows. Also visible in the MBES dataset as highly irregular linear feature orientated north-east to south-west, with linear and elongate mounds located generally along this trend. No anomalous features were identified in the Mag. data at this location. Interpreted as a possible debris field.	SSS	-
7060	Debris	520968	416038	A2_h	10.8	8.3	0.4	-	57	A parallel pair of linear dark reflectors with a distinct, angular shadow.	SSS, Mag.	-



ID	Classification	Easting	Northing	Archaeological discrimination	Length (m)	Width (m)	Height (m)	Least Depth (m LAT/CD)	Magnetic amplitude (nT)	Description	Anomaly type	External references
										Associated with a medium, complex asymmetric dipole with peak and trough over two profile lines on the Mag. dataset. Visible in the MBES dataset as a broad, linear mound with some small rounded mounds adjacent. Interpreted as possible ferrous debris.		
7061	Dark reflector	520975	416053	A2_I	6.6	0.2	0.2	-	-	A short, curved dark reflector with a distinct shadow. Visible in the MBES dataset as an linear, slightly curved mound. No anomalous features were identified in the Mag. data at this location. This feature is located inside debris field 7062 but is highlighted here as one of the more distinct features. Interpreted as a possible natural feature or may be possible debris.	SSS	-
7062	Debris field	520996	416044	A2_I	150.2	20.6	0.4	-	-	A large, relatively low-density spread of angular and short curvilinear dark reflectors with sometimes jagged and irregular shadows. Aligned north-west to south-east. No anomalous features were identified in the MBES or Mag. data at this location. Interpreted as a possible debris field.	SSS	-
7063	Dark reflector	520996	415899	A2_I	8.4	0.7	0.5	-	-	An elongate, narrow and slightly curved dark reflector which is slightly irregular in width. A large shadow of varying height is visible. Visible in the MBES dataset as a possible pair or slightly elongate mounds. No anomalous features were identified in the Mag. data at this location, although this feature is located within a large magnetic response associated with the pier and therefore smaller anomalies may be masked. Interpreted as a possible natural feature or may be possible debris.	SSS	-



ID	Classification	Easting	Northing	Archaeological discrimination	Length (m)	Width (m)	Height (m)	Least Depth (m LAT/CD)	Magnetic amplitude (nT)	Description	Anomaly type	External references
7064	Debris	521008	415905	A2_I	3.5	0.3	0.3	-	-	A short, curved, linear dark reflector with a distinct, consistent shadow along its length. No anomalous features were identified in the MBES or Mag. data at this location, although this feature is located within a large magnetic response associated with the pier and therefore smaller anomalies may be masked. Interpreted as possible debris.	SSS	-
7065	Debris	520998	415959	A2_I	5.5	5.3	0.3	-	-	A small cluster of primarily short, straight and slightly curved linear dark reflectors with shadows in various orientations. Visible in the MBES dataset as a curved, D-shaped mound with some surrounding disturbed seabed. No anomalous features were identified in the Mag. data at this location, although this feature is located on the edge of a large magnetic response associated with the pier and therefore smaller anomalies may be masked. Interpreted as possible non-ferrous debris.	SSS	-
7066	Mound	521013	416114	A2_I	14.6	1	0.1	-3.9		A very long, linear mound orientated approximately north-east to south-west, with some adjacent smaller rounded mounds. No anomalous features were identified in the SSS or Mag. data at this location. Interpreted as a possible natural feature or may be possible debris.	MBES	
7067	Dark reflector	521020	416072	A2_I	2.6	1.2	0.1	-	-	A short linear dark reflector with a distinct, tapered shadow. No anomalous features were identified in the MBES or Mag. data at this location. Interpreted as a possible natural feature or may be possible non-ferrous debris.	SSS	-
7068	Dark reflector	521053	416054	A2_I	3.1	0.2	0.1	-	-	A short linear dark reflector with a short shadow. No anomalous features were	SSS	-



ID	Classification	Easting	Northing	Archaeological discrimination	Length (m)	Width (m)	Height (m)	Least Depth (m LAT/CD)	Magnetic amplitude (nT)	Description	Anomaly type	External references
										identified in the MBES or Mag. data at this location, although this feature is located within a large magnetic response associated with the pier and therefore smaller anomalies may be masked. Interpreted as a possible natural feature or may be possible non-ferrous debris. Located 5 m southwest of similar feature 7069 and may be associated.		
7069	Dark reflector	521057	416057	A2_I	6	1.3	0.1	-	-	A short, straight, linear dark reflector with a short shadow. No anomalous features were identified in the MBES or Mag. data at this location, although this feature is located within a large magnetic response associated with the pier and therefore smaller anomalies may be masked. Interpreted as a possible natural feature or may be possible debris. Located 5 m northeast of similar feature 7068 and may be associated.	SSS	-
7070	Debris field	521079	415919	A2_I	159.6	53.2	0.3	-	-	A very large area consisting of a series of overlapping straight and curved linear dark reflectors with short shadows at the southern end, with a more sparse series of dark reflectors and larger bright areas in the north. Located alongside the pier/jetty. Visible at the extents of the MBES data as an area of disturbed seabed, although the full extents are not seen. Not fully covered by Mag. data and the large magnetic response associated with the pier/jetty is likely to mask any smaller individual magnetic responses from ferrous material within this feature. Interpreted as a possible debris field.	SSS	-
7071	Debris field	521176	416013	A2_I	130.2	69	0.6	-	-	Large area of highly irregular and linear	SSS	-



ID	Classification	Easting	Northing	Archaeological discrimination	Length (m)	Width (m)	Height (m)	Least Depth (m LAT/CD)	Magnetic amplitude (nT)	Description	Anomaly type	External references
										dark reflectors with shadows, some of which are sinuous and irregular in form, with a denser cluster of linear reflectors in the south of the area, with sparser but more irregular features in the north and occasional circular features. The debris features are located amongst seabed disturbances and likely sedimentary features. Visible at the extents of the MBES data as an area of disturbed seabed, although the full extents are not seen. Not fully covered by Mag. data and the large magnetic response associated with the pier/jetty is likely to mask any smaller individual magnetic responses from ferrous material within this feature. Interpreted as a possible debris field.		
7072	Dark reflector	521094	416007	A2_I	6.8	3.7	0.4	-	-	An elongate dark reflector with a distinct, sloped shadow. Located in a broader area of disturbed seabed. No anomalous features were identified in the MBES or Mag. data at this location, although this feature is located within a large magnetic response associated with the pier and therefore smaller anomalies may be masked. Interpreted as a possible natural feature or may be possible debris.	SSS	-
7073	Dark reflector	521092	416057	A2_I	1.2	0.2	0.4	-	-	A short dark reflector with a short shadow. No anomalous features were identified in the MBES or Mag. data at this location, although this feature is located within a large magnetic response associated with the pier and therefore smaller anomalies may be masked. Interpreted as a possible natural feature or may be possible debris.	SSS	-



ID	Classification	Easting	Northing	Archaeological discrimination	Length (m)	Width (m)	Height (m)	Least Depth (m LAT/CD)	Magnetic amplitude (nT)	Description	Anomaly type	External references
7074	Debris field	521106	416070	A2_l	110.4	34.2	0.4	-	-	Very large area containing a spread of rounded, angular and linear dark reflectors with shadows, some of which are highly irregular and jagged, within an area of seabed disturbances that are likely natural sedimentary features. No anomalous features were identified in the MBES or Mag. data at this location, although this feature is located within a large magnetic response associated with the pier and therefore smaller anomalies may be masked. Interpreted as a possible debris field.	SSS	-
7075	Debris field	521100	416097	A2_h	33.7	19.2	0.5	-	-	Spread of irregular straight and slightly curved linear dark reflectors with distinct shadows. No anomalous features were identified in the MBES or Mag. data at this location, although this feature is located within a large magnetic response associated with the pier and therefore smaller anomalies may be masked. Interpreted as a possible debris field.	SSS	-
7076	Debris field	521067	416157	A2_l	94	45.7	1.5	-	-	A very large area containing rounded, angular and linear dark reflectors with shadows, some of which are highly irregular and jagged, and several likely natural sedimentary features. Visible in the MBES dataset as an area of slightly disturbed seabed and some sedimentary mounds, with straight, linear mounds also visible. These are centred around a large elongate feature, visible in the MBES data as a hole within the interpreted peat outcrop. No anomalous features were identified in the Mag. data at this location. Interpreted as a possible debris field.	SSS	-
7077	Dark reflector	521124	416112	A2_l	14	1	0.1	-	-	A narrow, curvilinear dark reflector	SSS	-



ID	Classification	Easting	Northing	Archaeological discrimination	Length (m)	Width (m)	Height (m)	Least Depth (m LAT/CD)	Magnetic amplitude (nT)	Description	Anomaly type	External references
										which tapers slightly at the southeast end, with a short shadow. Also identified in the MBES dataset as two elongate, linear mounds, one orientated northeast-southwest and one perpendicular to this. The smaller feature measures 8.6 x 0.8 x 0.1 m. No anomalous features were identified in the Mag. data at this location, although this feature is located within a large magnetic response associated with the pier and therefore smaller anomalies may be masked. Interpreted as a possible natural feature or may be possible debris.		
7078	Dark reflector	521139	416089	A2_I	7.8	0.8	0	-	-	A long, straight dark reflector with no distinct shadow. No anomalous features were identified in the MBES or Mag. data at this location, although this feature is located within a large magnetic response associated with the pier and therefore smaller anomalies may be masked. Interpreted as a possible natural feature or may be possible debris.	SSS	-
7079	Debris	521190	416137	A2_I	21	1.1	1	-	-	Distinct, wide, slightly curvilinear dark reflector with a consistent, large shadow. Visible in the MBES dataset as a very long, straight linear mound orientated southeast-northwest. One end of 7080 is perpendicular to this feature and is possibly attached. No anomalous features were identified in the Mag. data at this location, although this feature is located within a large magnetic response associated with the pier and therefore smaller anomalies may be masked. Interpreted as possible debris.	SSS	-



ID	Classification	Easting	Northing	Archaeological discrimination	Length (m)	Width (m)	Height (m)	Least Depth (m LAT/CD)	Magnetic amplitude (nT)	Description	Anomaly type	External references
7080	Rope/chain	521191	416128	A2_I	12.7	0.2	0.1	-	-	A very narrow curvilinear dark reflector with a very short shadow. One end is perpendicular to 7079 and is possibly attached. No anomalous features were identified in the MBES or Mag. data at this location, although this feature is located within a large magnetic response associated with the pier and therefore smaller anomalies may be masked. Interpreted as a possible length of rope or chain.	SSS	-
7081	Rope/chain	521213	416147	A2_I	25.4	0.3	0.1	-	-	A long, highly curvilinear dark reflector with a short shadow in places. No anomalous features were identified in the MBES or Mag. data at this location, although this feature is located within a large magnetic response associated with the pier and therefore smaller anomalies may be masked. Interpreted as a possible length of rope or chain.	SSS	-
7082	Debris field	521213	416098	A2_I	53.6	27.2	0.7	-	-	Large area of rounded, angular and very long curvilinear dark reflectors, some with distinct, irregular shadows. The southern section appears to have a more dense cluster of very dark reflectors although these may be part of the port infrastructure. Visible in the MBES dataset as multiple clusters of rounded mounds. This feature is located within a large magnetic response associated with the pier and therefore smaller anomalies may be masked. Interpreted as a possible debris field.	SSS	-
7083	Mound	521229	416101	A2_I	12.1	2.6	0.5	-5.3	-	A slightly curved elongate mound with a pointed top and evenly sloping sides. No distinct scour is visible. No anomalous features were identified in the SSS data at this location. This	MBES	-



ID	Classification	Easting	Northing	Archaeological discrimination	Length (m)	Width (m)	Height (m)	Least Depth (m LAT/CD)	Magnetic amplitude (nT)	Description	Anomaly type	External references
										position was not covered by Mag. data though its proximity to the pier/jetty means it would likely be within a large associated magnetic response likely to mask any smaller individual magnetic responses from ferrous material at this location. Interpreted as a possible natural feature or may be possible debris.		
7084	Debris field	521294	416110	A2_I	177.4	37.4	0.4	-	-	A large area of primarily angular and linear dark reflectors with shadows. It is difficult to distinguish between individual features, although many curved linear features are visible. Visible at the extents of the MBES data as an area of disturbed seabed, although the full extents are not seen. The main extents of this area were not covered by Mag. data though its proximity to the pier/jetty means it would likely be within a large associated magnetic response likely to mask any smaller individual magnetic responses from ferrous material within this feature. Interpreted as a possible debris field.	SSS	-
7085	Debris field	521225	416136	A2_I	10	11.2	0.5	-	-	A small cluster of straight, linear dark reflectors but with distinct, irregular shadows. Located amongst larger, likely natural linear and rounded features. No anomalous features were identified in the MBES or Mag. data at this location, although this feature is located within a large magnetic response associated with the pier and therefore smaller anomalies may be masked. Interpreted as a possible debris field.	SSS	-
7086	Debris	521244	416148	A2_I	6.4	3.4	0.1	-	-	A discrete, compact area of primarily linear debris which is distinct compared	SSS	-



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										to the surrounding debris fields. Primarily a cluster of linear dark reflectors with shadows. No anomalous features were identified in the MBES data at this location. This position was not covered by Mag. data though its proximity to the pier/jetty means it would likely be within a large associated magnetic response likely to mask any smaller individual magnetic responses from ferrous material at this location. Interpreted as possible debris.		
7087	Debris field	521257	416150	A2_I	13.4	7.3	0.1	-	-	Two sub-rectangular features consisting of a linear dark reflector with a short shadow around the perimeter, sometimes crossing over each other at the corners. The internal areas are relatively featureless, but with an additional linear dark reflector with sloping shadow adjacent. Visible in the MBES dataset as linear features within an area of disturbed seabed. This location was not covered by Mag. data though its proximity to the pier/jetty means it would likely be within a large associated magnetic response likely to mask any smaller individual magnetic responses from ferrous material within this feature. Interpreted as a possible debris field.	SSS	-
7088	Dark reflector	521266	416180	A2_I	6.4	1	1.3	-	-	A slightly irregular and curved linear dark reflector which is wider in the centre. A tall shadow is visible in the centre of the feature. No anomalous features were identified in the MBES data at this location. This position was not covered by Mag. data though its proximity to the pier/jetty means it would likely be within a large associated	SSS	-



ID	Classification	Easting	Northing	Archaeological discrimination	Length (m)	Width (m)	Height (m)	Least Depth (m LAT/CD)	Magnetic amplitude (nT)	Description	Anomaly type	External references
										magnetic response likely to mask any smaller individual magnetic responses from ferrous material at this location. Interpreted as a possible natural feature or may be possible debris.		
7089	Dark reflector	521267	416156	A2_I	10.3	3.5	0.1	-	-	A roughly rectangular feature consisting of a linear dark reflector with a short shadow around the perimeter, sometimes crossing over each other at the corners. The internal area is relatively featureless. No anomalous features were identified in the MBES data at this location. This position was not covered by Mag. data though its proximity to the pier/jetty means it would likely be within a large associated magnetic response likely to mask any smaller individual magnetic responses from ferrous material at this location. Interpreted as a possible natural feature or may be possible debris.	SSS	-
7090	Debris field	521267	416165	A2_I	5.4	2.6	0.8	-	-	A small grid of straight, linear dark reflectors with no distinct shadow. No anomalous features were identified in the MBES data at this location. This location was not covered by Mag. data though its proximity to the pier/jetty means it would likely be within a large associated magnetic response likely to mask any smaller individual magnetic responses from ferrous material within this feature. Interpreted as a possible debris field.	SSS	-
7091	Dark reflector	521270	416162	A2_I	3.2	0.6	0.1	-	-	A short, angular linear dark reflector which appears to consist of two parallel features. A tall shadow is visible but indistinct. No anomalous features were identified in the MBES data at this location. This position was not directly	SSS	-



ID	Classification	Easting	Northing	Archaeological discrimination	Length (m)	Width (m)	Height (m)	Least Depth (m LAT/CD)	Magnetic amplitude (nT)	Description	Anomaly type	External references
										covered by Mag. data though its proximity to the pier/jetty means it would likely be within a large associated magnetic response likely to mask any smaller individual magnetic responses from ferrous material within this feature. Interpreted as a possible natural feature or may be possible debris.		
7092	Dark reflector	521221	416193	A2_I	5.7	1.4	0.2	-	-	A short, slightly curvilinear dark reflector with a short shadow along its length. Visible in the MBES dataset as a slightly curved mound. No anomalous features were identified in the Mag. data at this location, though this feature is located within a large magnetic response associated with port infrastructure and therefore smaller anomalies may be masked. Interpreted as a possible natural feature or may be possible debris.	SSS	-
7093	Debris field	521280	416226	A2_I	201.6	63.2	0.6	-	-	Large area adjacent to and beneath the jetty containing linear, angular and rounded dark reflectors with tall and irregular shadows. The jetty footings are also visible within the area. A large, dark perimeter can be seen along the western side which is a likely escarpment. Visible in the MBES dataset as an area of irregular mounds, although many of the features visible are likely to be natural. No anomalous features were identified in the Mag. data at this location, although the majority is within a large magnetic response associated with the pier and therefore smaller anomalies may be masked. Interpreted as a possible debris field.	SSS	-
7094	Debris	521340	416249	A2_I	7.5	0.7	0.6	-13.4	-	An elongate mound with evenly sloping	MBES	-



ID	Classification	Easting	Northing	Archaeological discrimination	Length (m)	Width (m)	Height (m)	Least Depth (m LAT/CD)	Magnetic amplitude (nT)	Description	Anomaly type	External references
										sides and a rounded top. More proud section at the southwest end. Some encircling scour visible extending for 0.4 m. No anomalous features were identified in the SSS data at this location and it is not covered by the Mag. data, though its proximity to the pier/jetty means it would likely be within a large associated magnetic response masking any smaller individual magnetic responses from ferrous material within this area. Interpreted as possible debris.		
7095	Debris field	521350	416248	A2_I	9	7.1	0.5	-13.4	-	A small area of angular and elongate mounds, none clearly defined, perhaps indicating layering. The most distinct anomaly is at the south and measures 3.5 x 1.1 x 0.2 m. No anomalous features were identified in the SSS data at this location. This location was not covered by Mag. data though its proximity to the pier/jetty means it would likely be within a large associated magnetic response likely to mask any smaller individual magnetic responses from ferrous material within this feature. Interpreted as a possible debris field.	MBES	-
7096	Debris	521364	416245	A2_I	7.6	0.6	0.1	-12.8	-	An elongate mound with an irregular top and little surface expression, which is orientated east-west. No anomalous features were identified in the SSS data at this location and it is not covered by Mag. data, though its proximity to the pier/jetty means it would likely be within a large associated magnetic response masking any smaller individual magnetic responses from ferrous material within this area. Interpreted as possible debris.	MBES	-



ID	Classification	Easting	Northing	Archaeological discrimination	Length (m)	Width (m)	Height (m)	Least Depth (m LAT/CD)	Magnetic amplitude (nT)	Description	Anomaly type	External references
7097	Magnetic	520518	416637	A2_l	-	-	-	-	47	A small symmetric dipole with peak and trough over two profile lines in the Mag. data. No anomalous features were identified in the SSS or MBES data at this location. Interpreted as possible ferrous debris either buried or with no surface expression.	Mag.	-
7098	Magnetic	520699	416519	A2_l	-	-	-	-	10	A small, broad asymmetric dipole with peak and trough on one profile line in the Mag. data. No anomalous features were identified in the SSS or MBES data at this location. Interpreted as possible ferrous debris either buried or with no surface expression.	Mag.	-
7099	Magnetic	520814	416463	A2_h	-	-	-	-	78	A medium asymmetric dipole with peak and trough over two profile lines in the Mag. data. No anomalous features were identified in the SSS or MBES data at this location. Interpreted as possible ferrous debris either buried or with no surface expression. Located 23 m west of 7100 and may be related.	Mag.	-
7100	Magnetic	520837	416463	A2_h	-	-	-	-	171	A large, sharp symmetric dipole with peak and trough on one profile line in the Mag. data. Also visible on other profile lines. No anomalous features were identified in the SSS or MBES data at this location. Interpreted as possible ferrous debris either buried or with no surface expression. Located 23 m east of 7099 and may be related.	Mag.	-
7101	Debris	520951	416587	A2_l	3	1	0.4	-13.4	-	An elongate mound with evenly sloping sides and a pointed top. This feature is not fully captured by the available data so measurements are not complete. There is scour visible extending to the south-east for 1.9 m. No anomalous features were identified in the Mag. data at this location, although it is within	MBES	UKHO 67016



ID	Classification	Easting	Northing	Archaeological discrimination	Length (m)	Width (m)	Height (m)	Least Depth (m LAT/CD)	Magnetic amplitude (nT)	Description	Anomaly type	External references
										proximity of the port infrastructure and so any smaller anomalies would likely be masked. There is a feature identified in the UKHO record (67016) 30 m to the west recorded as a demolished dolphin, but as it is difficult to determine whether this is the same feature, it has been retained as a precaution. Interpreted as possible modern or archaeological debris.		
7102	Seabed disturbance	520993	416448	A2_I	17.5	5.1	0.4	-15.6	-	A seabed disturbance comprising a series of short irregular mounds in very close proximity, at the base of a natural drop in seabed. No anomalous features were identified in the SSS at this location. This location was not directly covered by Mag. data and therefore it is not possible to ascertain if ferrous material is present. May be a natural feature or may be possible debris.	MBES	-

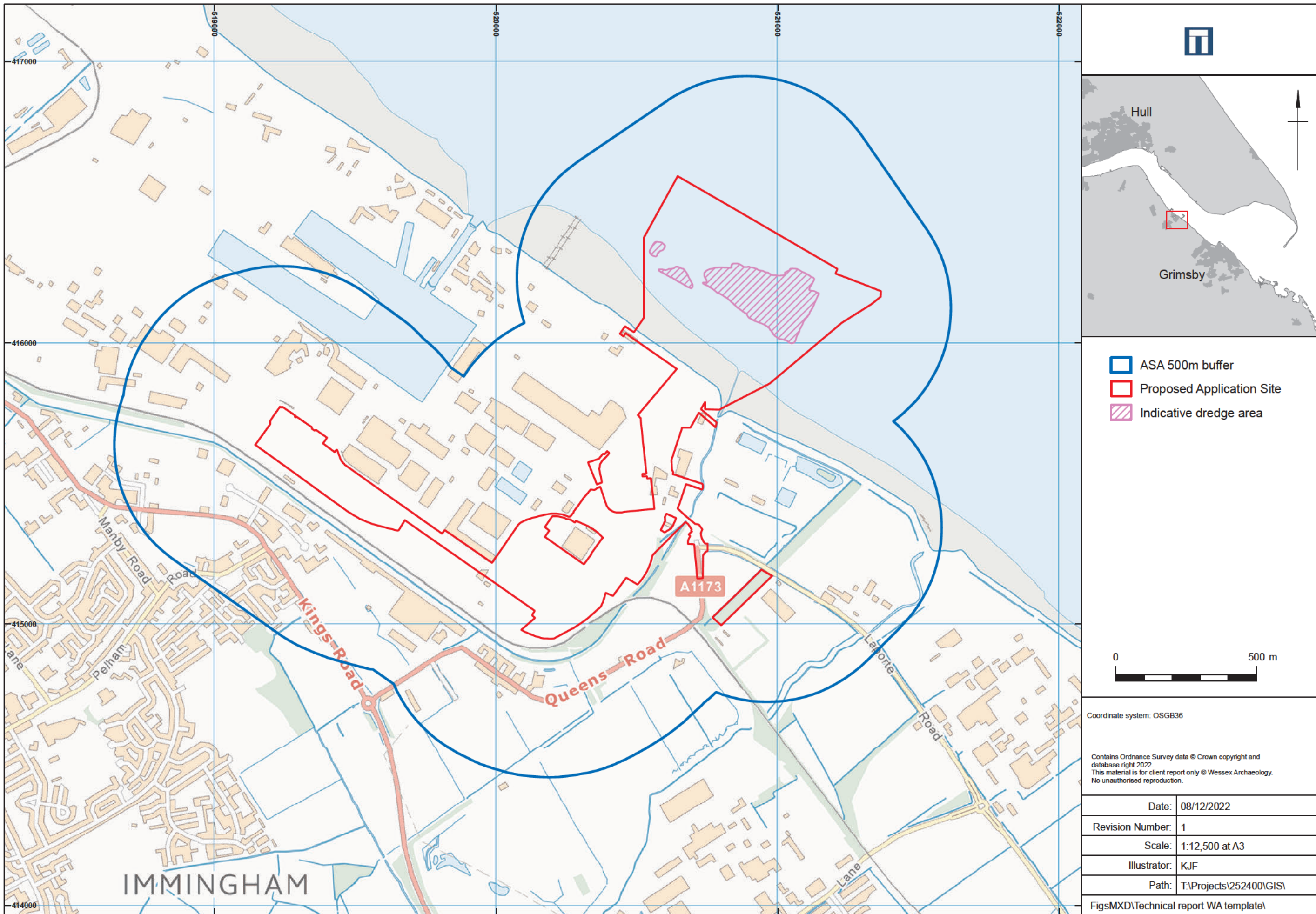


Annex 6: Maritime Recorded Losses

Source ID	Date	Name	Description
Hob Uid: 1302808; NMR: TA 21 NW 15	1810	<i>Margaret</i>	A wooden sailing cargo vessel was stranded at Stallingborough.
Hob Uid: 1303508; NMR: TA 21 NW 16	1880	<i>Agua</i>	A ketch that was stranded and lost in strong wind conditions.
Hob Uid: 1550211; NMR: TA 21 NW 22	1881	<i>Chanticleer</i>	A fishing ketch or smack beached near Stallingborough on 18 Jan 1881.
Hob Uid: 943012; NMR: TA 11 NE 19	1896	<i>Guiding Star</i>	A keel that was stranded and lost in strong wind conditions.
Hob Uid: 943144; NMR: TA 21 NW 14	1920	<i>Singapore</i>	A trawler that sank off Immingham following a collision.
Hob Uid: 1341163; NMR: TA 21 NW 17	1944	HALIFAX MK III MZ576	Two engines feathered; ditched off Immingham, Lincs. 28 Oct 1944.

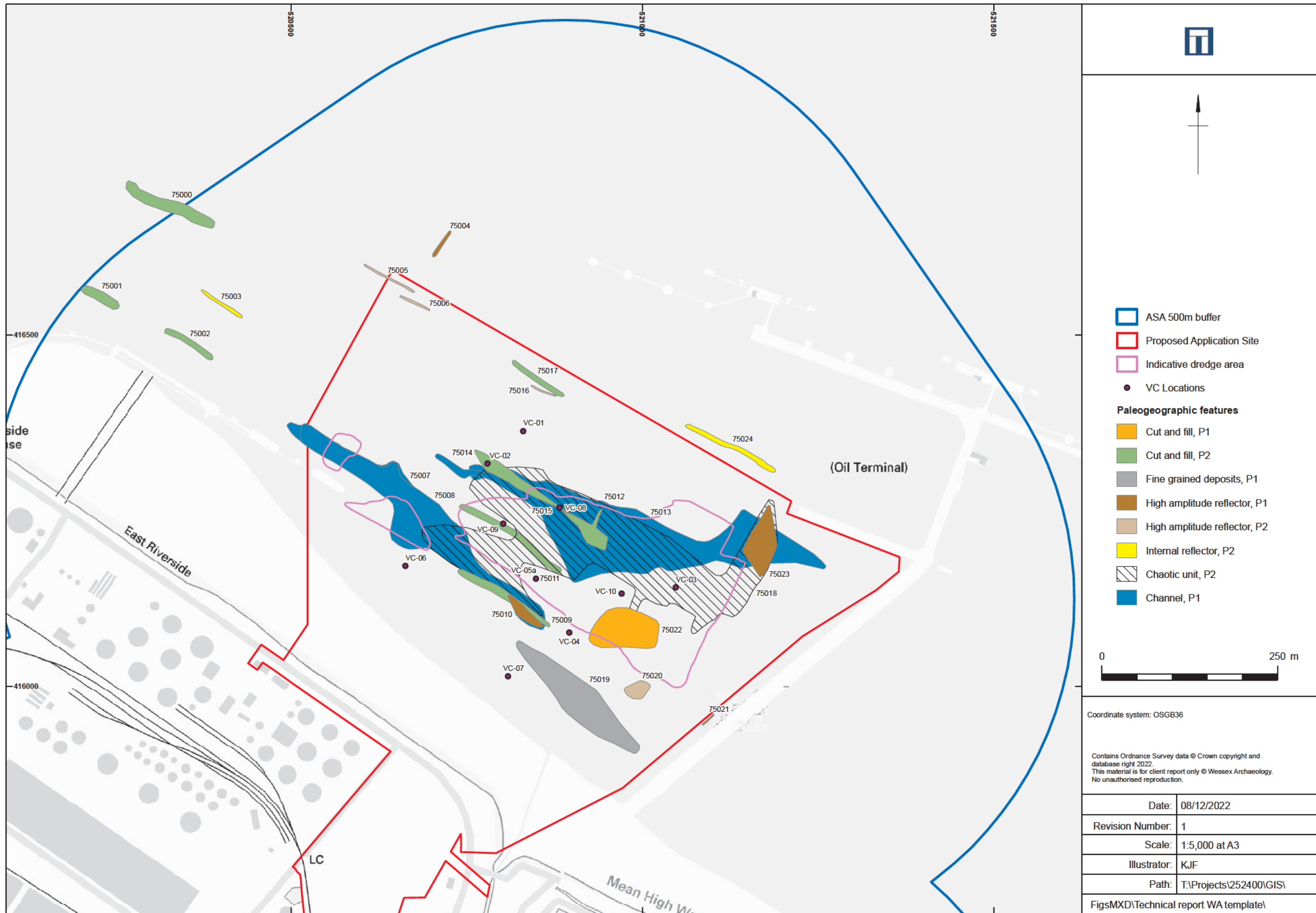
Annex 7: Intertidal Heritage Receptors

ID	External References	Type	Description	BNG Easting	BNG Northing
1001	N/A	Rock-cut feature	Rock-cut stairs, likely dating to the 20th century, located within the revetement linking the intertidal zone to the shore. There are a total of 11 steps, measuring approximately 180 cm wide, 40 cm high and deep.	520707.08	415896.91



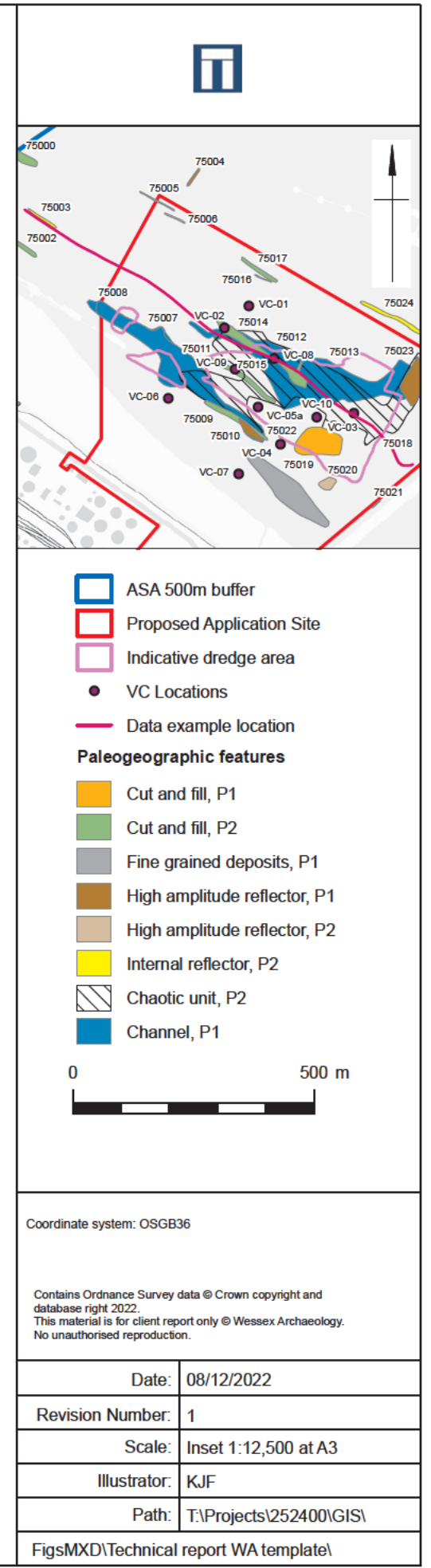
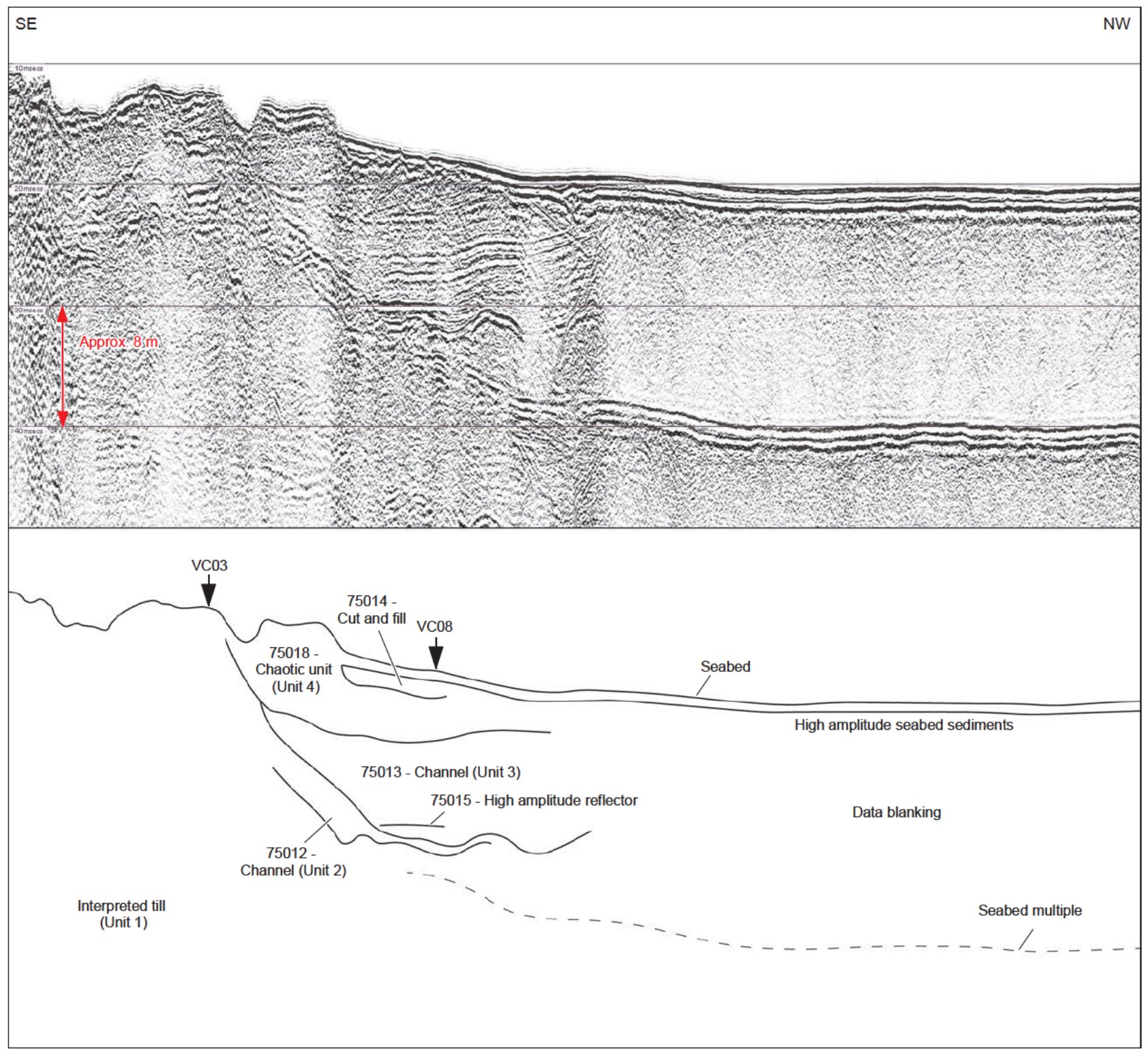
Site Location and Study Area

Figure 1



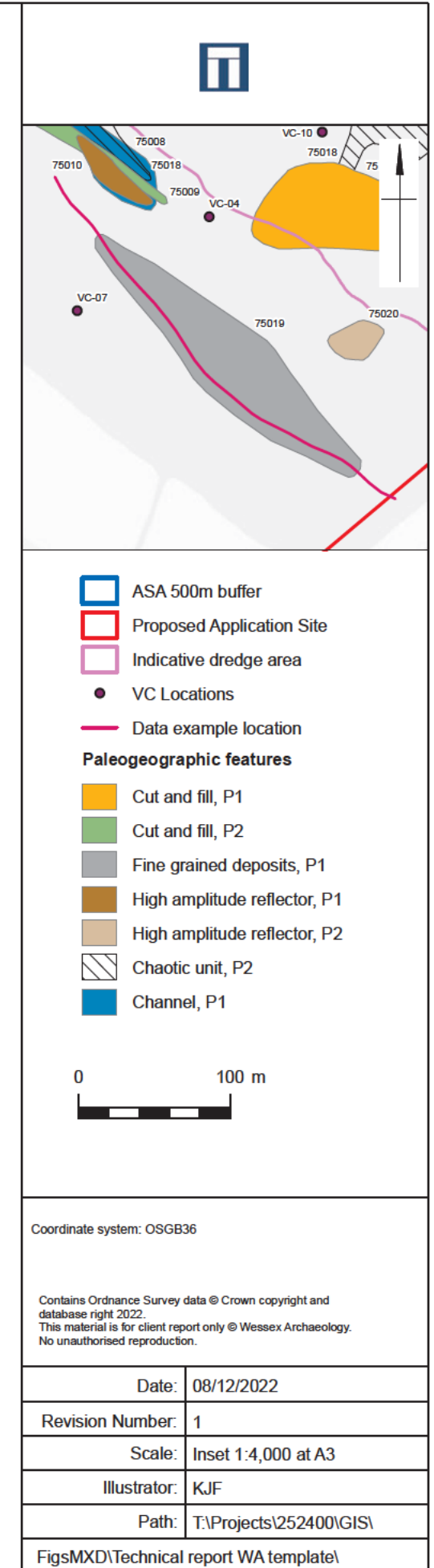
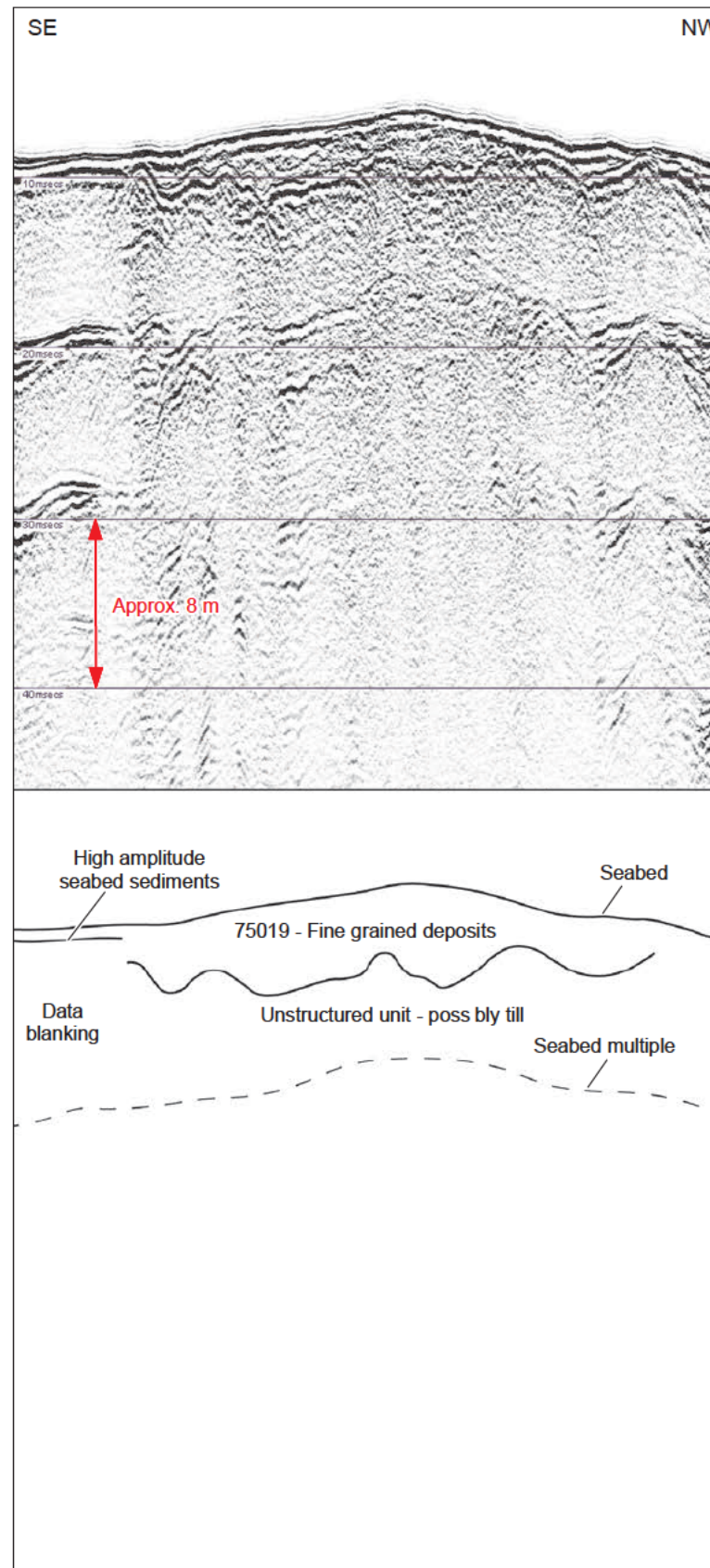
Palaeogeographic features of archaeological potential

Figure 2



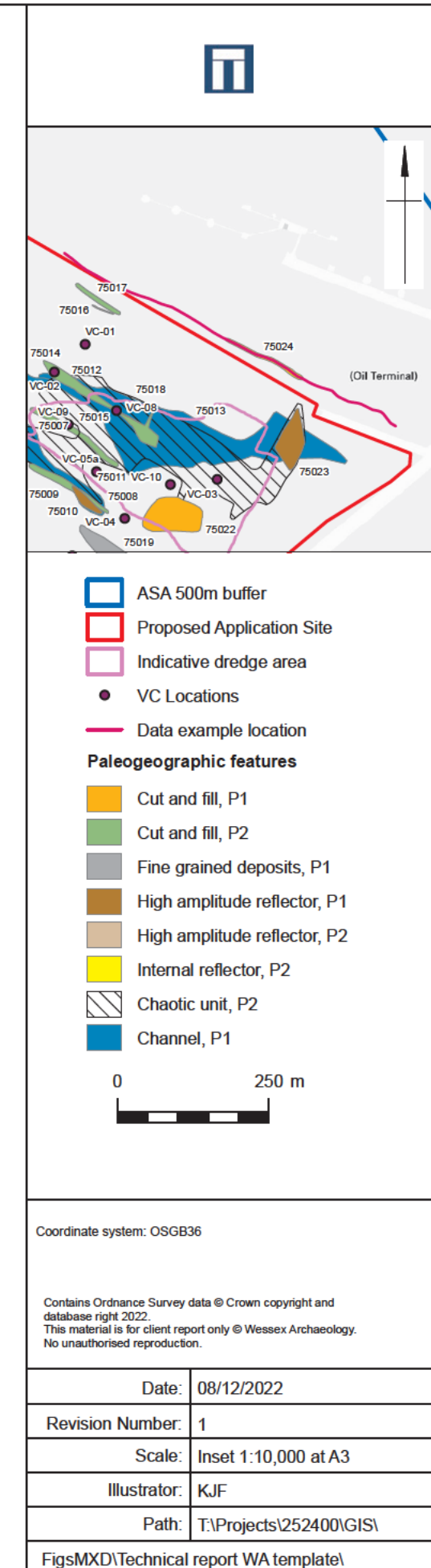
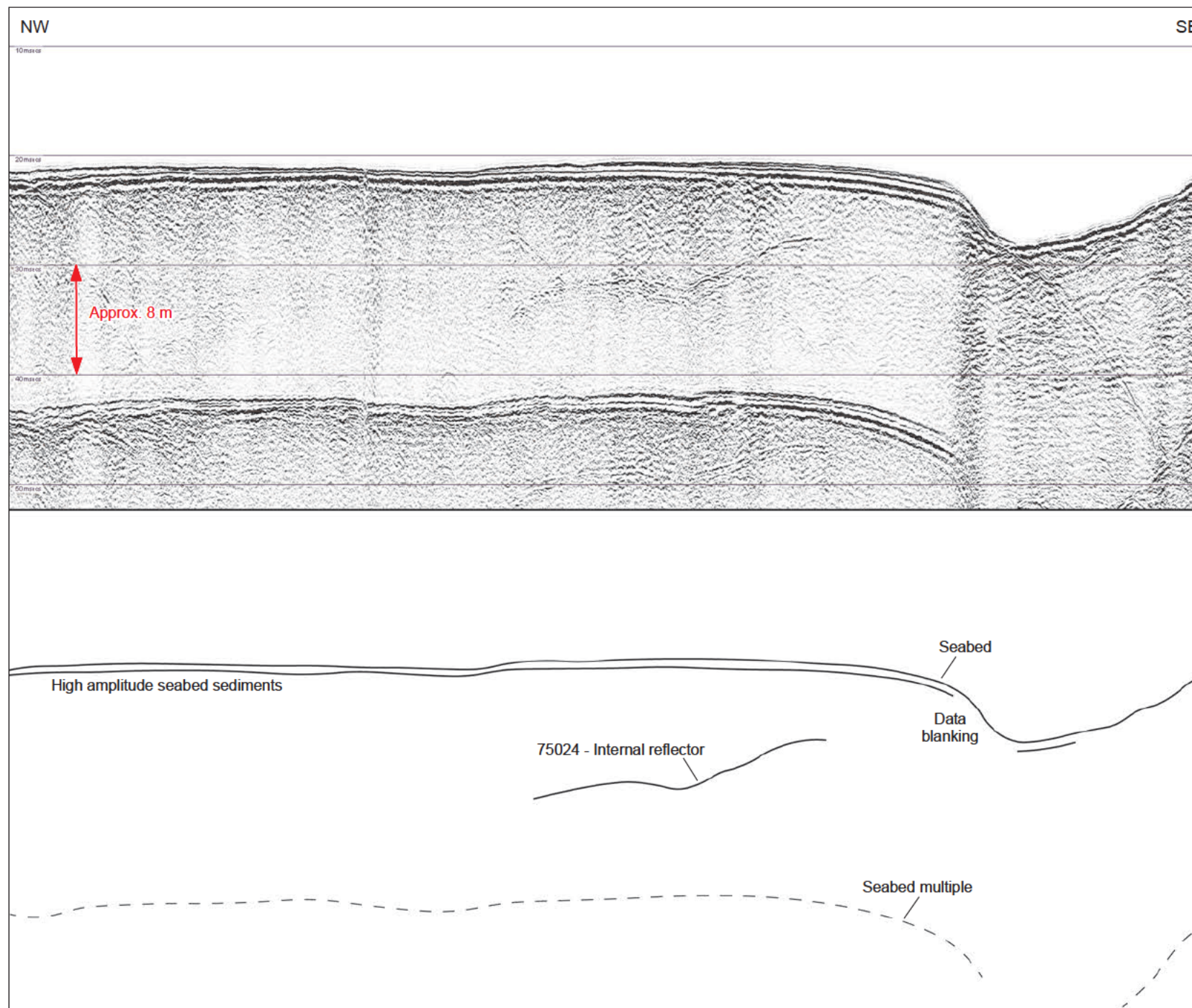
Palaeogeographic feature data example 1

Figure 3



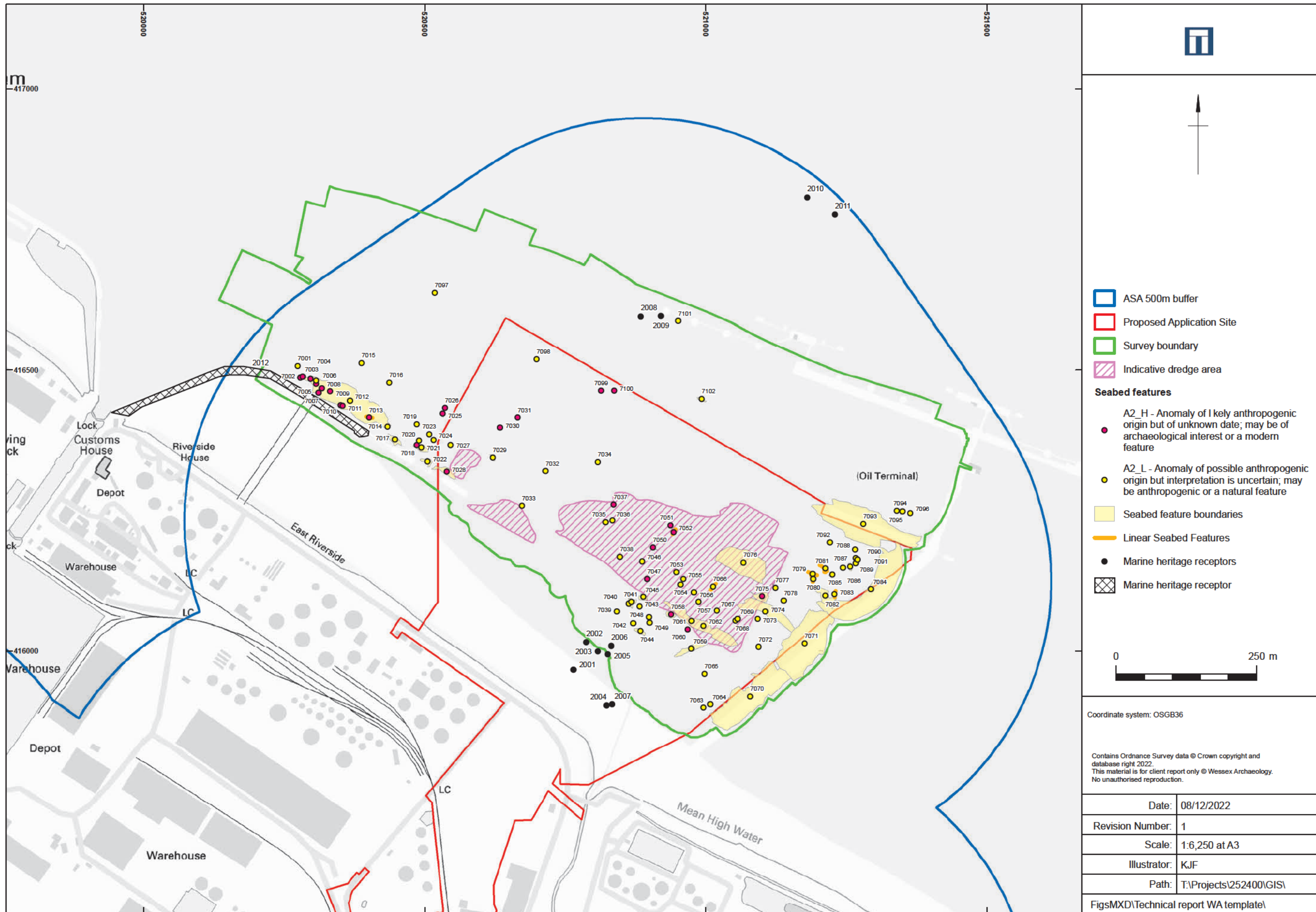
Palaeogeographic feature data example 2

Figure 4



Palaeogeographic feature data example 3

Figure 5

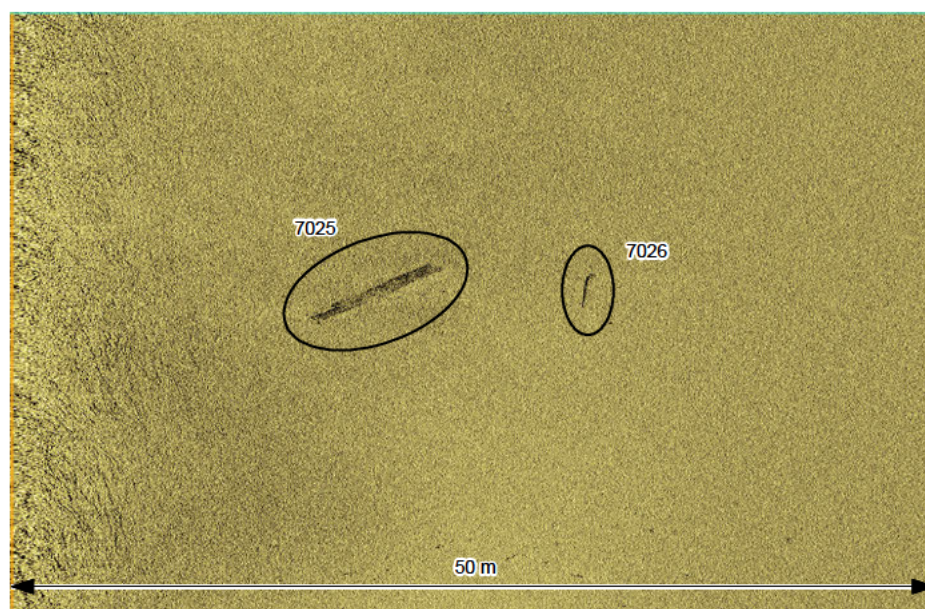


Seabed features of archaeological potential

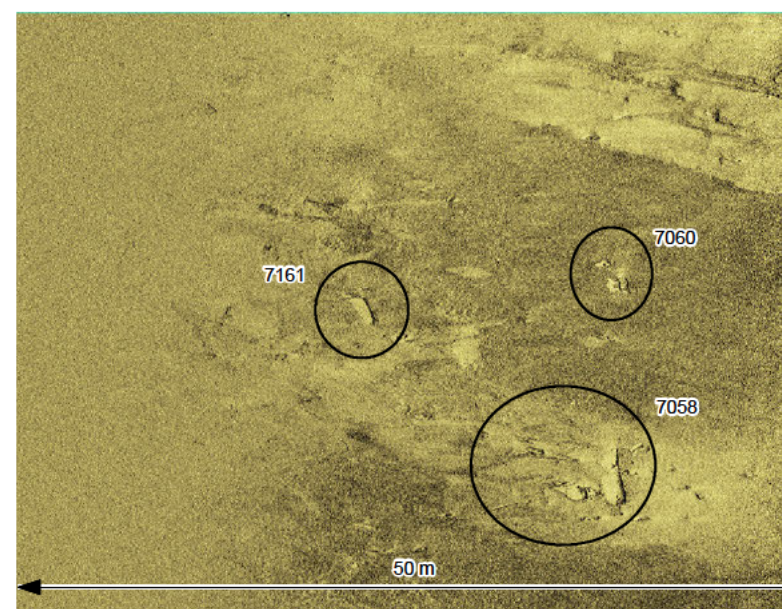
Figure 6



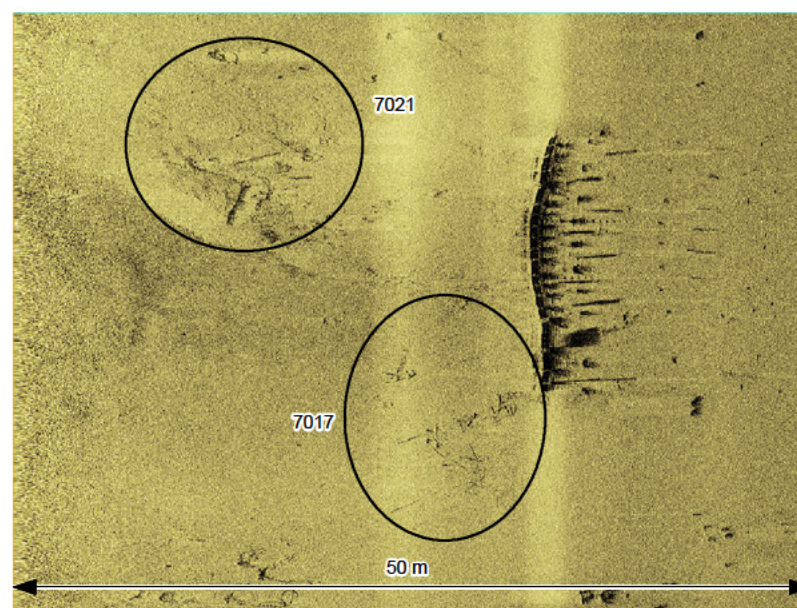
Multibeam bathymetry image of seabed disturbance 7102, looking north, x1 vertical exaggeration



Sidescan sonar image of debris items 7025 and 7026, measuring 11.3 x 2.2 x 0.4 m and 4.9 x 1.0 x 0.2 m respectively



Sidescan sonar image of dark reflector 7061, measuring 6.6 x 0.2 x 0.2 m, debris item 7060, measuring 10.8 x 8.3 x 0.4, and debris field 7058, measuring 16.2 x 10.8 x 0.5 m



Sidescan sonar image of debris fields 7017 and 7021, measuring 31.6 x 12.7 x 0.1 m and 28.7 x 12.6 x 0.5 m respectively

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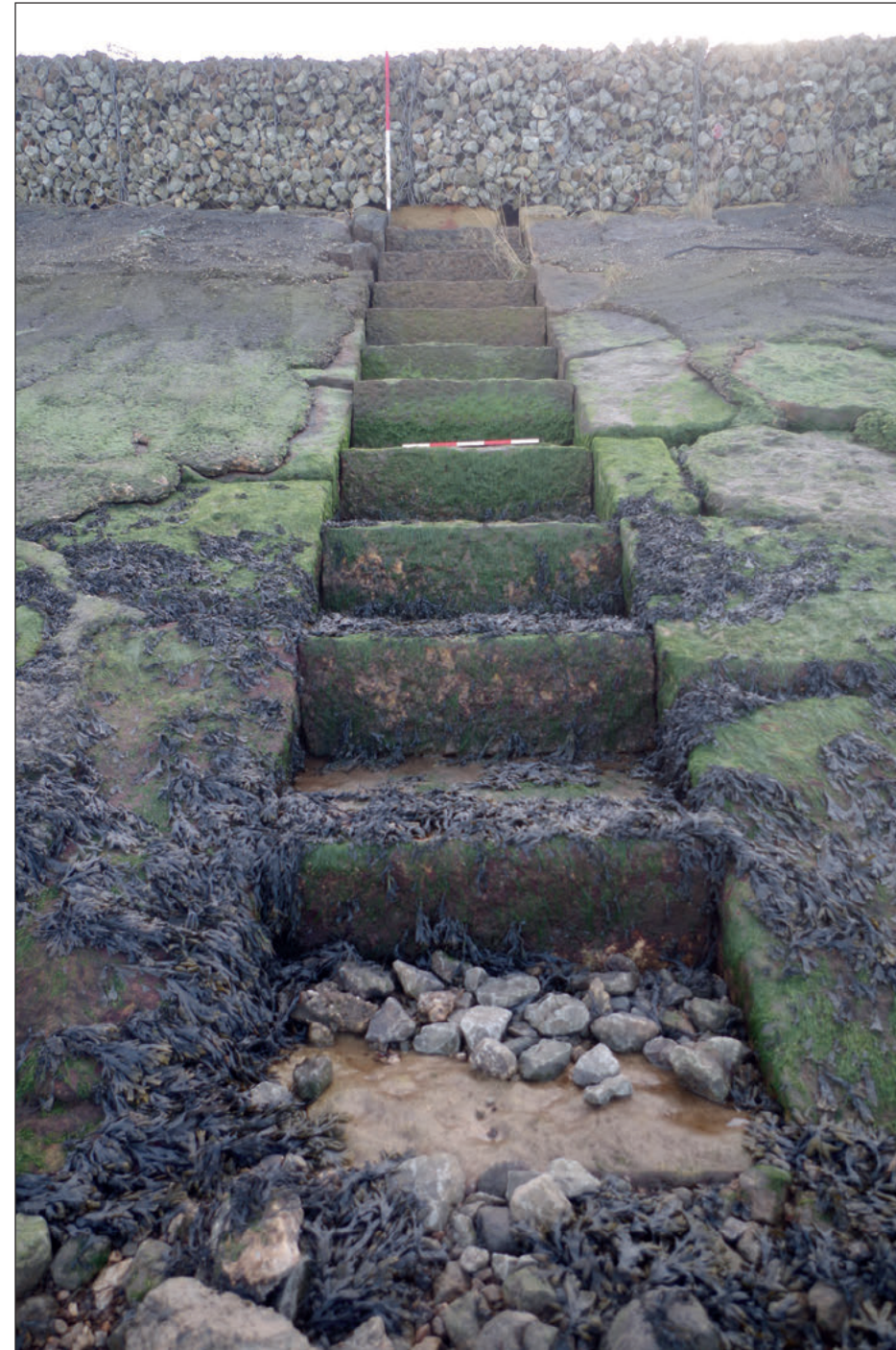
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Revision Number:	0
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Illustrator:	KJF
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Obstructions 2002, 2005 and 2007, as seen from the revetment



Obstructions 2002 and 2005, as seen from the revetment



Rock-cut stairs (1001), looking towards the revetment



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