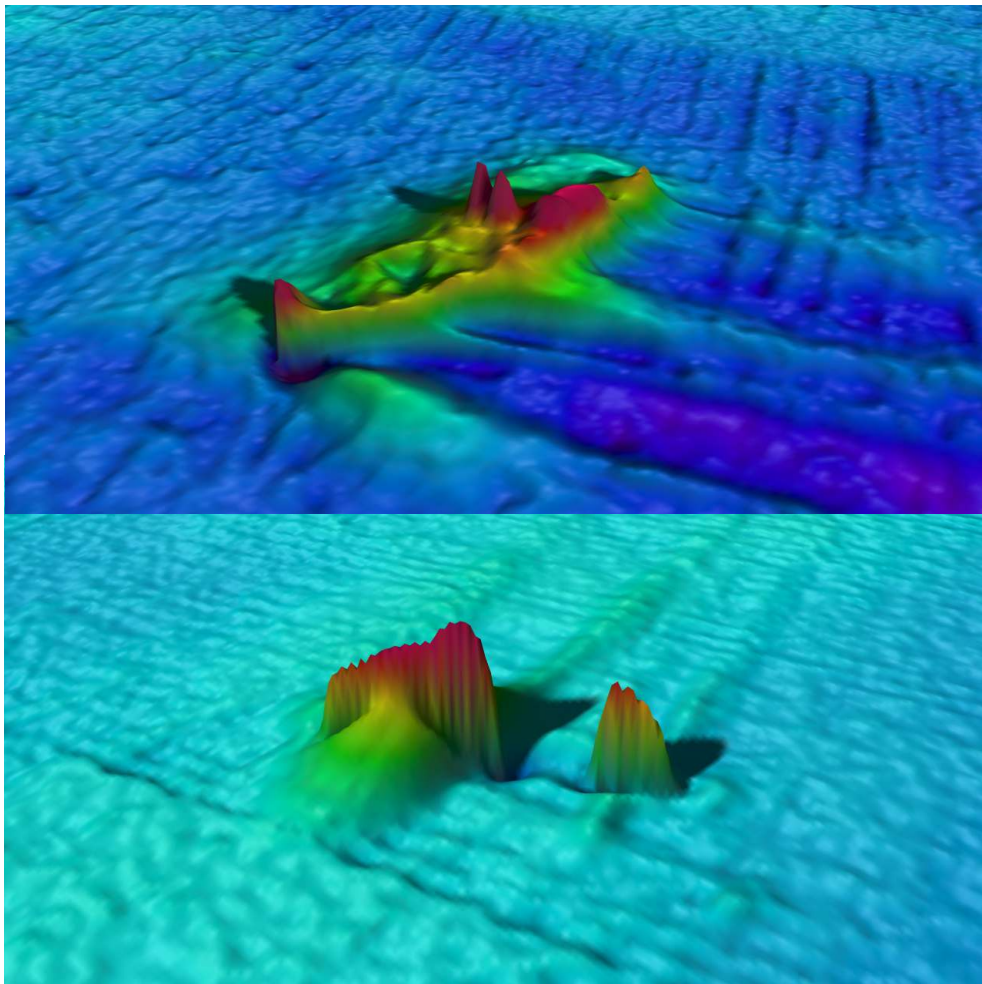




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Aggregate Areas 473 East and 474 Central Annual Monitoring Report

Archaeological Assessment of Geophysical Data



Ref: 106780.01
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Aggregate Areas 473 East and 474 Central

Annual Monitoring Report Archaeological Assessment of Geophysical Data

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Archaeological Assessment of Geophysical Data

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Aggregate Areas 473 East and 474 Central Annual Monitoring Report

Archaeological Assessment of Geophysical Data

Summary

Wessex Archaeology was commissioned by Fugro EMU Ltd. to undertake an archaeological assessment of geophysical survey data as part of the heritage annual monitoring process for aggregate extraction Areas 473 East and Area 474 Central. The data comprised sidescan sonar and multibeam bathymetry data acquired by Fugro EMU Ltd. during September and October 2014.

The overall aim of this report is to provide an archaeological review of the effects of dredging upon known archaeological sites and previously identified geophysical anomalies that may potentially be of archaeological interest; and to assess the areas for any new anomalies that may be of potential archaeological interest.

A total of 15 anomalies were identified in the geophysical data; 12 associated with licence Area 473 East and three with licence Area 474 Central.

Three of the anomalies identified in Area 473 East were given an archaeological rating of an A1 (anthropogenic origin of archaeological interest) and were identified as two wrecks. It is recommended that a 150m exclusion zone around the boundaries of wreck 7004 and 7005 is retained. No exclusion zone is required around wreck 7007 as the wreck lies outside the current licenced area and is not impacted by dredging activities. The remaining anomalies are situated outside of the current aggregate licence area.

Of the three anomalies associated with the survey of Area 474 Central, only anomaly 7013 is situated within the aggregate licence area and should be avoided if possible. However, due to its uncertain nature no exclusion zone is recommended. Further avoidance is recommended in the location of undisturbed area of seabed towards the centre of the active dredging area in line with previous monitoring recommendations.

It is recommended that any artefacts recovered during dredging activities are reported using the established *Protocol for Reporting Finds of Archaeological Interest* (BMAPA and English Heritage 2005).



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Archaeological Assessment of Geophysical Data

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Rachel Chester carried out the assessment and compiled the report, with quality control provided by Dr Louise Tizzard and Dave Howell. Kenneth Lymer prepared the illustrations and the project was managed for Wessex Archaeology by Dr Louise Tizzard.



Aggregate Areas 473 East and 474 Central Annual Monitoring Report

Archaeological Assessment of Geophysical Data

1 INTRODUCTION

1.1 Project Background

- 1.1.1 Wessex Archaeology (WA) was commissioned by Fugro EMU Limited (FEMU) to undertake an archaeological assessment of geophysical survey data as part of the annual monitoring process for aggregate extraction Areas 473 East and Area 474 Central, located off the coast of East Sussex (**Figure 1**).
- 1.1.2 Areas 473 East and 474 Central are located within the eastern English Channel approximately 35km off Beachy Head, East Sussex and cover an area of 5km² and 2.9km², respectively.
- 1.1.3 The Study Areas, as provided by FEMU, are delimited by the following coordinates (WGS 84 UTM Zone 31N):

Easting	Northing
315867	5597179
316051	5596332
321777	5598701
321972	5598194
322036	5597977

Table 1: Delimiting coordinates for Area 473 East

Easting	Northing
322953	5592760
323061	5592271
328627	5594133
328747	5593729
328762	5593657

Table 2: Delimiting coordinates for Area 474 Central

- 1.1.4 The data comprised sidescan sonar and multibeam bathymetry data acquired by FEMU during September and October 2014. The geophysical survey data assessed for this report covers the Study Areas for Area 473 East and Area 474 Central as provided by the client (**Figure 1**). The sidescan sonar survey area (6km² and 8km²) covers a slightly larger area than the multibeam bathymetry. The boundary of the survey area (**Figure 1**) is based on the sidescan sonar coverage.
- 1.1.5 As required by the licence conditions for the dredging area, geophysical monitoring surveys are undertaken in order to ascertain any changes to the archaeological baseline. This report presents the archaeological assessment of the most recently acquired geophysical survey data for the areas (year 8).



1.2 Previous Work

- 1.2.1 In 2002 WA undertook two desk-based assessment (DBA) in support of a licence application for Area 473 East and for Areas 474 Central and 475. The DBA's included an assessment of known, suspected and potential archaeological sites.
- 1.2.2 The DBA (WA 2002) compiled and reviewed documentary records of known archaeological sites and assesses the potential for new sites to be discovered. The reviewed material consisted of:
- *Records of wrecks, obstructions and casualties (documented losses) from the National Monuments Record (NMR);*
 - *The Receiver of Wreck at the Marine and Coastguard agency was approached with regards to reports of historic wrecks;*
 - *Records of wrecks and obstructions collated by the UK Hydrographic Office (UKHO);*
 - *Records of Palaeolithic and Mesolithic finds from the East Sussex Sites and Monuments Record (ESSMR);*
 - *The Ministry of Defence (Naval staff Directorate) were consulted with regard to the existence of war graves within the Study Area;*
 - *Marine geophysical and geotechnical data provided by the client;*
 - *Various secondary sources relating to the palaeoenvironment and to the Palaeolithic and Mesolithic archaeology of Northern Europe;*
 - *Secondary sources relating to known and potential wreck sites and casualties.*
- 1.2.3 In 2006 an archaeological assessment of geophysical data was undertaken by WA in preparation for aggregate extraction within the Areas 473 East, 474 Central and 475. Geophysical datasets assessed for this report consisted of sidescan sonar and sub-bottom profiler data, provided by Hanson Aggregates Marine Ltd., alongside a geotechnical examination of grab samples. The archaeological assessment of geophysical data aimed to locate, assess and report on the position, character and nature of known and newly discovered archaeological sites.
- 1.2.4 Subsequently Year 4 archaeological monitoring was undertaken by EMU (2011) and Year 6 annual monitoring was undertaken by Sea Change Heritage Consultant (2013).
- 1.2.5 There are seven reported BMAPA *Protocol for Reporting Finds of Archaeological Interest* records within Area 473 East and 474 Central indicating evidence of maritime and aviation activity remains within the Study Areas. Since 2005 there have been five reported finds located in the vicinity of the current Study Area for Area 473 East. These included two finds found at the same time (2010-2011) but not necessarily associated with one another: a cannonball and burnt timber (**Cemex_0368**). The cannonball has a large dent, either from impact or manufacturing fault. The burnt timber is likely to have come from a ship, but this has not been proven. Another cannonball was reported in May 2011 (**Hanson_0359**). Research showed this was likely to have been fired from a 32-pounder or demi-cannon.



- 1.2.6 Two modern pieces of debris were also reported from the vicinity of Study Area 473 East. Half an iron artillery shell (**Hanson_0089**) was reported 2006 – 2007. A copper alloy hinge (**Hanson_0179**) was reported in June 2009 and is presumed, but not confirmed, to have come from a vessel.
- 1.2.7 There have been two reported finds in the vicinity of the Study Area for 474 Central. One discovered in October 2008 was found to be a levered tailwheel from a WWII Hawker Hurricane built by Dowty Equipment Ltd (**Hanson_0188**). An exclusion zone exists over what is believed to be the location of the aircraft in the north of dredging Area 474 Central, which is outside of the current area of investigation. The second reported find was a cannonball (**Hanson_0364**) discovered in April 2011. This find was smaller (1.1” – 1.5” in diameter) than most cannonball finds and is believed to have been designed for use in a Robinet, a small gun, or as a group of small cannonballs shot together from a cannon.

1.3 Seabed Geology

- 1.3.1 According to the British Geological Survey (BGS) the seabed sediments within the Study Areas consist of sandy gravel and muddy sandy gravel (BGS Sheet Sea Bed Sediments, 50°N-00°E and East Channel Association 2003). The underlying Tertiary sediments are the Middle Eocene Barton formation (Hamblin *et al.* 1992. The overall nature of the seabed was relatively flat with no significant bathymetric expressions.

1.4 Aim

- 1.4.1 The aim of this report is to provide an archaeological review of the effects of dredging on known archaeological sites and previously identified geophysical anomalies that may be of potential archaeological interest; and to assess the areas for any new sites of potential archaeological interest.

2 METHODOLOGY

2.1 Introduction

- 2.1.1 The methodology adopted for this assessment conforms to the Standard and Guidance for Archaeological Desk-based Assessment published by the Chartered Institute for Archaeologists (CIfA 2014) and the BMAPA and English Heritage (2003) Marine Aggregate Dredging and the Historic Environment guidance note.

2.2 Data Sources

- 2.2.1 The data comprised sidescan sonar and multibeam bathymetry data acquired by FEMU during September and October 2014. The sidescan sonar data were provided in .xtf format with files separated into aggregate area and date of acquisition. The bathymetry data were provided as two separate .txt files, one for each licence area.
- 2.2.2 Further background information was obtained previous archaeological investigations (WA 2002; 2006; 2007, EMU 2011, Sea Change Heritage Consultant 2013).
- 2.2.3 The geophysical data used for this report were assessed for quality and their suitability for archaeological purposes, and rated using the following criteria.

Data Quality	Description
Good	Data which are clear and unaffected by weather conditions or sea state. The dataset is suitable for the interpretation of standing and partially buried metal wrecks and their character and associated debris field. These data also provide the highest chance of identifying wooden wrecks and debris



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

Table 3: Criteria for assigning data quality rating

2.2.4 Both the sidescan sonar and the multibeam bathymetry data have been rated as 'Good' using the above criteria.

2.3 Geophysical Data – Technical Specifications

2.3.1 The data assessed were obtained by FEMU during September and October 2014. The dataset consisted of sidescan sonar and multibeam bathymetry data.

2.3.2 An Edgetech 4200 dual frequency sidescan sonar system was used to collect the sidescan sonar data. It was operated at both high and low frequencies (100 and 400kHz) simultaneously at a range of 150m. The sidescan sonar data were acquired with a line spacing of 150m and cross lines approximately 500m apart. The data were recorded digitally and processed in SonarWiz. The data were provided to WA as .*xtf* files alongside Geotiffs exported at 0.5m.

2.3.3 Sidescan sonar positioning for the survey was achieved using a USBL system. Processing of the data and comparison of the positions of anomalies indicates that any identified features can be positioned to ± 10 m.

2.3.4 Multibeam bathymetry data were acquired using a Kongsberg EM 2040 MBES system. The data were processed in QINSy and reduced to Chart Datum, Newhaven for Area 473 East and to Eastbourne for Area 474 Central. The data were digitally recorded, gridded to 1m cell size and provided to WA as a .*txt* file.

2.3.5 For this survey all positions were recorded and expressed in WGS 1984, UTM Zone 31N.

2.4 Geophysical Data – Processing

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

2.4.2 A mosaic of the sidescan sonar data is produced during this process to assess the quality of the sonar towfish positioning. Corrected navigation had been applied to the raw data using the USBL system and was left unaltered by WA.



- 2.4.3 The form, size, and/or extent of an anomaly is a guide to its potential to be an anthropogenic feature, and therefore of its potential archaeological interest. A single, small, but prominent anomaly may be part of a much more extensive feature that is largely buried. Similarly, a scatter of minor anomalies may define the edges of a buried but intact feature, or it may be all that remains of a feature as a result of past impacts from, for example, dredging or fishing.
- 2.4.4 The multibeam bathymetry data were analysed to identify any unusual seabed structures that could be shipwrecks or other anthropogenic debris. This was correlated with the sidescan sonar interpretation. The data were analysed using Fledermaus software, which enables 3-D visualisation of the acquired data and geo-picking of seabed anomalies.

2.5 Geophysical Data – Anomaly Grouping and Discrimination

- 2.5.1 The previous section describes the initial interpretation of all available geophysical data sets, which were conducted independently of each other. This inevitably leads to the possibility of any one object being the cause of numerous anomalies in different data sets and apparently overstating the number of archaeological features in the Study Area.
- 2.5.2 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, multiple sidescan sonar anomalies and a multibeam bathymetry anomalies.
- 2.5.3 Once all the geophysical anomalies have been grouped, a discrimination flag is added to the record in order to discriminate against those which are not thought to be of an archaeological concern. These flags are ascribed as follows:

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

Table 4: Criteria for discriminating archaeological importance of features

- 2.5.4 In order to provide direct comparison with previous monitoring reports the A1 classification can be considered to be High Potential (defined as an anomaly representing an object or site of anthropogenic origin and of likely archaeological interest). A2 classification can be considered to be medium potential (defined as an anomaly representing an object or site of likely anthropogenic origin that would require further investigation in order to clarify its origin and establish its archaeological potential) and the A3 classification can be considered to be low potential (defined as an anomaly representing an object or site of possible anthropogenic origin and unknown archaeological interest that does not require further investigation). Discrimination, potential and descriptions of the anomalies are provided in **Appendix I** and **II**.
- 2.5.5 The grouping and discrimination of information at this stage is based on all available information and is not definitive. It allows for all features of potential archaeological interest to be highlighted, while retaining all the information produced during the course of the geophysical interpretation and desk-based assessment for further evaluation should more information become available.



3 RESULTS

3.1.1 The results of this assessment are collated in gazetteer format and detailed in **Appendix I** and **II** and are illustrated in **Figure 2**. Interpretation of the geophysical data identified a total of 15 anomalies of possible archaeological potential across both Area 473 East and 474 Central. Of these anomalies three were rated as A1 and 12 were rated as A2 in accordance with the criteria table (**Table 4**). Three UKHO wreck records are located within the Study Areas and have been further described below.

3.2 Area 473 East

3.2.1 A total of 12 archaeological anomalies of potential interest were identified from the geophysical data covering Area 473 East. This includes two anomalies that are located outside of the Study Area (but within survey coverage), and four anomalies lying within the active licence Area 473 East. The 12 anomalies were discriminated as follows:

Archaeological Discrimination	Number of anomalies	Interpretation
A1	3	Anthropogenic origin of archaeological interest
A2	9	Uncertain origin of possible archaeological interest
Total	12	

Table 5: Anomalies of archaeological potential in Area 473 East

3.2.2 These anomalies of potential archaeological interest have been classified by probable type, which can further aid in assigning archaeological potential and importance:

Anomaly Classification	Number of Anomalies Inside Study Area	Number of Anomalies Outside Study Area (within survey coverage)	Total Number of Anomalies
Wreck	3	0	3
Debris	4	0	4
Debris Field	1	0	1
Dark Reflector	2	2	4
Total	10	2	12

Table 6: Types of anomalies identified in Area 473 East

3.2.3 Anomaly **7007**, measuring 77.8m x 20.8m x 3m, is the distinctly elongated oval structure of a wreck lying upright in a minimum water depth of 39.2m LAT and is orientated at 15/195°, NNE/SSW. The wreck has a distinctly raised outer edge; especially along its south-eastern length which protrudes above the seabed with moderate regularity and has a great deal of sediment build-up surrounding it. The wrecks north-western length is more irregular with less height and less distinct features, this end appears to either be partially buried or has experienced a greater amount of degradation. Scour is observed orientated east-west, on the eastern side of the wreck in line with the prevailing current.

3.2.4 The southern tip of the wreck is clearly pointed, remaining at a height of 2m above the seabed, and is possibly the bow of the vessel. Two further peaks are located adjacent to one another amidships of the wreck. These two features are the wrecks greatest remaining height, measuring approximately 4m x 2m x 3m. The location and dimensions of these features are indicative of two surviving boilers. A distinctly angular structure was observed on the sidescan sonar to be immediately adjacent to the southeast of the two



possible boilers. It is visible as an elongated mound on the multibeam bathymetry and measures approximately 20m x 7m x 2m, and is possibly a cabin.

- 3.2.5 A scattering of debris, **7008**, lies immediately to the south of the wreck, **7007**, and is highly likely to be associated with it. Identified on the sidescan sonar it contains an assortment of features. A minimum of three linear anomalies are present measuring a maximum length of 56m in length, and approximately 0.5m in width and 1m in height. Two of these features have slightly curved characteristics however; one has a more rigid structure. This rigid linear feature has at least three kinks but no curved characteristics, indicating a possibly bent ferrous or other strong material, piece of debris. It is adjacent, or adjoined, to regular anomalies with tapered shadows. Other debris in the vicinity are predominately small with sub-oval to tapered shadows measuring approximately 1.3m x 0.8m x 1.1m.
- 3.2.6 Wreck **7007** was also identified during the previous monitoring reports for year 4 (EMU_Area473_0042) and year 6 (SC_0002). The additional length observed in this dataset may be due to increased exposure at the northern end of the wreck. An additional five anomalies were also identified during these phases: three in year 4 and two in year 6. They were located to the east and the northwest of the wreck and due to their proximity were assumed to be associated. No features were identified during the current phase to be lying to the northwest or east of the wreck. However, the increase in recorded width of the wreck may account for some of the debris to the east.
- 3.2.7 A cluster of debris located immediately south of the wreck (**7008**) was observed in the recent dataset that was not previously identified which may indicate increased exposure since the last survey.
- 3.2.8 Wreck **7007** (**Figure 3**) is situated at the location of two UKHO records: 20342 (SS *Caterham*) and 30713 (UC 65). The SS *Caterham* was a British cargo ship built by Short Brothers in Sunderland in 1886 with a tonnage of 1777t and a triple expansion engine with single shaft. Its dimensions measured 83.2m in length, 11.6m in width with a 6.1m draught. It was captured by the German Submarine UC 38 and sunk by scuttling charges on 13th November 1916. The UC 65 was a World War I German minelaying Submarine with a formidable service history having sunk 103 ships on 11 patrols. UC 65 was built by Blohm and Voss, Hamburg and was commissioned on 8th July 1916. Furthermore, it was a rare casualty of an enemy submarine, having been torpedoed and sunk by British Submarine HMS C15 under the command of Lt. E. H. Dolphin on 3rd November 1917 (McCartney 2003).
- 3.2.9 Based on the dimensions and features of the wreck, including boilers and superstructure the wreck is interpreted as the SS *Caterham*.
- 3.2.10 The UKHO record 30713 appears to correlate greater with that of **7004** and **7005** which lies to the west at the location of the UKHO record 20693: a Submarine reported by divers to be that of a German minelayer (**Figure 4**). The wreck is observed as two distinct thin elongated structures located approximately 10m apart with a clearly defined height of up to 4.8m.
- 3.2.11 **7004** lies to the northwest of **7005** in a minimum depth of 38m LAT and is the larger of the two fragments measuring 21.8m x 7.8m x 4.8m. Orientated 140/320°, SE/NW, it is a distinctly thin and pointed structure. The multibeam bathymetry shows a predominantly smooth and, partially, intact structure but with a few notches and additional structural features indistinctly visible on the sidescan sonar dataset. The structure is fairly regular with the height increasing along the length of the wreck; from the smallest in the north-western end to its greatest measurement in the south-eastern end. The location of the



greatest remaining height of the wreck may be the location of the conning tower. Sediment build-up has occurred along both the south-western and north-eastern sides of the wreck, covering any possibly associated debris.

- 3.2.12 Located approximately 10m to the southeast is the smaller of the two sections of wreck, **7005**, measuring 12m x 7.3m x 4.1m. This section lies at a minimum water depth of 38.8m LAT and has been identified on the UKHO records as possibly being the bow of the vessel. It is similar in structure and features to its north-western section but is orientated at 160/340°, SSE/NNW. Similarly to **7004**, few structural features are identifiable with only diffuse indistinct notches observed on the sidescan sonar data.
- 3.2.13 A distinct depression is noticeable on the multibeam bathymetry data between the two sections of wreck; with a maximum depth of 0.7m immediately southeast of **7004**. As this area is likely to be the position of the vessel break point, this area may contain associated debris that are not visible on the geophysical data due to size or burial.
- 3.2.14 It is possible that this wreck is actually that of UC 65, due to its dimensions and structure relating it to a submarine. Furthermore, it's broken into two fragments correlating with previous diving reports (McCartney 2003).
- 3.2.15 Wreck **7004** and **7005** was also identified during the previous two phases of monitoring work conducted within Area 473 East (EMU_Area473_0031a and b; SC0001). As was observed in the previous monitoring report, the scour observed in the data conforms to the models for a wreck in this orientation to the prevailing current described by Dix *et al.* (2007), suggesting that the strongest current direction is west to east across the site.
- 3.2.16 A very distinct piece of debris (**7006**), measuring 4.8m x 1.4m x 0.7m, is located approximately 50m to the southeast of wreck **7004** and **7005**, and is possibly associated. It is an irregular anomaly with a triangular to arrow shaped structure and an irregular shadow progressing from oblong along one side to square, indicating possible height variation of 0.25m.
- 3.2.17 Another distinct piece of debris within the Study Area is **7002**. An elongated anomaly, with some possibly cylindrical features it measures 3.7m x 1.3m and has a clearly defined tapered shadow giving a height of 1.2m. It is surrounding by a slight depression and a possible scour.
- 3.2.18 **7000** and **7001** are both two pieces of debris that are located in the same vicinity in the east of the Study Area but have slightly varying characteristics. **7000** is an elongated and slightly curved angular anomaly with a distinct oblong shadow that shows some possible height variation, increasing towards the southwest. Measuring 5.7m x 1.1m x 0.4m it is smaller than the nearby **7001** which measures 8.9m x 1.1m x 0.4m. This piece of debris is another slightly curved angular anomaly but with a clearly defined square shadow and an oval depression to the south.
- 3.2.19 The remaining anomalies identified on the geophysics data are all dark reflectors. **7003** is the most distinct lying on the edge of an area of dredging. Measuring 6.7m x 1.7m x 1m it is angular with a clearly defined rectangular shadow, but it is acknowledged that this could be natural material caused by dredging. **7010** is an indistinct anomaly measuring 3.5m x 0.7m but with a distinctly tapered shadow resulting in a height of 1.6m. **7009** and **7011** both lie outside the Study Area and measure 2m x 1.1m x 1.3m and 3.5m x 2m x 1.6m, respectively.



3.2.20 With the exception of the wrecks, **7004/7005** and **7007**, none of the anomalies identified within the geophysical data covering Area 473 East were identified during the previous phases of monitoring work.

3.3 Area 474 Central

3.3.1 A total of three archaeological anomalies of potential interest were identified from the geophysical data covering Area 474 Central. This includes a single anomaly located outside of the Study Area. The three sites were discriminated as follows:

Archaeological Discrimination	Number of anomalies	Interpretation
A1	0	Anthropogenic origin of archaeological interest
A2	3	Uncertain origin of possible archaeological interest
Total	3	

Table 7: Sites of archaeological potential in Area 474 Central

3.3.2 These anomalies of potential archaeological interest have been classified by probable type, which can further aid in assigning archaeological potential and importance:

Anomaly Classification	Number of Anomalies Inside Study Area	Number of Anomalies Outside Study Area (within survey coverage)	Total Number of Anomalies
Debris	1	0	1
Dark Reflector	1	1	2
Total	2	1	3

Table 8: Types of anomalies identified in Area 474 Central

3.3.3 None of the anomalies identified were observed during the two previous phases of monitoring work. Furthermore; two of the anomalies (**7012** and **7014**) are located outside of the licensed Aggregate Area 474 Central but within the Study Area (**Figure 2**).

3.3.4 The single piece of debris located within Area 474 Central Study Area is **7014**. A hard edged elongated anomaly, it is located in the east of the Study Area. Measuring 5.7m x 0.8m x 1.1m it appears to have some cylindrical features and a distinct angular shadow showing some possible height variation.

3.3.5 **7013** is classified as a dark reflector and is situated within the Study Area, within the licence area. **7013** is a hard edged elongated anomaly, with a slight 'w' shaped formation. It measures 7.2m x 0.6m and has an irregular square shadow giving a height of 0.6m.

3.3.6 **7012** is an elongated anomaly with a distinct, slightly angular to sub-oval shadow measuring 8.9m x 0.8m x 1m and is the only anomaly located outside of the Study Area 474 Central but within survey coverage.

3.3.7 Towards the centre of the Study Area is an oval area of undisturbed seabed in the centre of the dredging area where the dredging has avoided. WA previously identified a piece of debris with an archaeological rating of medium potential during the pre-dredging assessment (anomaly 4029, WA, 2006) and a 50m exclusion zone was recommended. No anomaly was identified during the 4 year monitoring report (EMU, 2011a), but an anomaly of low potential was recorded during year 6 (anomaly SC_0010, Sea Change,



2013). No anomaly was identified during the current phase of work. However, avoidance is still recommended as it is possible that this feature has become buried or dispersed and is no longer visible on the available geophysical datasets.

4 MITIGATION

- 4.1.1 With regards to mitigation of archaeology the marine planning authority, working with the relevant regulator and advisors, take account of the desirability of sustaining and enhancing the significance of heritage assets and adopt a general presumption in favour of the conservation of designated heritage assets within an appropriate setting (HM Government 2011; DCALG 2012).
- 4.1.2 A total of 12 anomalies of potential archaeological interest were identified within the geophysical data covering Area 473 East with two of these anomalies located outside of the Study Area and seven located outside of the Licensed Aggregate Area. Three anomalies, **7004**, **7005** and **7007**, were designated an archaeological rating of A1 (anthropogenic origin of archaeological interest) and represent two wrecks. It is recommended that the 150m exclusion zone around wreck **7004** and **7005** is retained. This area includes the area of scour associated with the wreck. No exclusion zone is recommended around wreck **7007** as it is outside of the Licensed Aggregate Area and as such will not be impacted. However, an exclusion zone would be recommended in the future if changes are made to the license areas. No exclusion zones are required for the remaining nine anomalies since their origin is undetermined and they are not within the aggregate licence area and, as such, are not impacted.
- 4.1.3 Three anomalies of potential archaeological interest were identified within the geophysical data covering Area 474 Central, one of which was located outside of the Study Area and two outside of the Licensed Aggregate Area. No exclusion zones are recommended for Area 474 Central since the anomalies identified are of uncertain origin of possible archaeological interest and therefore been designated an archaeological rating of A2. Anomaly **7013** is situated within the aggregate licence area and avoidance is recommended. However, based on the size and nature of the anomaly an exclusion zone is not recommended at this time.
- 4.1.4 Further avoidance is recommended in the location of undisturbed area of seabed towards the centre of the active dredging area in line with previous monitoring recommendations (previously identified as SC_0010 (Sea Change Heritage 2013)).
- 4.1.5 It is recommended that if any objects of possible archaeological interest are recovered during dredging operations from Areas 473 East and 474 Central, that they should be reported using the established Marine Aggregate Industry *Protocol for reporting finds of archaeological interest* (BMAPA and English Heritage 2005).

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APPENDIX I: ANOMALIES OF POSSIBLE ARCHAEOLOGICAL POTENTIAL – AREA 473 EAST

WA ID	Classification	Easting	Northing	Archaeological Discrimination	Length (m)	Width (m)	Height (m)	Description	Potential Rating	External References	Study Area
7000	Debris	321384	5598481	A2	5.7	1.1	0.4	A distinct elongated and slightly curved anomaly with a clear hard edged side. An irregular angular shadow shows some height variation. Located on a quiet seabed.	Low	-	Inside
7001	Debris	321426	5598462	A2	8.9	2.5	0.4	A distinct curved anomaly with a clearly defined square shadow visible. An oval depression is to the south. A similar anomaly is located nearby, 7000 , but otherwise isolated on a quiet seabed.	Low	-	Inside
7002	Debris	320093	5597496	A2	3.7	1.3	1.2	A distinct elongated anomaly with a clear tapered shadow, small depression in front and a possible scour above. Surrounded by smaller, more regular anomalies.	Low	-	Inside
7003	Dark Reflector	318843	5597688	A2	6.7	1.7	1.0	A distinct anomaly with a clear sub-oval shadow visible. Possibly associated with wreck, 7004/7005 , located approximately 145m north.	Medium	-	Inside
7004	Wreck	318805	5597854	A1	21.8	7.8	4.8	A distinct thin elongated oval structure of a wreck at a minimum depth of 38m. Orientated 140/320°, SE/NW it is a distinctly thin and pointed mound with sediment build up on both the SW and NE sides. The multibeam bathymetry shows a predominantly smooth structure, but a few notches and structural features are identifiable on the SSS. It has a well-defined sub-oval shadow visible, showing limited height variation. Associated with fragmented section located approximately 10m to the southeast, 7005 . In the UKHO recorded location of a submarine and reported to possibly be a German minelaying submarine by divers in 1993. These reports suggest the bow lies to the SSE, and therefore part of 7005 .	High	UKHO 30693	Inside



WA ID	Classification	Easting	Northing	Archaeological Discrimination	Length (m)	Width (m)	Height (m)	Description	Potential Rating	External References	Study Area
7005	Wreck	318818	5597829	A1	12.0	7.3	4.1	A distinct thin elongated oval structure of a wreck at a minimum depth of 38.8m. Associated with larger fragment of wreck, 7004, located approximately 10m to the northwest. Orientated an additional 20° to the south, 160/340°, SSE/NNW. It is a thin pointed mound, with the majority of sediment build up occurring to the NE. A regular oval structure, few additional features are identifiable. A well-defined sub-oval shadow is visible showing little height variation. In the UKHO recorded location of a submarine and reported to possibly be a German minelaying submarine by divers in 1993. These reports suggest the bow lies to the SSE, and therefore this section.	High	UKHO 30693	Inside
7006	Debris	318758	5597866	A2	4.8	1.4	0.7	A distinct irregular anomaly with a triangular to arrow shaped structure. A clear irregular shadow is visible - progressing from oblong along one side to square. Possible associated with the nearby wreck 7004/7005 , located 49m to the southeast.	Medium	-	Inside
7007	Wreck	321203	5597865	A1	77.8	20.8	3.0	A distinct elongated oval structure of a wreck with a minimum depth of 39.2m. Orientated 15/195°, NNE/SSW it has a distinct raised outer edge with a clearly pointed southern tip. This southern tip is one of three peaks across the wreck at 2m high. The other two are located adjacently towards the centre of the vessel and reach the maximum height of 3m. An angular structure is observed on the SSS and an elongated mound is visible on the multibeam bathymetry towards the northern end of the wreck measuring approximately 20m x 7m x 2m. The very northern end appears to be more buried or broken up than that of the southern end. The eastern end is more irregular and varies more in height than the western side, with a greater overall height. This suggests a greater amount of preservation. The eastern side also has a great deal more sediment build-up than the other sides of the wreck, indicating partial burial. Two UKHO records are located in this position: 20342 and 30713. Suggesting either the SS <i>Caterham</i> , a British vessel sunk 13/11/1916, after being captured by UB 38 and sunk by scuttling charges, or the German submarine UC 65 (respectively). The dimensions and form of the wreck lean towards it being that of the SS <i>Caterham</i> .	High	UKHO 20342, UKHO 30713	Inside



WA ID	Classification	Easting	Northing	Archaeological Discrimination	Length (m)	Width (m)	Height (m)	Description	Potential Rating	External References	Study Area
7008	Debris Field	321148	5597774	A2	91.1	89.4	1.1	A diffuse scattering of debris immediately to the south of the wreck, 7007 . A minimum of 3 pieces of linear debris measuring a maximum of 56m in total length and approximately 0.5m in width and 0.1m height. Two of these linear features have curved characteristics, however one is observed to have at least 3 kinks but a rigid structure. It is located adjacent to or adjoining regular anomalies with tapered shadows. Further numerous small anomalies with sub-oval to tapered shadows are scattered across the area, measuring approximately 1.3m x 0.8m x 1.1m. The most distinct of which is an angular anomaly with a tapered shadow and surrounded by a depression.	Medium	-	Inside
7009	Dark Reflector	320229	5598405	A2	2.0	1.1	1.3	A regular anomaly with a clearly defined long tapered shadow visible.	Low	-	Outside
7010	Dark Reflector	320486	5598098	A2	3.5	0.7	1.6	Hard edged anomaly with a clear defined thin tapered shadow.	Low	-	Inside
7011	Dark Reflector	321189	5597448	A2	3.5	2.0	1.6	Distinct angular anomaly with a clear tapered shadow visible.	Low	-	Outside

Notes:

1. All coordinates are in WGS84 UTM Zone 31N
2. Positions are considered accurate to within approximately ± 10 m
3. Potential ratings based on definitions in Sea Change Heritage Consultants (2013)

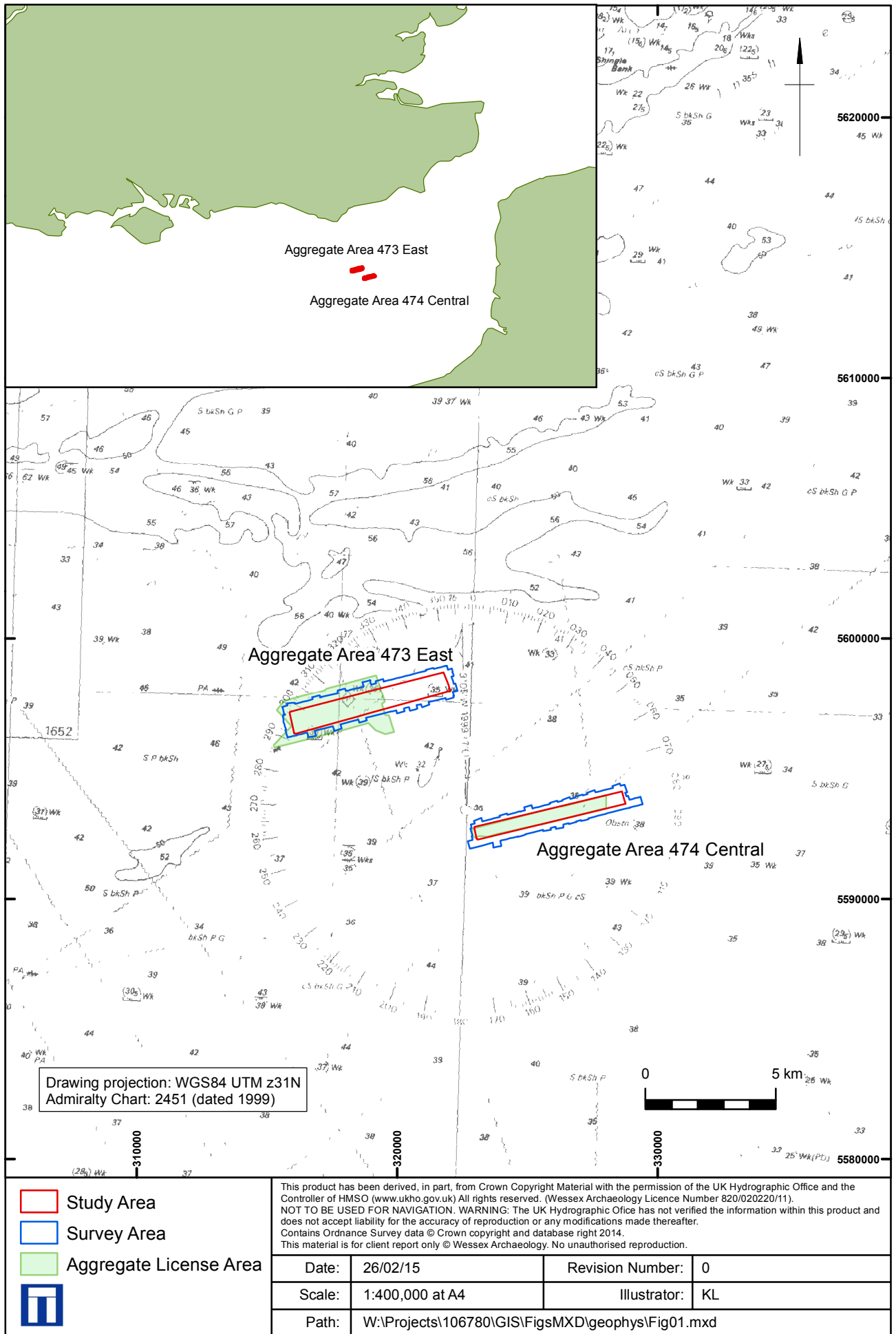


APPENDIX II: ANOMALIES OF POSSIBLE ARCHAEOLOGICAL POTENTIAL – AREA 474 CENTRAL

WA ID	Classification	Easting	Northing	Archaeological Discrimination	Length (m)	Width (m)	Height (m)	Description	Potential rating	External References	Study Area
7012	Dark Reflector	325303	5593423	A2	8.9	0.8	1.0	Distinct elongated anomaly with a sub-oval shadow.	Low	-	Outside
7013	Dark Reflector	326597	5593592	A2	7.2	0.6	0.6	Distinct elongated anomaly with an irregular square shadow showing a little height variation.	Low	-	Inside
7014	Debris	328429	5594024	A2	5.7	0.8	1.1	A distinct elongated anomaly with a clearly defined rectangular shadow. Some variation in height possible. Located on a quiet seabed.	Low	-	Inside

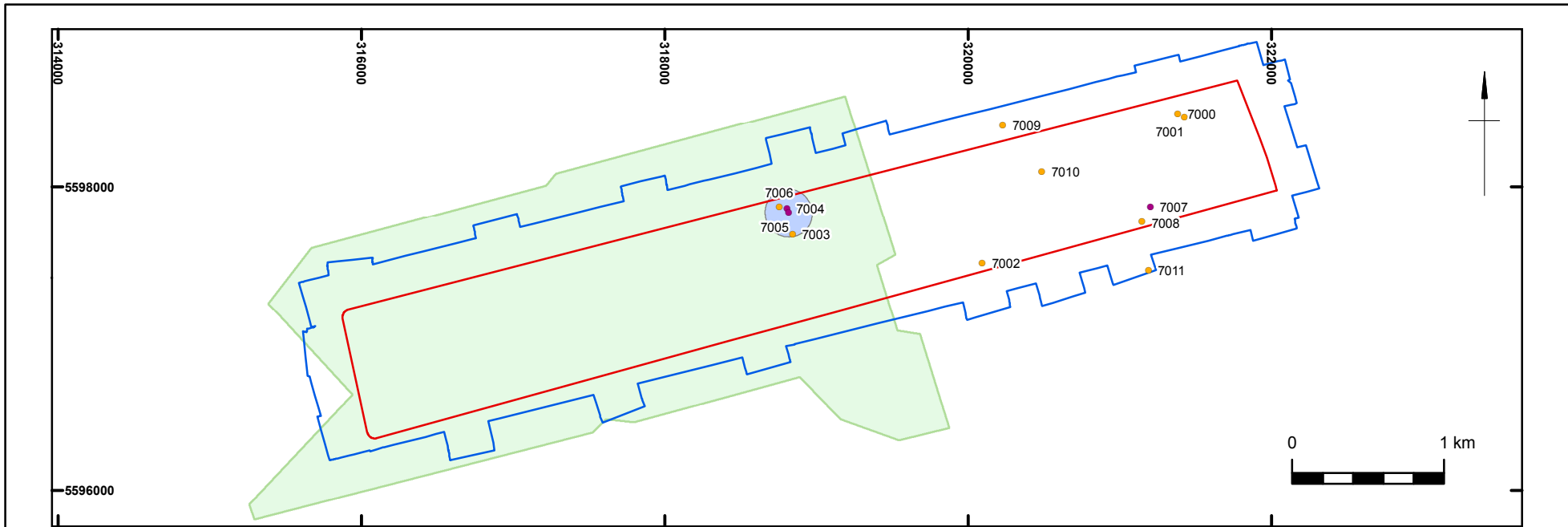
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1. All coordinates are in WGS84 UTM Zone 31N
2. Positions are considered accurate to within approximately ± 10 m
3. Potential ratings based on definitions in Sea Change Heritage Consultants (2013)



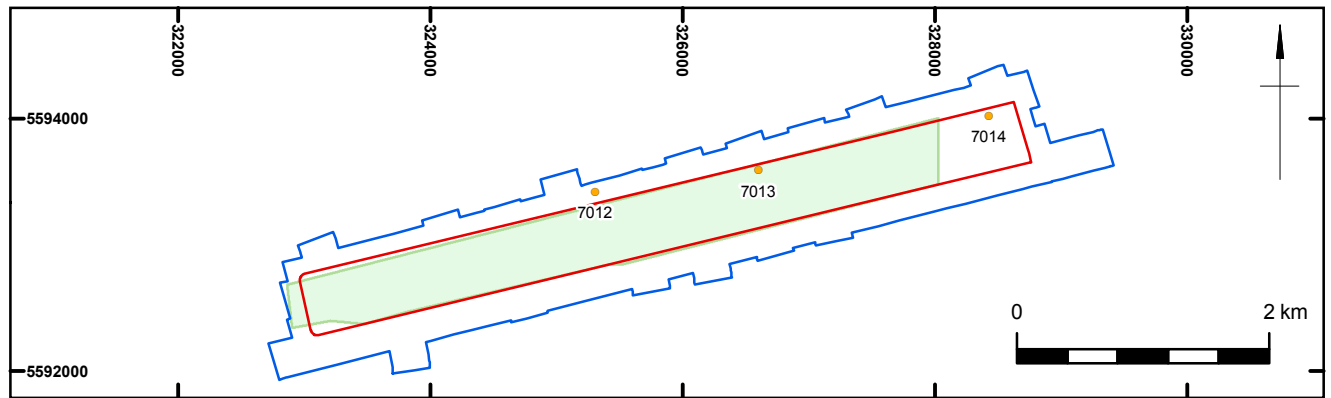
Location map

Figure 1



Anomalies of archaeological potential and exclusion zones in Aggregate Area 473 East

- Study Area
- Survey Area
- Exclusion Zone
- Aggregate License Area
- A1 - Anthropogenic origin of archaeological interest
- A2 - Uncertain origin of possible archaeological interest



Anomalies of archaeological potential and exclusion zones in Aggregate Area 474 Central



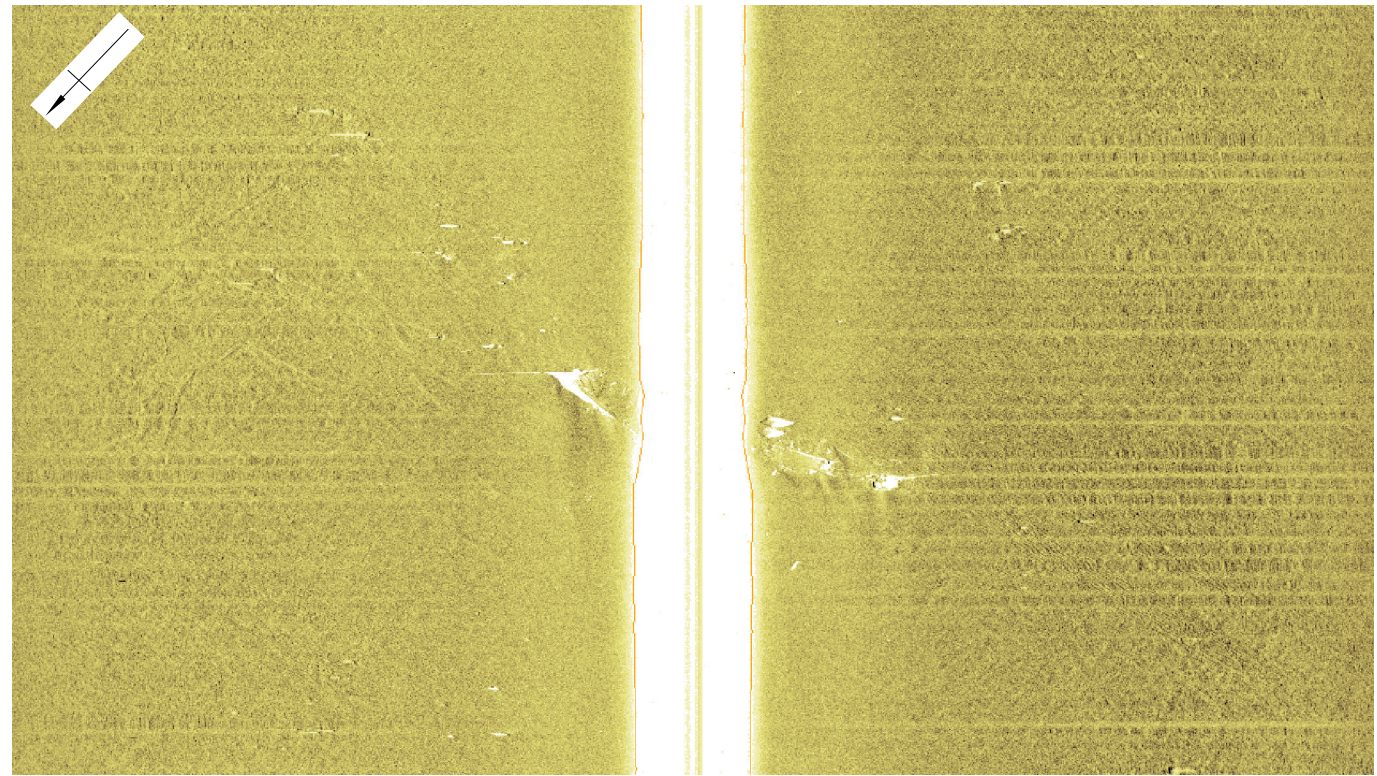
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Drawing projection: WGS84 UTM z31N

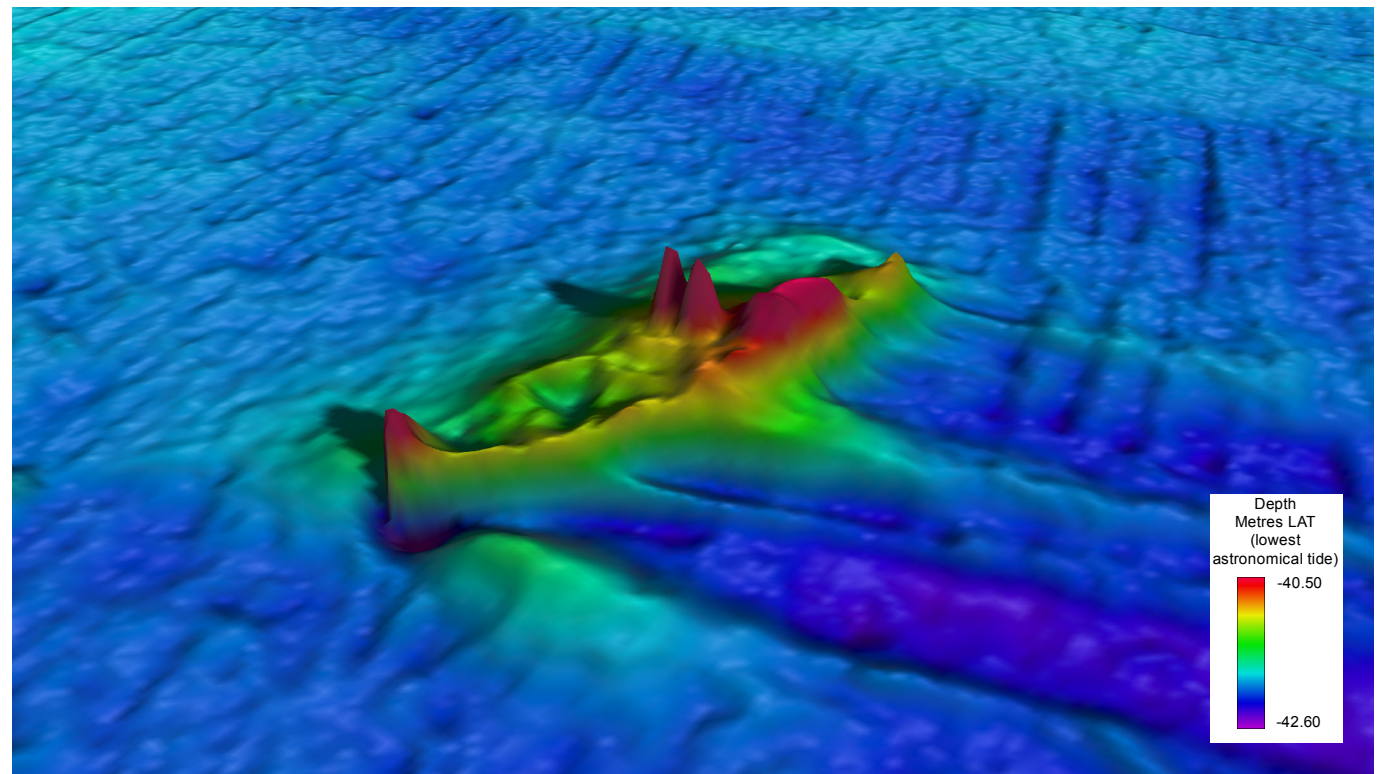
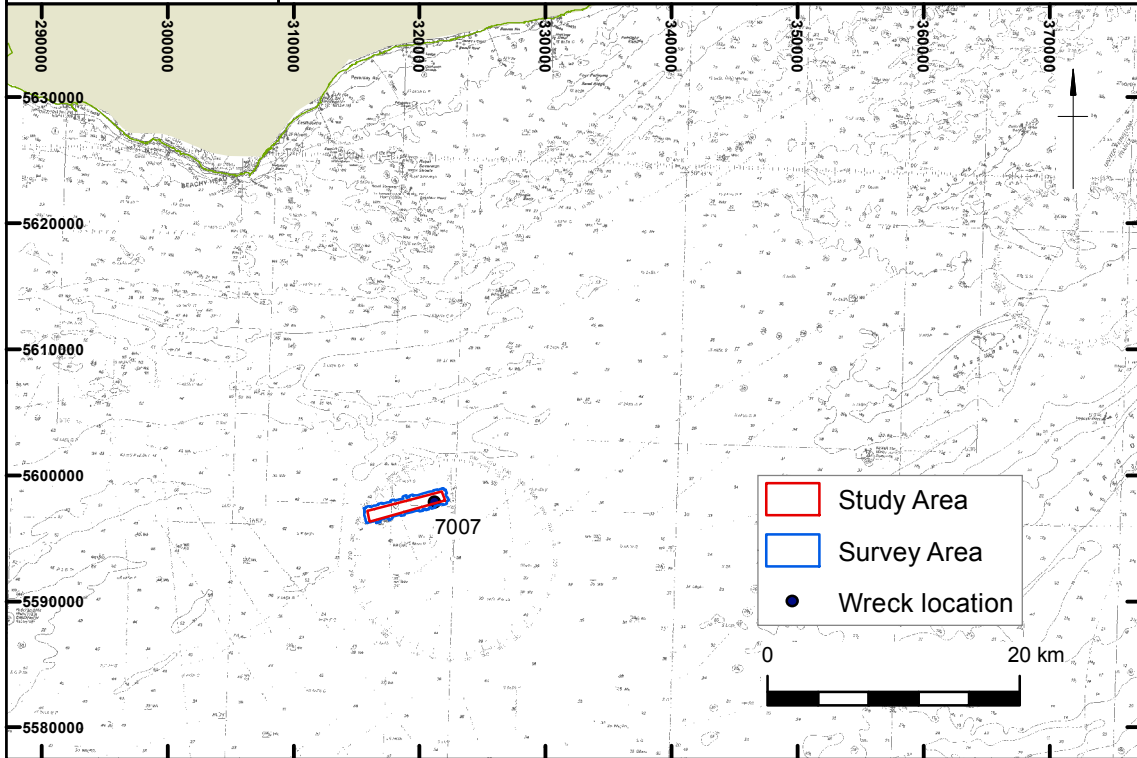
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WA ID 7007 – UKHO 20342 and 30713


Location		321203 E, 5597865 N (UTM31N)
Area		Aggregate Area 473 East
Geophysical Survey Dimensions and Notes		<p>Dimensions: 77.8m x 20.8m x 3m</p> <p>A distinct elongated oval structure of a wreck lying upright on the seabed with clear features visible on both the multibeam bathymetry and the sidescan sonar datasets. The wreck is orientated 15/195°, NNE/SSW and lies in a minimum water depth of 39.2m LAT. The wreck has a distinctly raised outer edge, especially along its south-eastern length, with the structure showing moderate regularity. The southern tip of the wreck is distinctly pointed and rests at 2m above the seabed; this end has been interpreted as the bow. The stern is less pointed and does not reach such a height. Within the wreck itself are two adjacent peaks amidships which reach the maximum height of 3m; these are possibly boilers which have remained standing. Immediately adjacent to these structures is an angular feature measuring 20m x 7m x 2m, which may be a cabin.</p> <p>There is a significant amount of sediment build-up along the south-eastern edge of the wreck.</p> <p>The wreck is located at the position of two UKHO records: 20342 and 30713. However, there is some discrepancy as observations made from the geophysical data differ greatly from the characteristics of these two wrecks.</p>
Build	Type	Steel Coaster
	Construction	Unknown
	Dimensions	Unknown
	Shipyard	Unknown
Loss	Cause	Unknown
Extents of Survival		<p>The wreck appears upright with a significant amount of height remaining, particularly the bow and the two central possible boilers. The adjacent angular structure also appears well preserved. The wrecks raised outer edges, especially south-eastern length, appear intact with moderate regularity. A distinct amount of sediment build-up is observed along this south-eastern length with may have aided in its preservation, and possibly have buried further pieces of associated debris. However, the north-western length appears less well preserved with increased irregularity and less height above seabed.</p>



A sidescan sonar waterfall image of wreck 7007, 77.8m x 20.8m x 3m

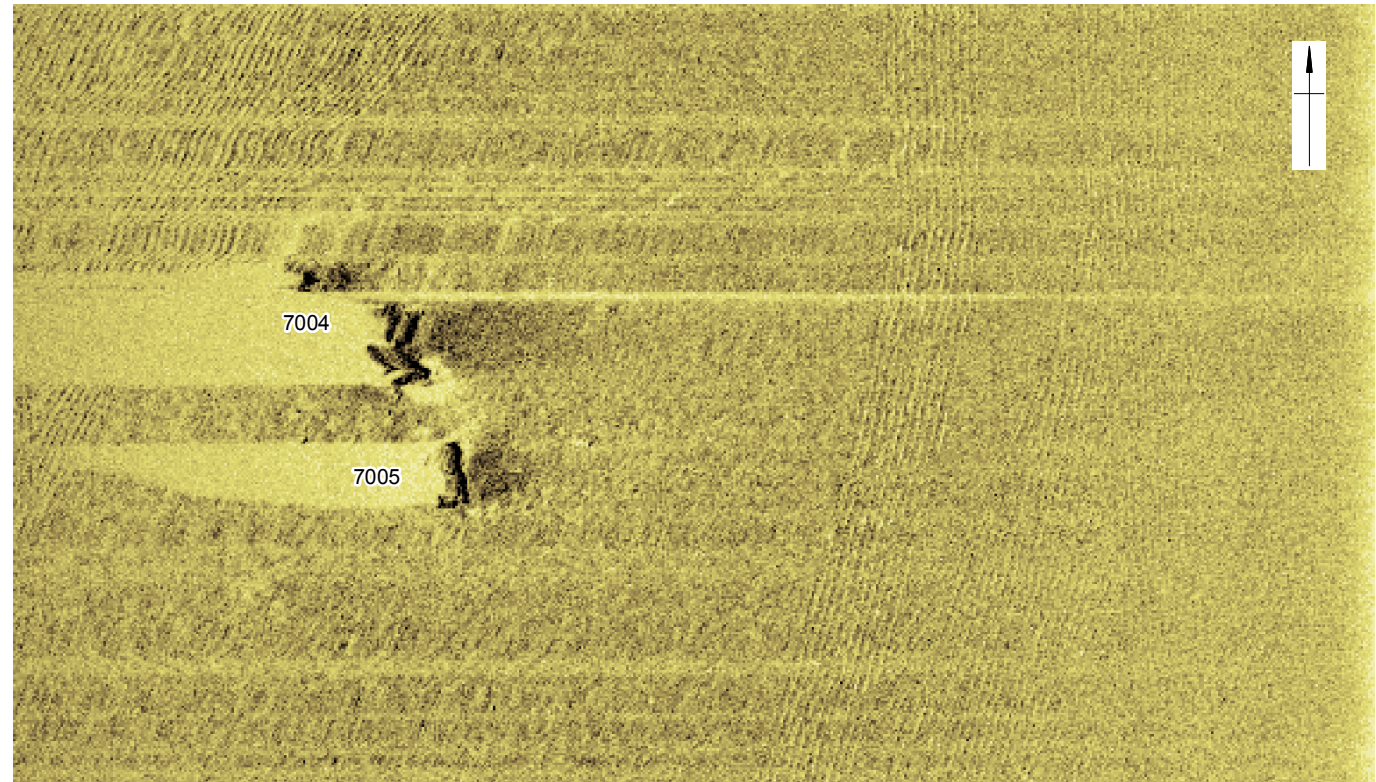


A multibeam bathymetry image facing northwest, x6 vertical exaggeration

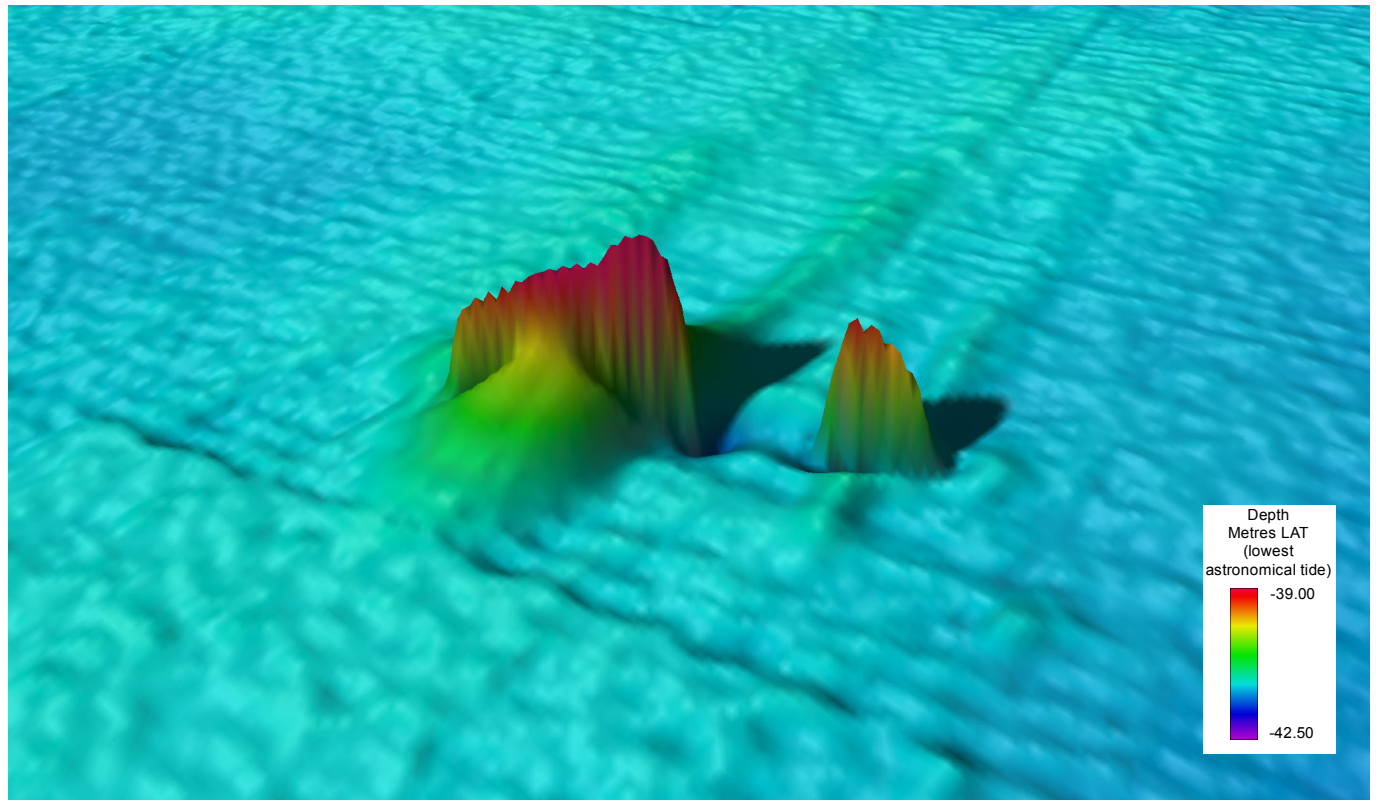
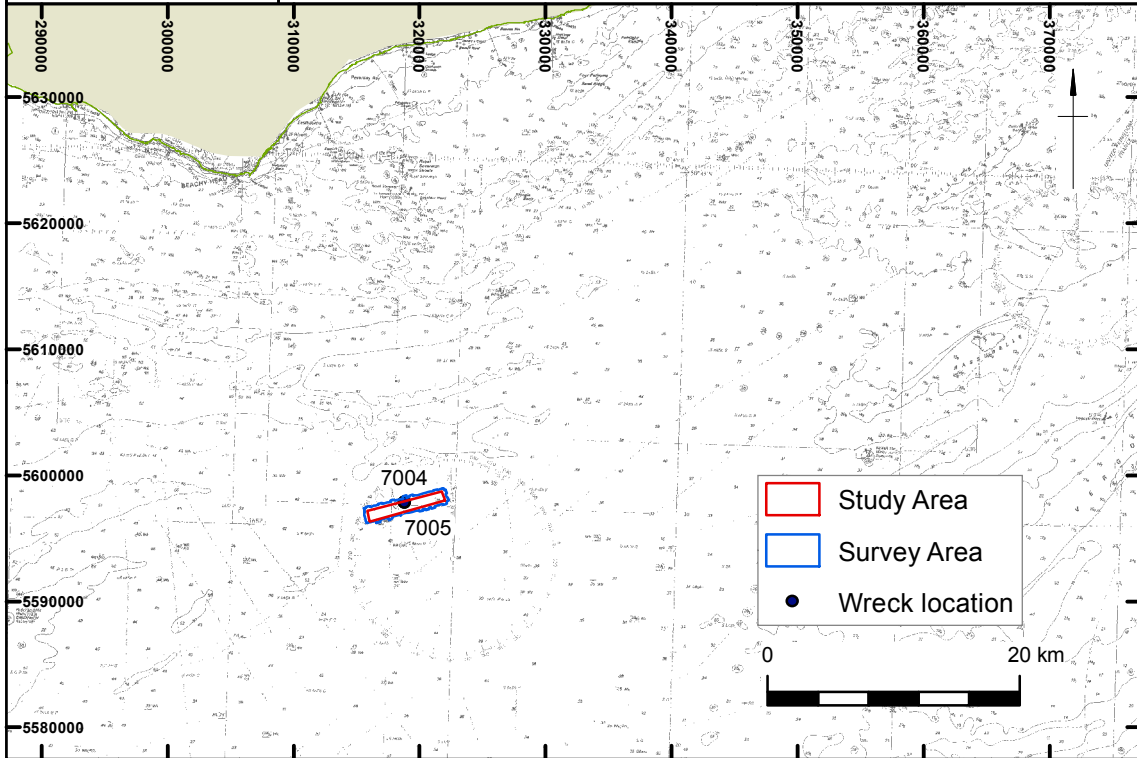
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WA ID 7004 and 7005 – UKHO 30693


Location		318809 E, 5597846 N (UTM31N)
Area		Aggregate Area 473 East
Geophysical Survey Dimensions and Notes		<p>Dimensions: 7004: 21.8m x 7.8m x 4.8m 7005: 12m x 7.3m x 4.1m</p> <p>Two distinct elongated oval structures lying 10m apart have been interpreted as possibly being the UC 65 lying upright on the seabed. The larger, north-western section, 7004, lies orientated 140/320°, SE/NW. The wreck has a predominantly smooth structure with the height gradually increasing towards the southeast. The greatest height of 4.8m is located within this section and is possibly the location of the conning tower.</p> <p>The smaller section of the wreck, 7005, lies approximately 10m to the southeast. Similar in structure to its larger half, this section is orientated 160/330°, SSE/NNW.</p> <p>Both sections of wreck have a distinct amount of sediment build-up on both the southwest and northeast lengths. Furthermore, a depression has formed at the break of the wreck, which may contain further associated pieces of debris.</p> <p>A distinct piece of debris, 7006, lies approximately 49m to the southeast and may be associated with the wreck. It has a triangular to arrow shaped structure and measures 4.8m x 1.4m x 0.7m.</p>
Build	Type	German Type II minelaying Submarine
	Construction	Steel
	Dimensions	Length: 50.35m Displacement: 508t
	Shipyard	Blohm & Voss, Hamburg
Loss	Cause	Torpedoed and sunk by HMS C15 on 3rd November 1917
Extents of Survival		A significant amount of wreck remains lying upright on the seabed although broken into two pieces approximately 10m apart. The smooth and intact structure observed on the data suggests a high level of preservation. The remaining height stands at 4.8m which further backs this interpretation. However, it can be inferred that the most degradation would have occurred around the break in the structure where there is a depression observed in the data.



A sidescan sonar waterfall image of wreck 7004 and 7005, 21.8m x 7.8m x 4.8m and 12m x 7.3m x 4.1m



A multibeam bathymetry image facing northwest, x6 vertical exaggeration

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