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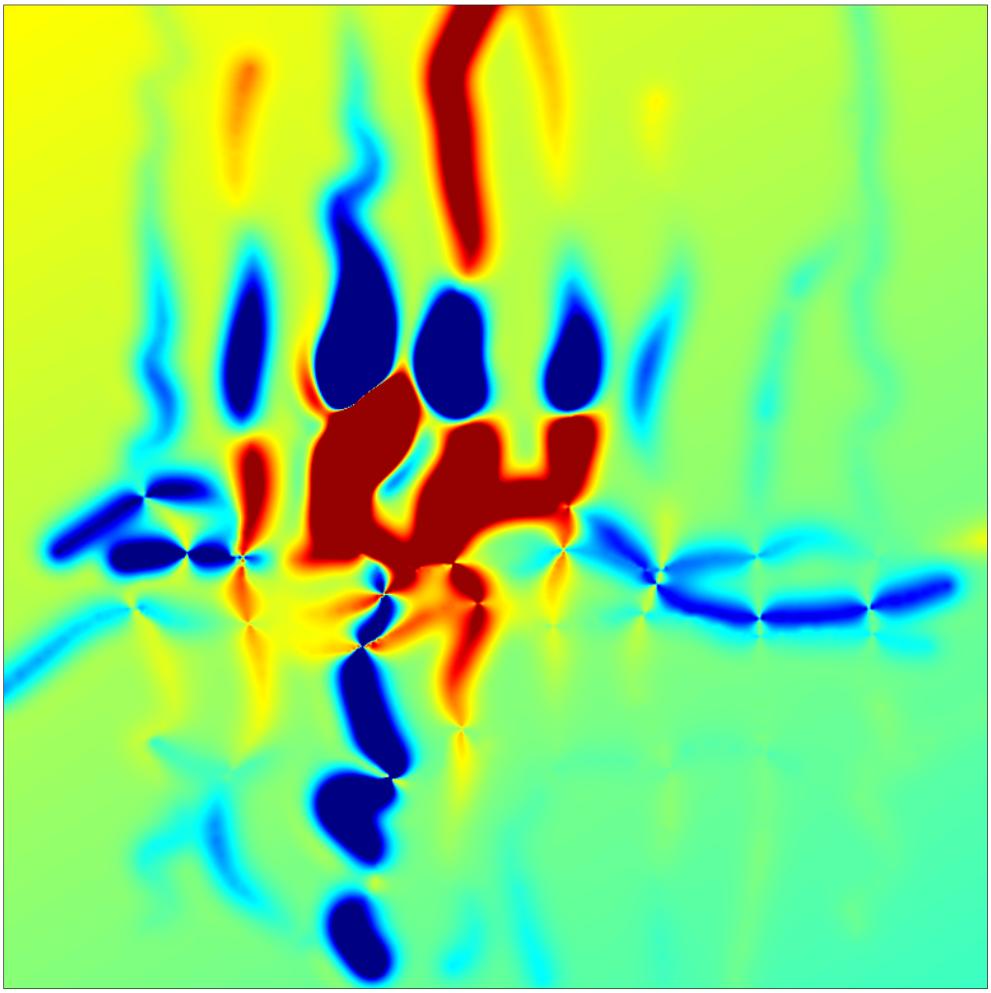
Archaeological Services in Relation to Marine Protection

UB12
Off Ramsgate

Marine Geophysical Survey and Archaeological Report



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Archaeological Services in Relation to Marine Protection

UB12
Off Ramsgate

Marine Geophysical Survey and Archaeological Report

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Marine Geophysical Survey and Archaeological Report

Contents

Summary iii
Acknowledgements iv

1 INTRODUCTION 1
1.1 Assessment Background 1

2 ASSESSMENT AIMS AND OBJECTIVES 1
2.2 Stage 1 1
2.3 Stage 2 1

3 METHODOLOGY 2
3.2 Data Audit 2
3.3 Geophysical Survey 2
Technical Specifications 2
Data Quality 3
Data Processing 3
Anomaly Grouping and Discrimination 4

4 RESULTS 5
4.1 Summary of Progress against Objectives 5
4.2 Site Position 5
4.3 Seabed Features Assessment 6
4.4 Historical Data 7
Specifications 7
Modifications 8
Ordnance 8
Loss 8
Wreck Location 8

5 DISCUSSION 8

6 ARCHIVE 9

7 REFERENCES 9
7.1 Bibliography 9
7.2 Online Sources 10
7.3 Charts 10

8 APPENDICES 11
8.1 Appendix 1: Gazetteer of Seabed Anomalies 11

Tables

Table 1: Criteria for assigning data quality rating 3
Table 2: Criteria for discriminating archaeological importance of features 4
Table 3: Summary table 5
Table 4: Site co-ordinates 6
Table 5: Sites of potential archaeological interest within the survey area 6

Figures

Figure 1: Site location
Figure 2: Sidescan sonar mosaic and gridded magnetometer data
Figure 3: Anomalies of potential archaeological interest
Figure 4: Magnetometer profile of anomaly **WA7000**

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Marine Geophysical Survey and Archaeological Report

Summary

Wessex Archaeology was commissioned by Historic England, through the Archaeological Services in Relation to Marine Protection (Diving) contract 2015-2017, to undertake a geophysical survey over the reported possible location of the UB12 wreck site off Ramsgate. The survey aimed to collect high resolution magnetometer and sidescan sonar data in order to establish its extent, stability and character.

Wessex Archaeology mobilised aboard *Site Seeker* at Whitstable, Kent on 1st July 2015 and the survey took place on 3rd July 2015 with Wessex Archaeology acquiring the marine magnetometer and sidescan sonar data, covering an area approximately 300 x 300m.

A total of 11 sites of archaeological potential were identified in the datasets. These include any anomalies associated with the given position and surrounding features of possible archaeological potential associated with this position. One very large magnetic anomaly, with an amplitude of 2577nT, has been designated as A1 – anthropogenic origin of archaeological interest. This position is located in approximately 5m LAT and approximately 11m southwest of the recorded UKHO position of the reported UB12 (possibly). The size and shape of the magnetic anomaly is consistent with a large quantity of ferrous material, but as a small scatter of surficial debris within the area would not be enough to produce this response, it must be inferred that this material is buried.

A further 10 anomalies were designated A2 – uncertain origin of possible archaeological interest, due to their uncertain structure identified within the survey area.

UB12
Off Ramsgate

Marine Geophysical Survey and Archaeological Report

Acknowledgements

Wessex Archaeology would like to thank Matthew Barnes of Barnes Offshore Ltd for providing the vessel and assisting with mobilisation. Steve Barnes skippered the *Site Seeker* on the survey day and we thank him and his crew for their assistance.

The investigation was commissioned by Historic England and the assistance of Alison James is gratefully acknowledged.

The geophysical survey was conducted by Stephanie Arnott and Laura Andrews of Wessex Archaeology. The report was compiled by Laura Andrews and Debra Shefi with figures provided by Kitty Foster. Quality control was provided by Stephanie Arnott, Louise Tizzard and Victoria Lambert. The project was managed on behalf of Wessex Archaeology by Toby Gane.

UB12
Off Ramsgate

Marine Geophysical Survey and Archaeological Report

1 INTRODUCTION

1.1 Assessment Background

1.1.1 Wessex Archaeology was commissioned by Historic England to undertake a geophysical survey of the wreck site thought to be the UB12 (UKHO 14934). The survey was designed to assess the presence, extent, stability and characteristics of the wreck in order to help establish identity. The work was undertaken as part of the Archaeological Services in Relation to Marine Protection (Diving) contract 2015-2017.

1.1.2 The wreck of the possible UB12 is located, approximately 4.5km off the coast, due east of Ramsgate (**Figure 1**). The study area comprised a 300m x 300m box within the geophysical survey area, orientated north to south in alignment with the tides, encompassing two positions provided for the wreck position: the UK Hydrographic Office (UKHO) wreck position and one provided in McDonald (1994).

1.1.3 The written brief and agreed scope of work (Historic England 2015) comprised a desk-based research element, a geophysical survey (sidescan sonar and magnetometer only) followed by diver survey. However, due to the combined results of the geophysical data and the desk-based assessment, no diver survey was subsequently undertaken as it was considered that there was not enough material or evidence to justify a diver survey. This report presents the methodology and results of the geophysical survey and subsequent archaeological assessment.

2 ASSESSMENT AIMS AND OBJECTIVES

2.1.1 The overall aim of the project was to compile an archaeological report. Detailed Stage 1 and Stage 2 were specified in the Client Brief (Historic England 2015), as follows:

2.2 Stage 1

- *Undertake a data audit comprising documentary research on the site as appropriate, to inform designation assessment;*
- *Establish links with local divers, dive groups and skippers to enable future site management options; and*
- *Undertake a geophysical survey (sidescan and magnetometer only) to assess the presence/absence of heritage assets, and to establish extent, stability and character.*

2.3 Stage 2

- *Undertake a diver survey of the remains. Confirm position, extent, stability and character (plotted by diver survey) of the site;*

- *Locate and accurately position (plotted by diver survey and probing as appropriate) any additional archaeological material; and*
- *Produce a structured record of field observations (including i) the collection of appropriate bed level pH level values and ii) the collection of footage suitable for broadcast); including a photographic record of the site and a basic site plan. Key artefacts are to be subject to detailed examination and recording (position by diver survey, taped measurements, photographs and video and written database entries).*

2.3.1 The Stage 1objectives were achieved by Wessex Archaeology; however, the secondary objectives were not undertaken due to the combined results of the geophysical survey and desk-based assessment.

2.3.2 The following products were specified in the Brief; this document is P1.

- *P1 – Archaeological Report (suitable for public release);*
- *P2 – Project archive/s compiled in accordance with current accepted standards; and*
- *P3 – Finds should also be logged appropriately with the Receiver of Wreck.*

3 METHODOLOGY

3.1.1 All fieldwork procedures and standards complied with the relevant guidance by the Chartered Institute for Archaeologists (CIfA; website accessed June 2015).

3.2 Data Audit

3.2.1 A limited audit of existing primary and secondary sources relevant to the site location has been undertaken, however this does not amount to a full desk-based assessment.

3.2.2 Existing data used throughout the assessment were as follows:

- *UKHO wreck and obstruction data;*
- *McDonald's Dive Kent: A Diver Guide (1994);*
- *National Record of the Historic Environment, Unique Identifier: 904896.*

3.3 Geophysical Survey

3.3.1 The geophysical data were acquired by Wessex Archaeology on-board the survey vessel MV *Site Seeker* on 3rd July 2015. The survey involved the acquisition of sidescan sonar and marine magnetometer data.

3.3.2 A study area was based on a 300m x 300m box within the geophysical survey area, encompassing known records of the possible UB12. Main survey lines were oriented north-south aligned with the predominant tidal orientation with cross lines oriented east-west.

Technical Specifications

3.3.3 The sidescan sonar data were acquired using a Klein 3900 system. The system was operated at 445kHz with a range of 50m per channel. An initial line spacing of 40m was used, with additional lines run if necessary to provide full data coverage. Towfish positioning information was provided by manual layback during processing. Data were recorded digitally using SonarPro software as .xtf files.

3.3.4 The marine magnetometer data were acquired using a Geometrics G-882 Caesium Vapour magnetometer operating at a frequency of 10Hz, towed independently on its own cable. The data were digitally logged in Hypack navigation software and later converted to .txt files for processing and interpretation.

3.3.5 Positioning for the survey was provided by a Hemisphere R110 DGPS receiver system, with the navigation data recorded using HyPack navigation software. All positions for the survey were recorded and expressed as WGS84 UTM31N.

Data Quality

3.3.6 The geophysical data used for this report were assessed for quality and their suitability for archaeological purposes, and rated using the following criteria:

Table 1: Criteria for assigning data quality rating

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

3.3.7 The sidescan sonar data have been rated as 'Average' using the above criteria. Some snatching due to tidal currents and weather are visible within the data, but this does not have a detrimental effect on the data. The positioning accuracy of the sonar towfish was relatively good despite strong tidal currents experienced during the survey as the length of towed cable used was relatively short. Positioning errors were rectified during data processing.

3.3.8 The marine magnetometer data have been rated as 'Average' using the above criteria with some spiking and background noise due to snatching by the tidal currents and weather; however these did not detrimentally affect the data. The positioning of the magnetometer towfish was relatively poor due to a combination of strong tidal currents experienced during the survey although the towfish was towed independently at a relatively short cable length. Positioning errors were rectified during processing.

Data Processing

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

3.3.10 A mosaic of the sidescan sonar data was produced (**Figure 2**) during this process to assess the quality of the sonar towfish positioning. The survey lines were smoothed, and the navigation corrected by applying individual fixed laybacks and vessel offsets, as recorded during the survey. This allows the position of anomalies to be checked between different survey lines and for the layback values to be further refined if necessary.

3.3.11 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.

3.3.12 The magnetometer data were processed using Geometrics MagPick software in order to identify any discrete magnetic contacts which could represent buried metallic debris or structures. The software enables both the visualisation of individual lines of data and gridding of data to produce a magnetic anomaly map.

3.3.13 The data were loaded into MagPick and laybacks and vessel offset values were added along with the sidescan sonar data. The data were then smoothed, a trend fitted to the results, and then the trend values subtracted from the smoothed values. This was carried out in an attempt to remove natural variations in the data (such as diurnal 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 and images taken in a similar process to that undertaken for the sidescan sonar data (**Figure 2**).

3.3.14 The form and size of a magnetic anomaly is a guide to its potential to be an anthropogenic feature. Generally single magnetic amplitudes of over 5nT identified along a short distance are interpreted to be of anthropogenic origin.

Anomaly Grouping and Discrimination

3.3.15 The previous section describes the initial interpretation of all available geophysical data sets. 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 around the wreck sites.

3.3.16 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 magnetic response and multiple sidescan sonar anomalies.

3.3.17 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:

Table 2: Criteria for discriminating archaeological importance of features

Non-Archaeological	U1	Not of anthropogenic origin
	U2	Known non-archaeological feature
	U3	Non-archaeological hazard
Archaeological	A1	Anthropogenic origin of archaeological interest

	A2	Uncertain origin of possible archaeological interest
	A3	Historic record of possible archaeological interest with no corresponding geophysical anomaly

3.3.18 All the anomalies that have been identified from around the wreck sites are presented in **Appendix 1** and **Figure 3**, and are discussed in this report.

3.3.19 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 for further evaluation should more information become available.

4 RESULTS

4.1 Summary of Progress against Objectives

4.1.1 **Table 2** shows the progress that has been made against the fieldwork objectives presented in **Section 2**.

Table 3: Summary table

Objective	Progress
Stage 1	
Undertake a data audit comprising documentary research on the site as appropriate, to inform designation assessment.	Achieved.
Contact the Receiver of Wreck and Historic England to gain a list of droits relating to the site.	Achieved. Historic England have no droit records in the area (pers. comm. H. Meara 02/11/2015).
Establish links with local divers, dive groups and skippers to enable future site management options.	Not undertaken based on desk-based research and results of the geophysical survey.
Undertake geophysical survey (sidescan and magnetometer only) to assess the presence/absence of heritage assets, and to establish extent, stability and character.	Achieved. Geophysical Survey was undertaken on 3rd August 2015. Geophysical data have been processed and an interpretation of the site undertaken.
Stage 2	
Undertake a diver survey of the remains. Confirm position, extent, stability and character (plotted by diver survey) of the site	Not undertaken
Locate and accurately position (plotted by diver survey and probing as appropriate) any additional archaeological material	Not undertaken
Produce a structured record of field observations	Not undertaken

4.2 Site Position

4.2.1 This site is located approximately 4.5km off Ramsgate, in approximately 5m LAT.

4.2.2 The following position has been derived from the geophysical data:

Table 4: Site co-ordinates

WGS84 Long/Lat (DDM)		WGS84 UTM 31N	
Longitude	E 01 29.979	**Easting**	395484
Latitude	N 51 20.100	**Northing**	5688148

4.3 Seabed Features Assessment

4.3.1 A total of 11 sidescan sonar and 11 magnetic anomalies were identified within the geophysical data (**Figure 3**). Following the grouping and discrimination procedure outlined above (**Section 3.3**), these were grouped to produce a list of 11 sites of potential archaeological interest within the survey area, which were characterised as follows:

Table 5: Sites of potential archaeological interest within the survey area

Archaeological Discrimination	Number of Anomalies	Interpretation
A1	1	Anthropogenic origin of archaeological interest
A2	10	Uncertain origin of possible archaeological interest
Total	**11**	

4.3.2 Anomaly **WA7000** has been classified as A1 (anthropogenic origin of archaeological interest); it is also an independent magnetic anomaly due to the size and apparent shape of the response. The highest central value of 2577nT was recorded as its position (**Figure 4**), which is located in approximately 5m LAT and approximately 11m southwest of the recorded UKHO position of the reported possible site of the UB12. The size and shape of the magnetic anomaly is consistent with a large quantity of ferrous material, but as a small scatter of surface debris within the area would not be enough to produce this response, it must be inferred that this material is buried.

4.3.3 Anomaly **WA7000** is considered likely to be the same feature previously recorded by the UKHO (UKHO 14934). The UKHO record details previous survey results: during a search of the reported loss in 1985 a small object protruding from the edge of a sandbank with a large magnetic anomaly was identified and a similar report was made in 1994. The location is recorded by the UKHO as a foul ground and is listed as UB12 (possibly). Based on the current geophysical evidence there is no surface feature and it is likely that the ferrous material has become completely buried.

4.3.4 The remaining 10 anomalies have been classified as A2; uncertain origin of possible archaeological interest. Of these, two have been interpreted as debris fields (**WA7004** and **WA7005**). A further three have been interpreted as individual pieces of possible debris (**WA7002**, **WA7003** and **WA7006**). None of these anomalies have an associated magnetic value, but it is possible that the response of **WA7000** is masking any smaller responses that may exist for these anomalies.

4.3.5 Two of these anomalies (**WA7002** and **WA7003**) are situated within 15m of the recorded UKHO position. Anomaly **WA7002** is situated 5m southeast of **WA7000** and consists of a rounded object measuring 4.8m x 1.9m x 0.7m. Anomaly **WA7003** is located 8m north east of **WA7000**. The anomaly is interpreted as a small oval object with a slight scour measuring 2m x 1.9m x 0.6m.

4.3.6 Anomaly **WA7004** is recorded as an array of clear bright reflectors measuring 11.6m x 11.2m in total with no discernible dark reflectors. From this it could be inferred that they

consist of material that absorbs acoustic waves instead of reflecting them (e.g. saturated wood or synthetic material). The feature is located in an area of high magnetic response and therefore any associated magnetic anomalies could be obscured.

4.3.7 Anomaly **WA7005** is recorded as an irregular angular area of dark reflectors, measuring 13.3m x 9.5m with no clear height shadow visible but interpreted as a possible debris field.

4.3.8 Anomaly **WA7006** is interpreted as a possible anchor situated approximately 65m southwest of the UKHO position and therefore it is not possible to ascertain its association. The feature has dimensions 3.2m x 2.9m x 0.8m.

4.3.9 One anomaly (**WA7007**) is classified as a seafloor disturbance comprising an array of dark curvilinear objects measuring 26.1m x 25.8m and located approximately 152m southwest of the UKHO position. It has no associated magnetic value and could represent natural material or buried non-ferrous material.

4.3.10 Two of the anomalies (**WA7008** and **WA7009**) are classified as dark reflectors located over 100m from **WA7000** position. Neither of these have an associated magnetic value and are likely to be non-ferrous.

4.3.11 The remaining two anomalies (**WA7010** and **WA7011**) are magnetic values only with no corresponding sonar contacts. Of these, **WA7010** has a recorded value of 49nT and has a position approximately 60m south of the possible wreck site. It could be an extension of the large anomaly but is a sharp monopole and so has been interpreted as a separate site of interest. Due to **WA7010**'s proximity to the large anomaly, its relationship to any of the sonar contacts is unclear.

4.3.12 Anomaly **WA7011** has been recorded in the south of the survey area with a value of 51nT. It has no associated sidescan sonar contact and could indicate the presence of buried ferrous material at this location.

4.4 Historical Data

4.4.1 The historical data used for this report were assessed for their suitability for comparison with the geophysical data.

Specifications

4.4.2 The U-boat UB12, a type UB-I submarine, was ordered on October 15th 1914, laid down November 7th 1914, launched on March 2nd 1915, and commissioned on March 29th 1915. UB12 was built by A.G. Weser in Bremen for the Flandern Flotilla, and measured 27.88m x 3.15m x 3.03m. The engines of the vessel consisted of a single 59 brake horsepower (44kW) Korting four cylinder diesel engine for surface travel, and a single 119 shaft horsepower (89kW) Siemens-Schuckert electric motor for underwater travel. Both engines were attached to single propeller (Tarrant 1989).

4.4.3 The size and structure of the submarine was designed for ease of transport via railway, and thus was directly related to constraints from railroad tracks and rail size (e.g. 28m in length and 3.15m in beam). The aim was to transport a deconstructed submarine via rail, to a designated port of operation, and then assemble the vessel from the component parts. As such, the railroad size limited the length and beam of submarine components.

4.4.4 Investigation of the specifications for UB-I type vessels suggest they were designed as seaworthy diving boats rather than as true submarines, which was reflected in their

dissimilar shape to the contemporary British Holland class design. The hull comprised conical sections riveted together, giving an angular shape at the waterline. The pressure hull had an almost circular cross-section, but it was made slightly elliptical to accommodate the two side by side bow torpedo tubes. There was a short superstructure in the forward section, and a narrow floodable upper deck that ran the length of the vessel, with a relatively large bridge placed on top (Rössler 2001).

Modifications

4.4.5 From November 1916 to January 1917, UB12 underwent conversion to a minelayer. At this time, the bow section containing the pair of torpedo tubes was removed, and replaced with a new bow containing four mine chutes capable of carrying two mines each. Subsequently, the length of the vessel was increased to 32m (Messimer 2002).

Ordnance

4.4.6 The vessel was initially designed with a single 8mm machine gun on deck and two 45cm C/03 torpedoes in each of the bow torpedo tubes (Karau 2003; Rössler 2001). The torpedoes were removed during the 1916-1917 conversion.

4.4.7 After conversion, UB12 maintained the machine gun for defence and carried eight mines.

Loss

4.4.8 Reports established that the submarine departed Zeebrugge to lay mines off the North Downs on August 19th 1918 and was never seen again. All 19 crew were lost (U-boat database, website accessed 14/01/2016).

4.4.9 British sources state that the submarine hit a British mine off Heligoland in August 1918 (Gibson and Prendergast 2003), but that location was nowhere near UB12's route from Zeebrugge to the Downs (Grant 2002; Messimer 2002). A post-war German study also identified that there were no new British mines in UB12's patrol area, suggesting the submarine was sunk accidentally by its own mine (McDonald 1994; Messimer 2002).

4.4.10 Messimer (2002) suggests that instead of striking a mine, UB12 could have sunk due to a mechanical failure related to its recent conversion.

Wreck Location

4.4.11 Historical data establishes that a number of U-boats, including UB12, were sent to mine the Downs and failed to return. In 1976, the UKHO identified wreckage protruding from a sandbank at this location which was thought to be UB12 (McDonald 1994). However, according to Young and Armstrong (2006), sport divers have identified a wreck off Flanders as UB12.

5 DISCUSSION

5.1.1 Located 11m southwest of the UKHO recorded position of the possible UB12, a very large magnetic anomaly of 2577nT was identified (**WA7000**), indicating the presence of a large amount of buried ferrous material. The size of the magnetic anomaly is too small to correspond to UB12 if it was buried just below the seabed surface. Considering the known geology of this area, it is unlikely for a U-boat to be buried at sufficient depth to correspond with the measured magnetic anomaly. However, it cannot be stated for certain whether this indicates the presence of a wreck at this location or not.

5.1.2 A total of 11 features of archaeological potential were identified across the survey area, including the large magnetic anomaly and two pieces of possible debris (**WA7002** and

WA7003) within 15m of the recorded position. Further features including interpreted debris, dark reflectors and magnetic only anomalies were also identified.

5.1.3 Further ground-truthing of the site (i.e. diver and/or Remotely Operated Vehicle (ROV) surveys) would be required to verify the interpretation of the exposed features and to assess the likelihood of buried features at the site, but this would only be worthwhile if a sufficient section of the anomaly were to become exposed.

5.1.4 Based on the geophysical data included in this report, it is unlikely that the site investigated in this survey is that of the UB12. This conclusion is further supported by the historical sources outlined above and the discovery of the potential wreck off Flanders.

6 ARCHIVE

6.1.1 The project archive consists of a hard copy file and computer records, including raw geophysical data and is currently stored at Wessex Archaeology under project code 108280. The project archive will be transferred to the accredited repository of the National Record of the Historic Environment.

6.1.2 Shapefiles generated for the project comply with Marine Environment Data and Information Network (MEDIN) standards for metadata (Seeley *et al.* 2014).

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7.2 Online Sources

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7.3 Charts

Admiralty Chart 1607 (2015).

8 APPENDICES

8.1 Appendix 1: Gazetteer of Seabed Anomalies

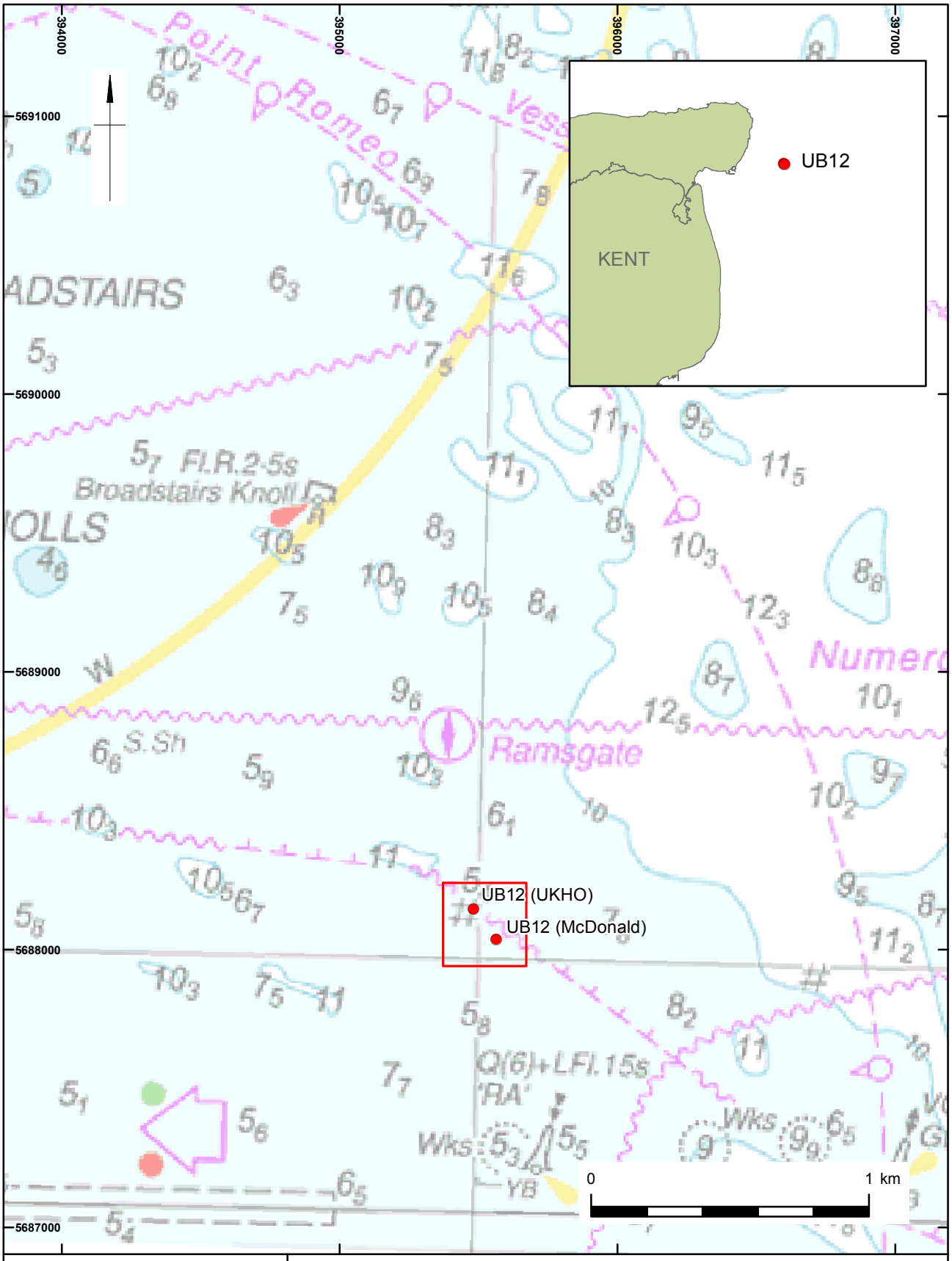
WA ID	Classif-ication	Easting (UTM 31N)	Northing (UTM 31N)	Latitude (WGS 84 DDM)	Longitude (WGS 84 DDM)	Archaeological Discrimination	Length (m)	Width (m)	Height (m)	Magnetic Amplitude (nT)	Description	External Refs
7000	Magnetic	395473	5688143	N 51 20.097	E 01 29.970	A1	-	-	-	2577	Large magnetic anomaly which seems to fade at either end. Scatter of surface debris visible but nothing that would cause such a high magnetic response therefore concludes that substantial quantity of ferrous material buried beneath the sand. Response covers approximately 200m by 150m which would mask smaller magnetic responses, but ferrous object(s) would not necessarily be this large. UKHO position recorded as foul ground; UB12 (possibly), however the UB12 is now thought to be in Flanders. The size of the magnetic anomaly suggests that something is buried at this location but cannot be sure if it is a wreck.	UKHO 14934

WA ID	Classif-ication	Easting (UTM 31N)	Northing (UTM 31N)	Latitude (WGS 84 DDM)	Longitude (WGS 84 DDM)	Archaeological Discrimination	Length (m)	Width (m)	Height (m)	Magnetic Amplitude (nT)	Description	External Refs
7002	Debris	395476	5688139	N 51 20.095	E 01 29.971	A2	4.8	1.9	0.7	-	Rounded object with corresponding rounded bright shadow located 5m southeast from the centre of a very large magnetic anomaly; could be debris. In area of magnetic anomaly **WA7000** so independent magnetic anomaly would be masked. Close to **WA7003** but definitely two separate anomalies.	-
7003	Debris	395484	5688141	N 51 20.096	E 01 29.980	A2	2	1.9	0.6	-	Indistinct oval object with rounded bright shadow. Slight scour around. Could be debris. Located 11m east of centre of very large magnetic anomaly. In area of magnetic anomaly WA7000 so independent magnetic anomaly would be masked. Close to **WA7002** but definitely two separate anomalies.	-

WA ID	Classif-ication	Easting (UTM 31N)	Northing (UTM 31N)	Latitude (WGS 84 DDM)	Longitude (WGS 84 DDM)	Archaeological Discrimination	Length (m)	Width (m)	Height (m)	Magnetic Amplitude (nT)	Description	External Refs
7004	Debris Field	395493	5688055	N 51 20.050	E 01 29.989	A2	11.6	11.2	-	-	Array of linear bright reflectors, anomalous to the rest of the seabed and on the edge of the trackplot. Consist of H-shape (possibly oval as could connect at visible end) and a further curvilinear, also could be oval. Large H measures approx. 14.5m by 5m. In an area of high magnetic value, 30m away from **WA7010**, but as large value of **WA7000** obscures everything. Cannot be sure they are associated.	-
7005	Debris Field	395538	5688151	N 51 20.102	E 01 30.026	A2	13.3	9.5	-	-	Irregular angular area, looking different to the rest of the seabed, an array of linear dark objects approx. Longest is approximately 10m by 3m. 66m, located east of and within area covered by magnetic anomaly **WA7000** so independent magnetic anomaly would be obscured.	-

WA ID	Classif-ication	Easting (UTM 31N)	Northing (UTM 31N)	Latitude (WGS 84 DDM)	Longitude (WGS 84 DDM)	Archaeological Discrimination	Length (m)	Width (m)	Height (m)	Magnetic Amplitude (nT)	Description	External Refs
7006	Debris	395444	5688096	N 51 20.072	E 01 29.946	A2	3.2	2.9	0.8	-	Irregular dark indistinct object with bright shadow indicating perpendicular shape. 55m southwest of **WA7000**. Shadow looks to be in the shape of an anchor. Independent magnetic anomaly would be masked by that of **WA7000**.	-
7007	Seafloor Disturbance	395384	5688033	N 51 20.037	E 01 29.895	A2	26.1	25.8	-	-	Array of dark curvilinears, with one small very round dark reflector and corresponding shadow, around the centre. Anomalous to other stretched data in the line. This area of seabed was not covered by any other line as on the edge of survey area. Located 142m southwest of **WA7000**. Unclear if covered by magnetometer data but no associated anomaly.	-
7008	Dark Reflector	395600	5688134	N 51 20.094	E 01 30.080	A2	1.7	3.6	0.3	-	Rounded thick edge on the crest of a sandwave with a large bright shadow very clearly not part of the surrounding sandwave formation. Unclear if covered by magnetometer data but no associated anomaly. Located 128m east of **WA7000**.	-

WA ID	Classif-ication	Easting (UTM 31N)	Northing (UTM 31N)	Latitude (WGS 84 DDM)	Longitude (WGS 84 DDM)	Archaeological Discrimination	Length (m)	Width (m)	Height (m)	Magnetic Amplitude (nT)	Description	External Refs
7009	Dark Reflector	395679	5687997	N 51 20.021	E 01 30.150	A2	2.9	1.1	-	-	Angled dark edge of an object near the middle of the trackplot, so rest could be obscured. The edge measures 0.2m in width. Unclear if covered by magnetometer data but no associated anomaly. Located approximately 250m southeast of **WA7000**.	-
7010	Magnetic	395478	5688082	N 51 20.064	E 01 29.975	A2	-	-	-	49	Small positive monopole, which could be an extension of **WA7000** but is quite sharp so could indicate nearby buried debris. Could be associated with **WA7004**.	-
7011	Magnetic	395466	5687947	N 51 19.992	E 01 29.967	A2	-	-	-	51	Isolated broad dipole approx. 160m away from large anomaly **WA7000**.	-



Target locations

Study area

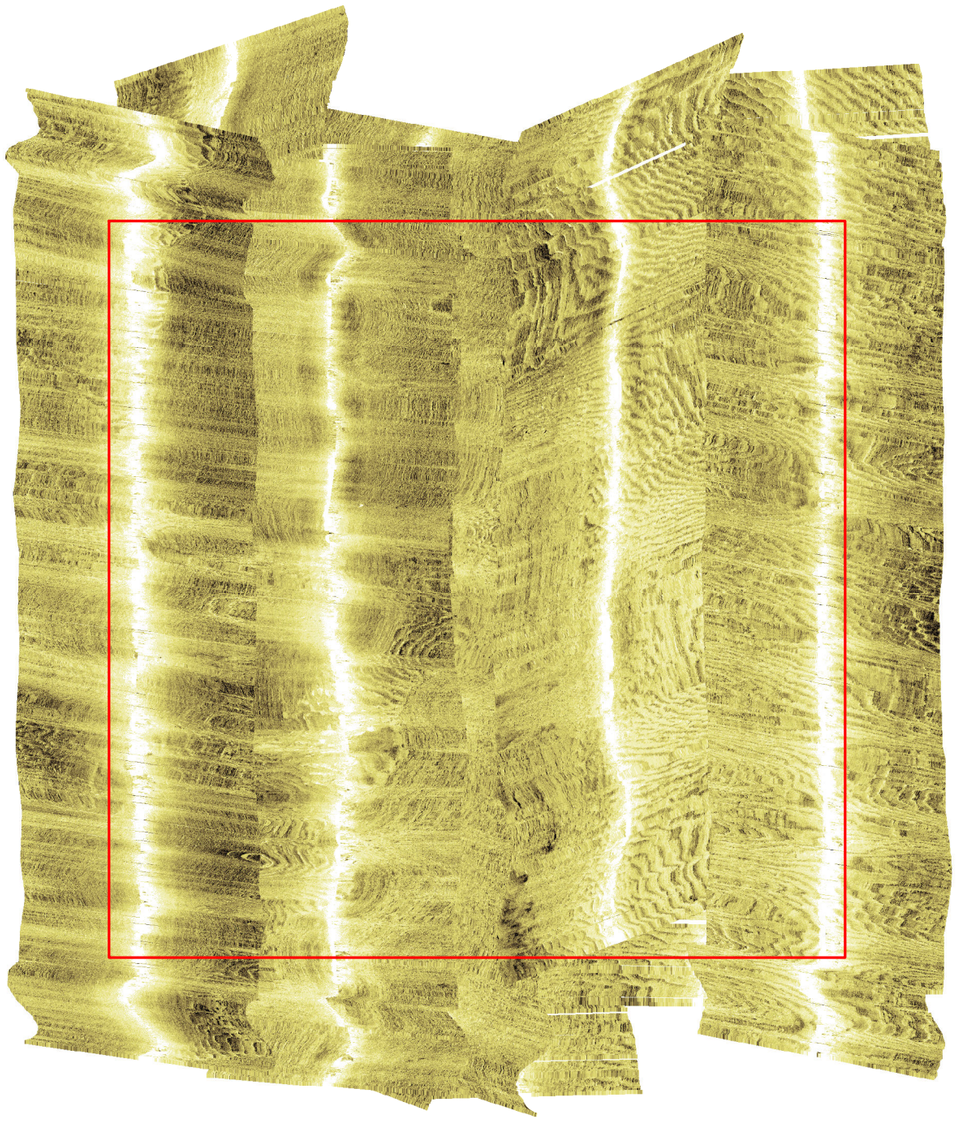
Drawing projection: UTM WGS84 z31N
Admiralty chart no. 1607

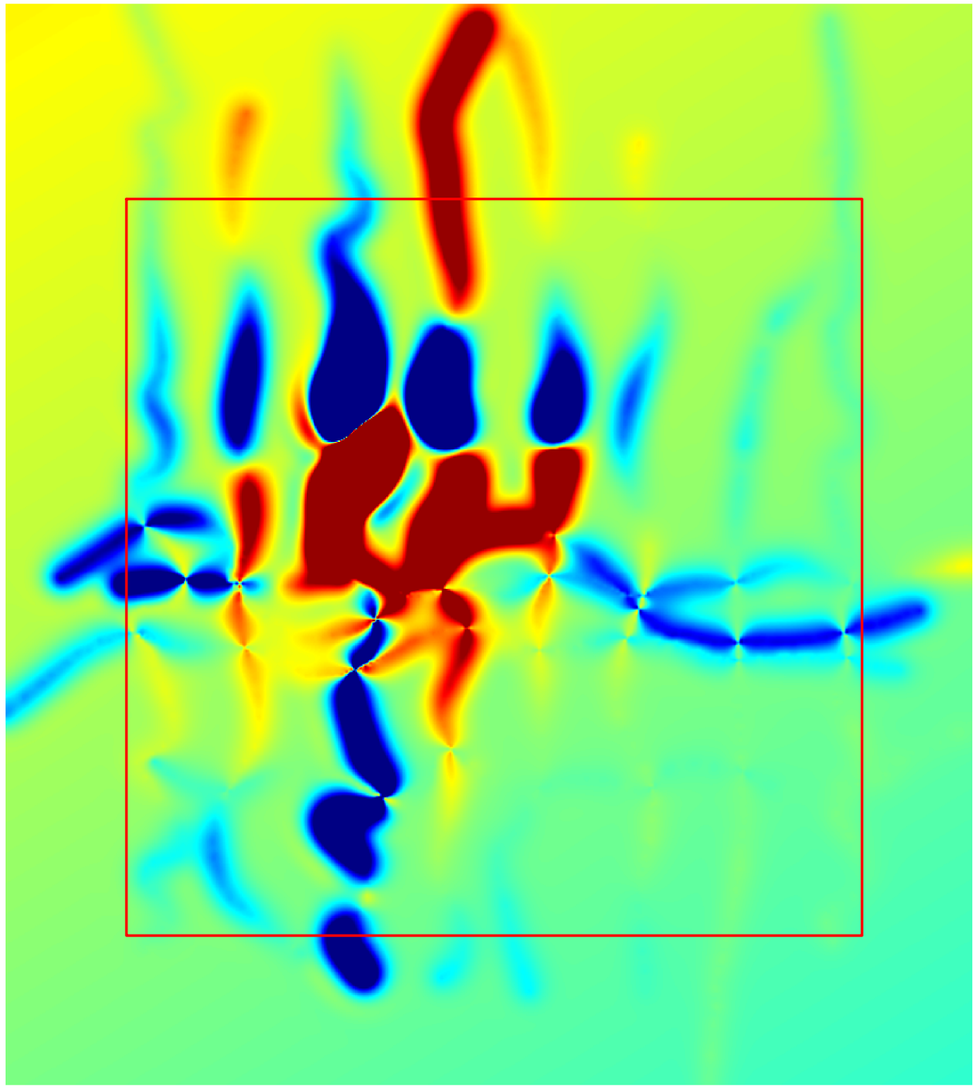
Date:	06/11/2015	Revision Number:	0
Scale:	1:20,000 at A4	Illustrator:	KJF
Path:	W:\Projects\108280\7 - Graphics Office\Rep figs\UB12\2015_11_06		

Site location

Figure 1

A. Sidescan sonar mosaic





5688300
5688200
5688100
5688000
5687900

395300 395400 395500 395600 395700

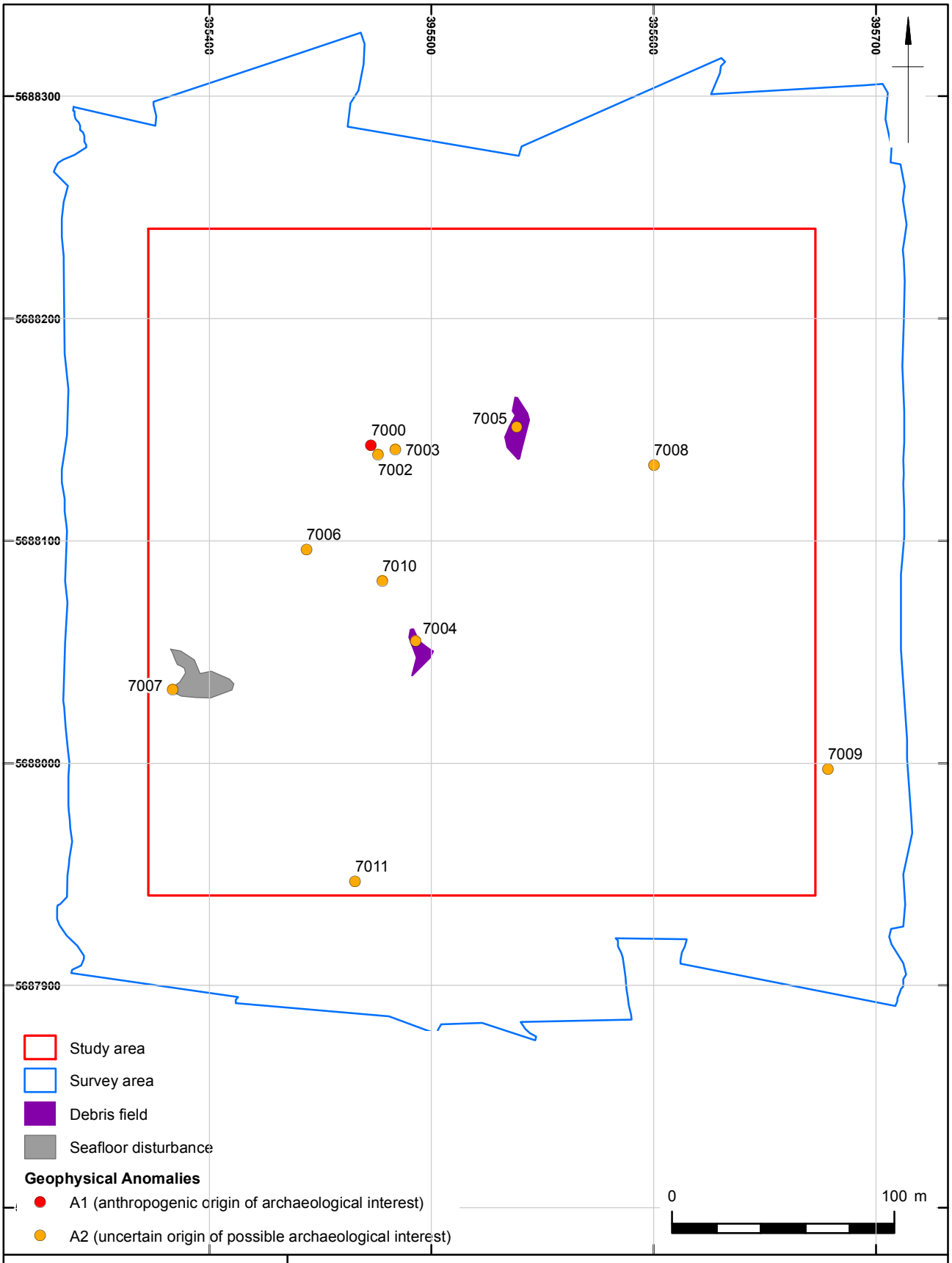
Study area

0 100 m

Date:	06/11/2015	Revision Number:	0
Scale:	1:2500 at A3	Illustrator:	KJF
Path:	W:\Projects\108280\7 - Graphics Office\Rep figs\UB12\2015_11_05		

Sidescan sonar mosaic and gridded magnetometer data

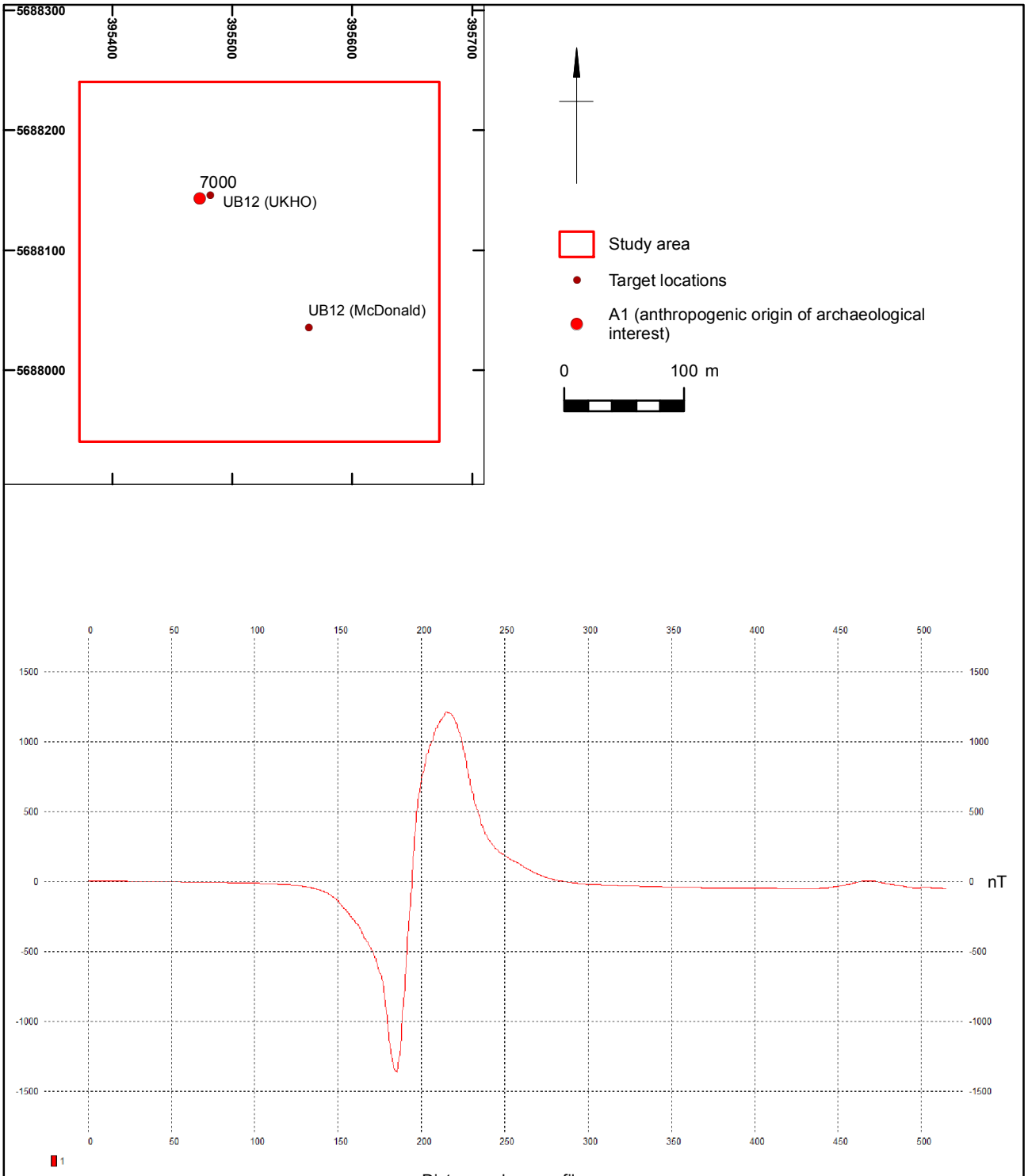
Figure 2



Date:	06/11/2015	Revision Number:	0
Scale:	1:2500 at A4	Illustrator:	KJF
Path:	W:\Projects\108280\7 - Graphics Office\Rep figs\UB12\2015_11_05		

Anomalies of potential archaeological interest

Figure 3



Date:	06/11/2015	Revision Number:	0
Scale:	1:2500 at A4	Illustrator:	KJF
Path:	W:\Projects\108280\7 - Graphics Office\Rep figs\UB12\2015_11_05		

Magnetometer profile of anomaly WA7000 Figure 4

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