

The Network Rail (Parsons Tunnel to Teignmouth Resilience) Order



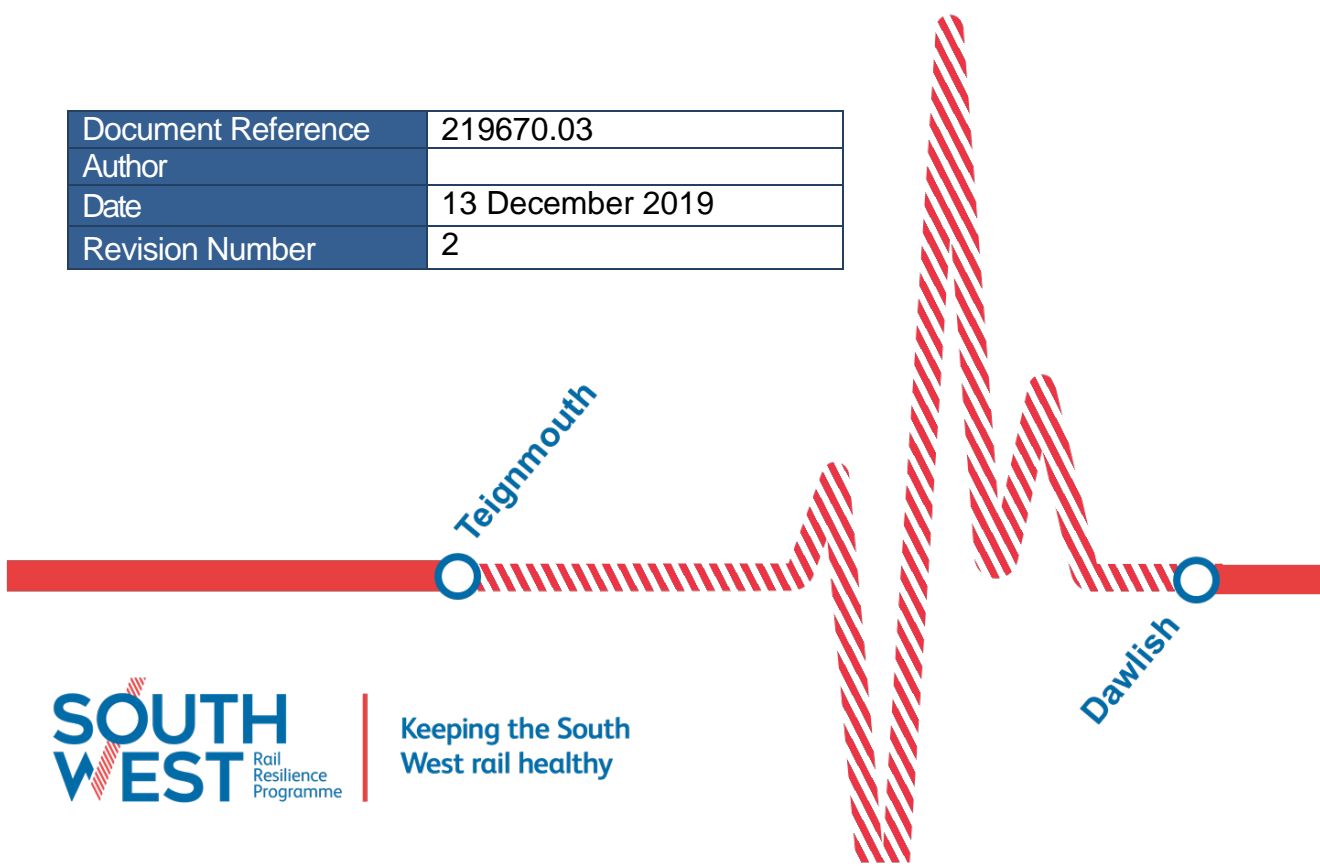
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The Network Rail (Parsons Tunnel to Teignmouth Resilience) Order

Teignmouth Designated Wreck Survey

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Teignmouth Designated Wreck Survey

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The Network Rail (Parsons Tunnel to Teignmouth Resilience) Order

Teignmouth Designated Wreck Survey

219670.03 (V2)

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1. EXECUTIVE SUMMARY

- 1.1.1 Wessex Archaeology was commissioned by Arcadis LLP, on behalf of Network Rail, to undertake a geophysical survey, and assessment of the collected data, over the 'Church Rocks' designated wreck site at Teignmouth, Devon. This was undertaken as part of assessments in advance of proposed improvements to the railway line between Holcombe and Teignmouth.
- 1.1.2 The wreck was discovered off a reef near Teignmouth in 1975. Various excavations have recovered a number of guns and other items. The ordnance was uniformly of Venetian origin and interpretations of the vessel range from an armed Venetian merchantman to a communications vessel associated with the 1588 Armada.
- 1.1.3 The survey was undertaken in October 2019 over the designated area, which measures 180 x 150 m. The site is often covered in up to 1.5 m of sediment, sometimes more, although it is periodically exposed. Sub-bottom profiler (SBP) data using a parametric sonar and magnetometer data were acquired by the survey. Multibeam echosounder (MBES) data collected in 2007 were acquired through the United Kingdom Hydrographic Office (UKHO) INSPIRE data portal and also assessed.
- 1.1.4 No definitive evidence of the wreck site was identified in the geophysical data. However, 21 anomalous features, which are interpreted as being of possible anthropogenic origin, are identified in the data within the study area. Although these cannot be conclusively associated with the wreck site, the possibility of some or all of these features being related to the wreck site remains.
- 1.1.5 If the designated area is subject to impacts from works associated with the railway line then further site investigations will be required. Ground-truthing by diver or remotely operated vehicle (ROV) would be needed to verify the interpretation of anomalies and assess the likelihood of buried features as well as assess the nature of the impacts. Excavation would be necessary unless the thickness of overlying sediment reduced sufficiently to expose the wreck site.
- 1.1.6 If objects of possible archaeological interest are identified or recovered during any operations it is recommended they are reported to the Retained Archaeologist via a pre-agreed protocol. This will determine whether the objects are of archaeological interest and recommend appropriate mitigation.
- 1.1.7 The designated area should be marked on all charts and drawings to ensure the avoidance of development works within it or that would impact on it.

2. INTRODUCTION

2.1 Project background

- 2.1.1 Wessex Archaeology was commissioned by Arcadis LLP, on behalf of Network Rail, to undertake a geophysical survey, and subsequent assessment of the geophysical data, over the 'Church Rocks' designated wreck site in Teignmouth, Devon.
- 2.1.2 This was undertaken as part of assessments in advance of proposed improvements to the railway line between Holcombe and Teignmouth. The proposed scheme involves the re-alignment of the railway line out towards the sea on a new coastal defence (combined seawall and rock revetment structure), planned to run parallel with the current railway line. The realignment of the railway will enable land to be reclaimed being the new coastal defence on to which cliff stabilisation works will be constructed to protect the cliffs from future failure.
- 2.1.3 The Church Rocks protected wreck site is thought to be the remains of a late sixteenth century armed cargo vessel, possibly a Venetian trading galley, stranded on Church Rocks off Teignmouth, Devon. It is located approximately 120 m from the shore (Figure 1), in recorded water depths of 0 – 2 m CD (Chart Datum).
- 2.1.4 The site was first discovered in 1975 by a snorkeler and, based on material recovered, is believed to be the remains of a sixteenth century Venetian armed merchant vessel, probably a galley rather than a warship (Historic England 2019). As such, the site was designated by Historic England under the Protection of Wrecks Act 1973. The extent of the wreck is seemingly unknown, but is defined by an area measuring 180 x 150 m. This area was used as the study area. Historic England state that the site is often covered in up to 1.5 m of mobile sediment overlying rock gullies, indicating the site is periodically both exposed and completely buried. This has been confirmed by the local licensee of the wreck, who added that the depth of burial may be more than this.
- 2.1.5 In 2007, a MBES survey was carried out as part of the Southwest Regional Coastal Monitoring Programme. This data, which is owned by Teignbridge District Council, was made available through the UKHO INSPIRE data portal. Initial analysis of the 2007 data indicates some rock exposures close to shore and sediment coverage throughout most of the site, although it is not possible to determine the thickness of sediment coverage.

2.1.6 The 2019 survey involved the acquisition of SBP and magnetometer data over the study area. This report contains an assessment of these datasets together with the MBES data from 2007.

2.2 Archaeological background

2.2.1 The 'Church Rocks' wreck was discovered off a reef near Teignmouth, Devon, in 1975 by 13 year old Simon Burton while he was out snorkelling, and not long after, a cannon was recovered from the site. Excavation and survey work have taken place from 1975 to 1983 and again from 1990 onwards (Fenwick and Gale 1998; Preece 2004; Preece and Burton 1993; Ruddock 2000).

2.2.2 In 1977, cannon balls and swivel guns were found, followed by a second cannon, still attached to the remains of a wooden gun carriage (Fenwick and Gale 1998). It was thought that the site was becoming exposed because new beach groynes had changed the sedimentation regime in the area, and therefore the second cannon was also recovered to protect it. Following these discoveries, the site was designated as a Protected Wreck.

2.2.3 Overall, six bronze guns were lifted: a saker (on display at Pendennis Castle); two smaller minions (one an Alberghetti, which suggested a date of 1582); and three swivel guns complete with their iron breech blocks, wedges, swivels and chains (Fenwick and Gale 1998; Preece 2004; Preece and Burton 1993; Tomalin *et al* 1988).

2.2.4 In 1990 work continued on the site, however by then there was 1-2 m of mobile sand over the area (Fenwick and Gale 1998).

2.2.5 Excavations in 1992 revealed a 7.3 m x 1.2 m section of carvel built stern and lower starboard hull (Fenwick and Gale 1998; Preece and Burton 1993). Analysis on the timber revealed it was made of oak, and it had predominantly iron fittings (Preece 2004).

2.2.6 In 1995, Time Team visited the wreck site (Time Team 1995), and worked with Chris Preece, the Project Director, to investigate the site. At this time, geophysical survey was undertaken, including sonar, SBP and magnetometer. The survey results were inconclusive, with Clive Sawyer, the project geophysicist noting that if there was anything hard on the seabed, it should have been picked up. However, he also noted that water-logged timbers would likely have the same acoustic density as sand, and therefore they may not be visible. It was also suggested that the timbers could have been lost during the stormy weather in 1994. Underwater excavations with an airlift exposed wooden timbers approximately 4 feet (1.2 m) under the

seabed. The timbers were fastened with concreted nails, and the presence of the sternpost indicated that this was part of the stern of the vessel.

2.2.7 In 1998, the site was covered with an unprecedented 5 m of mobile sand (Ruddock 2000: 14). However, sediment levels are likely to fluctuate from year to year.

2.2.8 A range of material has been recovered from the site. In addition to the ordnance of uniformly Venetian origin, there has been: earthenware from Lisbon; a copper cooking cauldron, with bones of sheep, cattle and fowl; a merchant brand; a copper alloy seal; copper alloy caulking pot; lead sheeting; a number of tools; nails; copper utensils; and Chinese porcelain (Hamel 2007; Preece and Burton 1993; Preece 2004; Ruddock 2000; and Teignmouth Museum & Historical Society 1992). Some of the bones discovered on the wreck site have been identified as human (Teignmouth Museum & Historical Society 1992).

2.2.9 Interpretations of the vessel range from an armed Venetian merchantman to a communications vessel associated with the 1588 Armada.

2.3 Aims and objectives

2.3.1 The aim of the survey was to record the extent and depth of the wreck as well as its precise location. This was to be achieved by undertaking a geophysical survey of the area surrounding the last known position of the wreck and surrounding area.

2.3.2 Objectives of this project are as follows:

- Undertake a geophysical survey investigating an area over and surrounding the wreck location;
- Assess the data for any possible buried anomalies;
- Assess the likelihood that any anomalies are related to the wreck site;
- Make recommendations for any future work which would further our understanding of the wreck site.

2.4 Co-ordinate system

2.4.1 The survey data were acquired in WGS84 UTM30N and the results are presented in the same coordinate system.

3. METHODOLOGY

3.1 Data sources

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

- Geophysical survey datasets acquired by Wessex Archaeology, consisting of magnetometer and SBP data;
- MBES data owned by Teignbridge District Council downloaded from the UKHO INSPIRE website. These data are made available under the terms of the Open Government License, in compliance with the ‘Infrastructure for Spatial Information in Europe’ (INSPIRE) initiative; and
- Information on the wreck site, as provided by Historic England (Historic England 2019) and the UKHO record (18302).

3.2 Geophysical data – technical specifications

3.2.1 Geophysical data were acquired by Wessex Archaeology aboard the vessel *Spot On* in October 2019. The vessel was mobilised on 21 October and the survey undertaken on 22 and 23 October. The vessel was demobilised following the survey on 24 October.

3.2.2 SBP data were acquired using a parametric sonar, and magnetometer data were also collected. Further details on the equipment used are in Table 1.

| Survey Company | Survey Vessel | Data Type | Equipment | Data Format |
|--------------------|----------------|-------------|--|-------------|
| Wessex Archaeology | <i>Spot On</i> | SBP | Innomar SES-2000 (standard) parametric sub-bottom profiler | .se3 |
| | | Mag. | Geometrics G-882 | .survey |
| | | Positioning | Hemisphere R330 GNSS GPS | N/A |

Table 1: Summary of survey equipment

3.2.3 A buoy was attached to the magnetometer to ensure it remained close to the surface in the shallow water of the survey area and to avoid contact with the seabed. The parametric sonar transducer was mounted on a pole and deployed over the starboard side of the vessel.

3.2.4 Data were acquired along the main survey lines aligned approximately south-west to north-east and with a line spacing of 5 m. The cross-lines were orientated north-west to south-east at a line spacing of 25 m.

3.2.5 Owing to the proximity of the survey area to the shore it was not possible to run all planned survey lines, and the three most northerly of the planned main lines could not be run for reasons of vessel safety. This resulted in a small triangular section, 20 m in width and with the longest side measuring 40 m, of the north-west corner of the study area not being covered (Figure 1).

3.2.6 In addition, the cross-lines were extremely difficult to run as they were oriented perpendicular to the shore. The vessel operators found it easier to run them towards the shore, but a single cross-line was run heading away

from shore to ensure that they could be used for improving the positioning of the survey data. Not all cross-lines could be run in their entirety, or accurately, owing to the proximity to the shore, the currents, and the swell, which picked up on the afternoon of 23 October.

3.2.7 Lines were re-run if the vessel strayed off line by over 5 m, apart from those lines run late afternoon on 23 October when the increased swell made it difficult to keep on line. A total of 66 lines of SBP data and 47 lines of magnetometer data were acquired. Not all cross-lines could be acquired with the magnetometer because towing the equipment behind the vessel restricted the ability of the vessel to manoeuvre close inshore.

3.2.8 As reported in the daily progress reports during the survey, two incidents occurred associated with the shallow water nature of the operations:

- The magnetometer towfish snagged the seabed, resulting in the parting of the tow cable. As the towfish was buoyed it was recovered intact and the spare tow cable deployed. However, troubleshooting issues with connections resulted in delays of several hours, impacting survey duration; and
- The parametric sonar suffered minor cosmetic damage when it made contact once with the seabed in shallow water; no further delay or cost resulted.

3.3 Geophysical data – processing

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

| Dataset | Processing Software | Interpretation and Rationalisation |
|---------|---|------------------------------------|
| SBP | Innomar ISE v2.9.5, Innomar SES Convert v 2.3.2.6, CodaOctopus File Utilities v 3.2, CodaOctopus Survey Engine v5.7 | ArcMap v10.6.1 |
| MBES | QPS Fledermaus v7.7.5 | |
| Mag. | Geometrics MagMap2000 v5.02, Geometrics MagPick v3.25 | |

Table 2: Software used for geophysical assessment

3.3.2 The SBP data were prepared for processing and then converted into .raw files using Innomar ISE software. The .raw files were converted into .sgy format using Innomar SES Convert and then into .cod files using CodaOctopus File Utilities.

3.3.3 The .cod files 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 buried features that might be of archaeological interest.

- 3.3.4 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.
- 3.3.5 The SBP was 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. However, the line spacing of 5 m used for this survey was considered high resolution enough for any such anomalies relating to the wreck site to be identified.
- 3.3.6 The MBES data were analysed to identify any unusual seabed structures that could be shipwrecks or other anthropogenic debris. The data were gridded at 3 m and analysed using QPS Fledermaus software, which enables a 3-D visualisation of the acquired data and geo-picking of seabed anomalies.
- 3.3.7 The magnetometer data were prepared for processing using Geometrics MagMap software and then processed using Geometrics MagPick software in order to identify any magnetic contacts which could be related to the wreck.
- 3.3.8 This 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 of the tagged anomalies, which aid in further interpretation and form part of the project archive.

3.4 Geophysical data – data quality

- 3.4.1 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).

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| 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. |

Table 3: Criteria for assigning data quality rating

- 3.4.2 The quality of the SBP data has been rated as ‘Good’ using the above criteria. Some slight interference is visible in some lines, however this does not affect the data to a significant degree and, as such, the data is considered suitable for archaeological assessment. It is possible that some of the interference may be related to engine noise or vibration transmitted through the hull and into the pole, however, efforts were made to minimise this.
- 3.4.3 The MBES data were rated as ‘Below Average’ using the above criteria. The data quality was found to be of a reasonable standard but the resolution of 3 m was only suitable for archaeological assessment of objects and debris over 10 m in size.
- 3.4.4 The magnetometer data have been rated as ‘Good’ using the above criteria table and are suitable for archaeological assessment. The shallow water depth meant that the magnetometer was towed close to the seabed and should therefore be able to provide a detailed picture of the wreck site. The background geology however means that the magnetic background is relatively high, particularly close inshore and adjacent to rocks, and smaller anomalies may be masked by the background. The quality of the data itself

is good with very little noise or spiking and was therefore able to provide an overview of the wreck site.

3.5 Geophysical data – anomaly grouping and discrimination

- 3.5.1 The previous section describes the initial interpretation of all available geophysical datasets which were conducted independently of one another. This inevitably leads to the possibility of any one object being the cause of numerous anomalies in different datasets and apparently overstating the number of archaeological features in the exploration area.
- 3.5.2 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 magnetometer anomaly and a MBES anomaly.
- 3.5.3 Once all the geophysical anomalies and desk-based information have been grouped, a discrimination flag is added to the record in order to discriminate against those which are not thought to be of an archaeological concern. For anomalies located on the seabed, these flags are ascribed as follows (Table 4).

| Overview Classification | Discrimination | Criteria | Data Type |
|-------------------------|----------------|--|-----------------|
| Archaeological | A2 | Uncertain origin of possible archaeological interest | MBES, Mag., SBP |
| Non-archaeological | U1 | Not of anthropogenic origin | MBES, Mag., SBP |
| Non-impact | O1 | Outside horizontal footprint of study area | MBES, Mag., SBP |

Table 4: Criteria discriminating relevance of identified features to proposed scheme

- 3.5.4 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.

4. SEABED FEATURES ASSESSMENT

4.1 Introduction

- 4.1.1 The geophysical data were assessed to identify features of archaeological potential relating to the wreck site and provide information on the extent, stability and character of the wreck site.

4.2 Seabed features assessment results

- 4.2.1 The results of this assessment are collated in gazetteer format detailed in Appendix A and illustrated in Figures 2 – 5.
- 4.2.2 It should be noted that the area of increased magnetic response to the north of the study area (Figure 2) is because of the close proximity of the rocky shoreline. The rocks extend out further from the shore here than they do within the study area. This can be seen in the MBES data (Figure 3). In addition there is also a beacon here which may well have some ferrous content and contribute to the higher magnetic response.
- 4.2.3 There is no definitive evidence of the wreck site identified in the geophysical data. However a total of 21 anomalous features, which are interpreted as being of possible anthropogenic origin, are identified in the geophysical data within the study area (Figure 3). Although these cannot be conclusively associated with the wreck site, the possibility of some or all of these features being related to the wreck site remains.
- 4.2.4 All of these 21 anomalous features have been assigned an A2 archaeological discrimination which are defined as features of uncertain origin which may be of possible archaeological interest.
- 4.2.5 Furthermore, these anomalies can be classified by probable type, which can further aid in assigning archaeological potential and importance (Table 5).

| Anomaly Classification | Definition | Number of Anomalies |
|------------------------|---|---------------------|
| Magnetic | No associated seabed surface expression, and have the potential to represent possible buried ferrous debris or buried wreck sites | 6 |
| SBP contact | Sub-seabed feature with no associated seabed surface expression, and with the potential to represent possible buried debris or buried wreck sites | 15 |
| Total | | 21 |

Table 5: Types of anomaly identified

- 4.2.6 Of these 21 features, a total of 15 (**7000–7014**) have been classified as ‘SBP contacts’ which are anomalous features, identified on the parametric sonar SBP data, that are thought to represent possible buried material.
- 4.2.7 The SBP data shows there to be three geological units within the area. Across the entire site, the shallow geology is interpreted as being a layer of sand that sits stratigraphically above the older bedrock. However, in the south-eastern corner of the site, this upper sand layer appears to be separated into two

- different sand units; the lower unit possibly representing older and less mobile sands, and the upper unit representing the younger, more mobile sediments.
- 4.2.8 The base of this upper sand unit is not always clearly discernible and, as such, it is not possible to tell whether it is the lower, older sand unit that gradually tapers out towards the shoreline in the north-west, or the younger, more mobile sand unit. The interpreted base of this upper sand unit has been mapped out and is as shown in Figure 4, however it is possible that this extends further across the site.
- 4.2.9 All of the SBP contacts (**7000-7014**) are identified within the interpreted sand layer that sits stratigraphically above the bedrock (Figure 5). In the south-eastern corner of the site, features have been interpreted within either the upper or the lower sand units. SBP contacts **7004-6** are located in the older, lower sand unit, and SBP contacts **7007-8** and **7011-13** are located within the upper sand unit.
- 4.2.10 Due to the mobile nature of this uppermost sand unit, it is possible that any features identified within it may have also been subject to movement and therefore may not be in their original position, whereas features in the older, less-mobile sediments are more likely to be in their original location as these are likely to have only moved during more extreme scour or storm events. It is also possible that the archaeological potential of these features, and their possible association with the wreck site, correlates with the different ages of the two units. However, as there is the potential for the sediments, and the features within them, to have moved between the units during high-energy storm events in the past, all anomalous features identified within the study area have been retained as potential archaeology, regardless of whether they are in the upper or lower sand unit.
- 4.2.11 The remaining six anomalies (**7015-7020**) are magnetic anomalies with no corresponding SBP contact, which may represent ferrous debris which is either buried or located on the seabed. These magnetic anomalies range in size with the smallest (**7017**) measuring 10 nT (nanoTesla) and the largest (**7019**) measuring 87 nT.
- 4.2.12 Two of the SBP contacts (**7011** and **7012**) are located relatively close to magnetic anomalies (**7015** and **7017**). It is possible therefore that the features are associated, which may suggest the possible presence of some buried ferrous debris. However, as this cannot be confirmed without further investigation, the features have been retained as separate anomalies.
- 4.2.13 No anomalies of archaeological interest were observed in the MBES data. The low resolution of these data, 3 m, would only enable large objects of

greater than approximately 10 m in size to be discerned and there are none apparent in the study area.

- 4.2.14 The wreck has an associated UKHO record (18302) which states that during the last reported survey in 2008 the wreck was not located by MBES but that magnetometer data were not acquired. In 1982 the site was excavated and decking and hull timbers of a vessel about 45 m in length and with a beam of 6 m were located. These were not evident in the current datasets.

5. CONCLUSIONS AND RECOMMENDATIONS

- 5.1.1 The assessment of the geophysical data within the study area resulted in a total of 21 anomalies identified as being of possible archaeological interest. These were all assigned an A2 archaeological rating.
- 5.1.2 No anomalies were observed that could clearly be linked to the wreck or associated debris and the results are considered inconclusive.
- 5.1.3 The UKHO record (18302) states that timbers of a vessel approximately 45 m long and with a beam of 6 m were discovered during excavations in 1982. Timbers will not be visible in SBP data, even that of very high resolution, if the acoustic impedance (a product of material density and acoustic velocity through the material) is similar to that of the surrounding substrate. It may be that this is the case here or it may be that the timbers no longer remain at their earlier location.
- 5.1.4 Historic England (2019) report that although the wreck was designated in 1977, a variety of objects were retrieved between 1975 and 1983, some of which were recovered during excavations undertaken for the Teignmouth Museum. These included 120 round shot, six bronze cannon, three anchors, pottery shards, a gold seal, nails, a steelyard weight and copper alloy pots. The majority of these items are held by Teignmouth Museum although two cannon were sold in order to finance excavations. As no magnetic anomalies were observed that are clearly of anthropogenic origin it is likely that all items with a substantial ferrous content have already been recovered from the site.
- 5.1.5 For features assigned A2 archaeological discrimination rating, no Archaeological Exclusion Zones are recommended at this time. However, no construction or development works will be permitted within the study area as this is an area of statutory protection. .
- 5.1.6 Ground-truthing of the site (i.e. diver and/or ROV work) will be required if the designated area is impacted by development works in the future. This would verify the interpretation of the anomalies and assess the likelihood of buried features at the site. Excavation would be required unless the level of overlying

sediment dropped sufficiently to expose the wreck site. Impacts to the designated area would also be assessed.

- 5.1.7 It is recommended that if any objects of possible archaeological interest are identified or recovered during any groundwork operations, that they should be reported to a suitably qualified archaeological contractor acting as the Retained Archaeologist via a pre-agreed protocol. A protocol provides a framework for project staff to report archaeological discoveries in a manner that is both convenient to their everyday work and effective with regard to curatorial requirements. Material is reported to the Retained Archaeologist, who will establish whether the recovered objects are of archaeological interest and recommend appropriate mitigation measures.
- 5.1.8 The designated area should be marked on all charts and drawings for the purposes of avoiding any development works taking place within it or that would impact on it.

6. REFERENCES

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Tomalin, D, Cross J, and Motkin, D 1988 An Alberghetti bronze minion and carriage from Yarmouth Roads, Isle of Wight. *The International Journal of Nautical Archaeology* 17.1: 75-86

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Historic Environment Records

Devon and Dartmoor Historic Environment Record: HER number: MDV9871
https://www.heritagegateway.org.uk/Gateway/Results_Single.aspx?uid=MDV9871&resourceID=104 (accessed 20 November 2019)

Video

Time Team, Season 3, Episode 4, released 28 January 1996 A Wreck of the Spanish Armada (Teignmouth, Devon)
<https://www.youtube.com/watch?v=BWYh1QSrAzg> (accessed 20 November 2019)

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APPENDICES

Appendix A

Seabed features of archaeological potential

| ID | Classification | Easting | Northing | Archaeological Discrimination | Magnetic Amplitude (nT) | Notes |
|------|----------------|---------|----------|-------------------------------|-------------------------|--|
| 7000 | SBP Contact | 465408 | 5599741 | A2 | - | Possible disturbance identified at the base of the sand layer. Feature appears to be slightly higher amplitude compared to the surrounding sediment. Possibly just natural feature, however looks a little anomalous and therefore may be a buried item of non-ferrous debris. Depth range: 0.5 - 0.6 m BSB. |
| 7001 | SBP Contact | 465402 | 5599771 | A2 | - | Two small, slightly higher-amplitude reflectors with possible associated hyperbolas identified at the base of the sand layer. Close, and possibly related, to feature 7002 . Possibly natural however may be buried items of non-ferrous debris. Depth range: 0.3 - 0.6 m BSB. |
| 7002 | SBP Contact | 465409 | 5599765 | A2 | - | Slightly higher-amplitude reflector with possible associated hyperbola identified at the base of the sand layer. Close, and possibly related, to feature 7001 . Possibly natural however may be a buried item of non-ferrous debris. Depth range: 0.4 - 0.6 m BSB. |
| 7003 | SBP Contact | 465446 | 5599749 | A2 | - | Small slightly higher-amplitude reflector identified within the sand layer. Possibly natural however may be a buried item of non-ferrous debris. Depth range: 0.5 - 0.7 m BSB. |
| 7004 | SBP Contact | 465517 | 5599736 | A2 | - | Possible small hyperbola identified within the sand layer, in the lower sand unit. Possibly natural however may be a buried item of non-ferrous debris. Depth range: 1.1 - 1.2 m BSB. |

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| ID | Classification | Easting | Northing | Archaeological Discrimination | Magnetic Amplitude (nT) | Notes |
|------|----------------|---------|----------|-------------------------------|-------------------------|---|
| 7005 | SBP Contact | 465533 | 5599764 | A2 | - | Small, slightly higher-amplitude reflector with possible associated hyperbola identified within the sand layer. Possibly natural however may be a buried item of non-ferrous debris. Depth range: 0.9 - 1.1 m BSB. |
| 7006 | SBP Contact | 465543 | 5599771 | A2 | - | Small, slightly higher-amplitude reflector identified within the sand layer, in the lower sand unit. Possibly natural however may be a buried item of non-ferrous debris. Depth range: 0.6 - 1.1 m BSB. |
| 7007 | SBP Contact | 465503 | 5599795 | A2 | - | Small, slightly higher-amplitude reflector identified within the sand layer, in the upper sand unit. Possibly natural however may be a buried item of non-ferrous debris. Depth range: 0.4 - 0.5 m BSB. |
| 7008 | SBP Contact | 465477 | 5599805 | A2 | - | Possible small hyperbola identified within the sand layer, in the upper sand unit. Possibly natural however may be a buried item of non-ferrous debris. Depth range: 0.5 - 0.6 m BSB. |
| 7009 | SBP Contact | 465468 | 5599811 | A2 | - | Possible disturbance identified at the base of the sand layer. Feature comprises an irregular area of high amplitude, possibly with associated hyperbolas. Possibly just natural feature, however looks a little anomalous and therefore may be a buried item, or multiple items, of non-ferrous debris. Close to a similar feature (7010) and possibly represents a continuation of the same feature. Depth range: 0.3 - 0.8 m BSB. |
| 7010 | SBP Contact | 465476 | 5599820 | A2 | - | Possible disturbance identified at the base of the sand layer. Feature comprises an irregular area of high amplitude, possibly with associated hyperbolas. Possibly just natural feature, however looks a little anomalous and therefore may be a buried item, or multiple items, of non-ferrous debris. Close to a similar feature (7009) and possibly represents a continuation of the same feature. Depth range: 0.5 - 0.6 m BSB. |

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| ID | Classification | Easting | Northing | Archaeological Discrimination | Magnetic Amplitude (nT) | Notes |
|------|----------------|---------|----------|-------------------------------|-------------------------|--|
| 7011 | SBP Contact | 465513 | 5599836 | A2 | - | Series of several small, slightly higher-amplitude reflectors with possible associated hyperbolas identified within the sand layer, in the upper sand unit. Possibly natural however may be buried items of debris. Located relatively close to magnetic anomalies 7015 and 7017 and therefore the possibility of ferrous material being present cannot be ruled out. However, as the features cannot be definitively associated, they have been retained as separate anomalies. Depth range: 0.3 - 0.9 m BSB. |
| 7012 | SBP Contact | 465526 | 5599829 | A2 | - | Small slightly higher-amplitude reflector identified within the sand layer, in the upper sand unit. Close to another similar feature (7013). Possibly natural however may be a buried item of debris. Located relatively close to magnetic anomaly 7017 and therefore the possibility of ferrous material being present cannot be ruled out. However, as the features cannot be definitively associated, they have been retained as separate anomalies. Depth range: 0.3 - 0.8 m BSB. |
| 7013 | SBP Contact | 465529 | 5599836 | A2 | - | Small slightly higher-amplitude reflector identified within the sand layer, in the upper sand unit. Close to another similar feature (7012). Possibly natural however may be a buried item of non-ferrous debris. Depth range: 0.3 - 0.4 m BSB. |
| 7014 | SBP Contact | 465544 | 5599830 | A2 | - | Possible disturbance identified at the base of the sand layer. Feature appears to be slightly higher amplitude compared to the surrounding sediment. Possibly just natural feature, however looks a little anomalous and therefore may be a buried item of non-ferrous debris. Depth range: 0.5 - 0.6 m BSB. |

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| ID | Classification | Easting | Northing | Archaeological Discrimination | Magnetic Amplitude (nT) | Notes |
|------|----------------|---------|----------|-------------------------------|-------------------------|---|
| 7015 | Magnetic | 465501 | 5599826 | A2 | 21 | Asymmetrical dipole identified on more than one line of data. No corresponding feature identified on the SBP data, however it is located approximately 10 m from SBP contact 7011 and therefore there is the possibility of these being associated. Possibly ferrous debris which may be buried or on the seabed. |
| 7016 | Magnetic | 465455 | 5599824 | A2 | 55 | Positive monopole identified on one line of data. No corresponding feature identified on the SBP data. Possibly ferrous debris which may be buried or on the seabed. |
| 7017 | Magnetic | 465515 | 5599826 | A2 | 10 | Positive monopole identified on more than one line of data. No corresponding feature identified on the SBP data, however it is located approximately 5 m south of SBP contact 7011 , and 8 m from SBP contact 7012 and therefore it is possible that these represent associated features. Possibly ferrous debris which may be buried or on the seabed. |
| 7018 | Magnetic | 465443 | 5599772 | A2 | 53 | Asymmetric dipole identified on one line of data. Possible part of a larger, complex anomaly with 7019 , however, as this cannot be confirmed without further investigation, they have been retained as two separate anomalies. No corresponding buried feature clearly identified but it is located relatively close to an area of possible disturbance identified at the top of the interpreted bedrock. This has not been tagged due to its similarity to the surrounding bedrock, however the possibility of this representing buried items cannot be ruled out. Possibly ferrous debris which may be buried or on the seabed. |

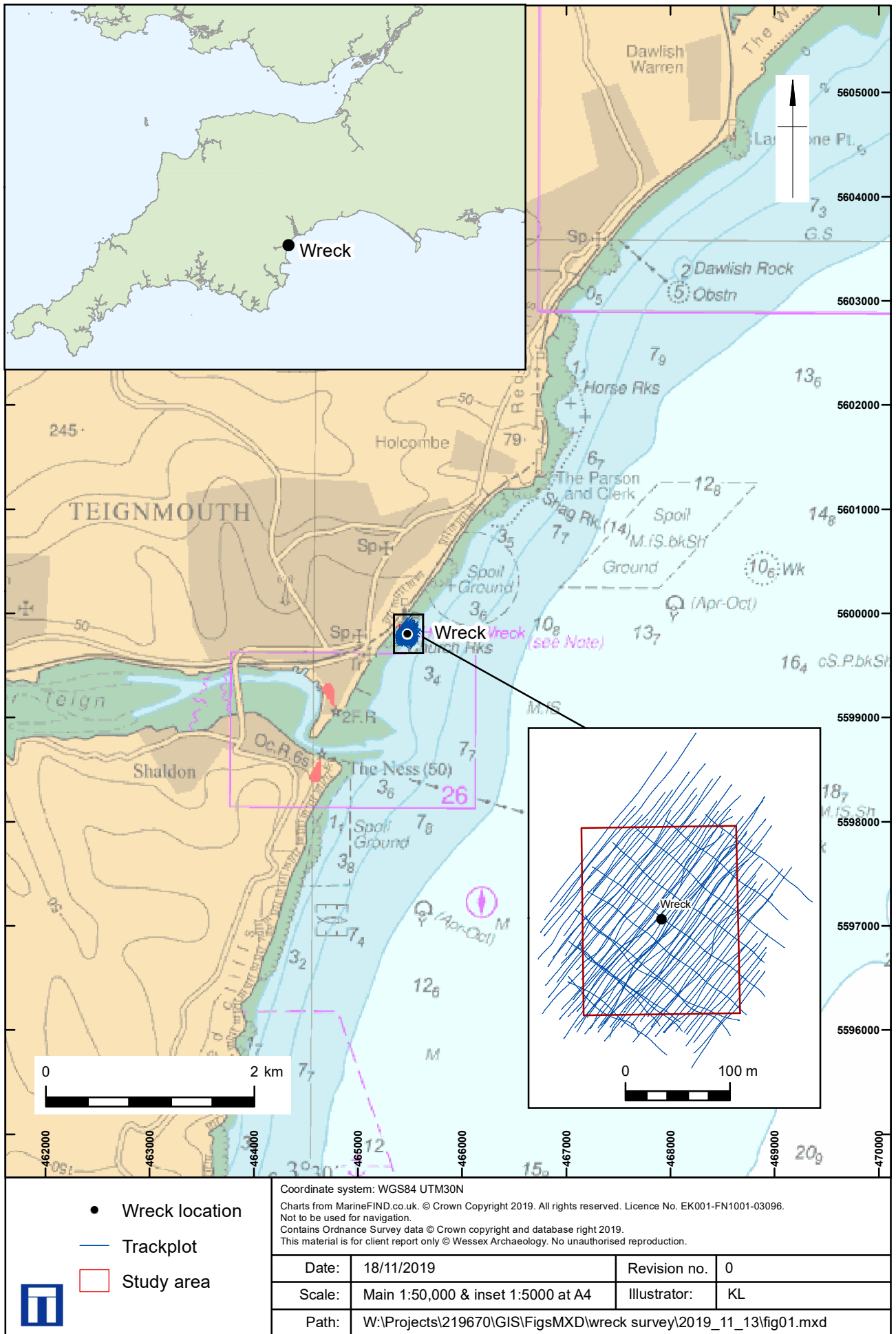
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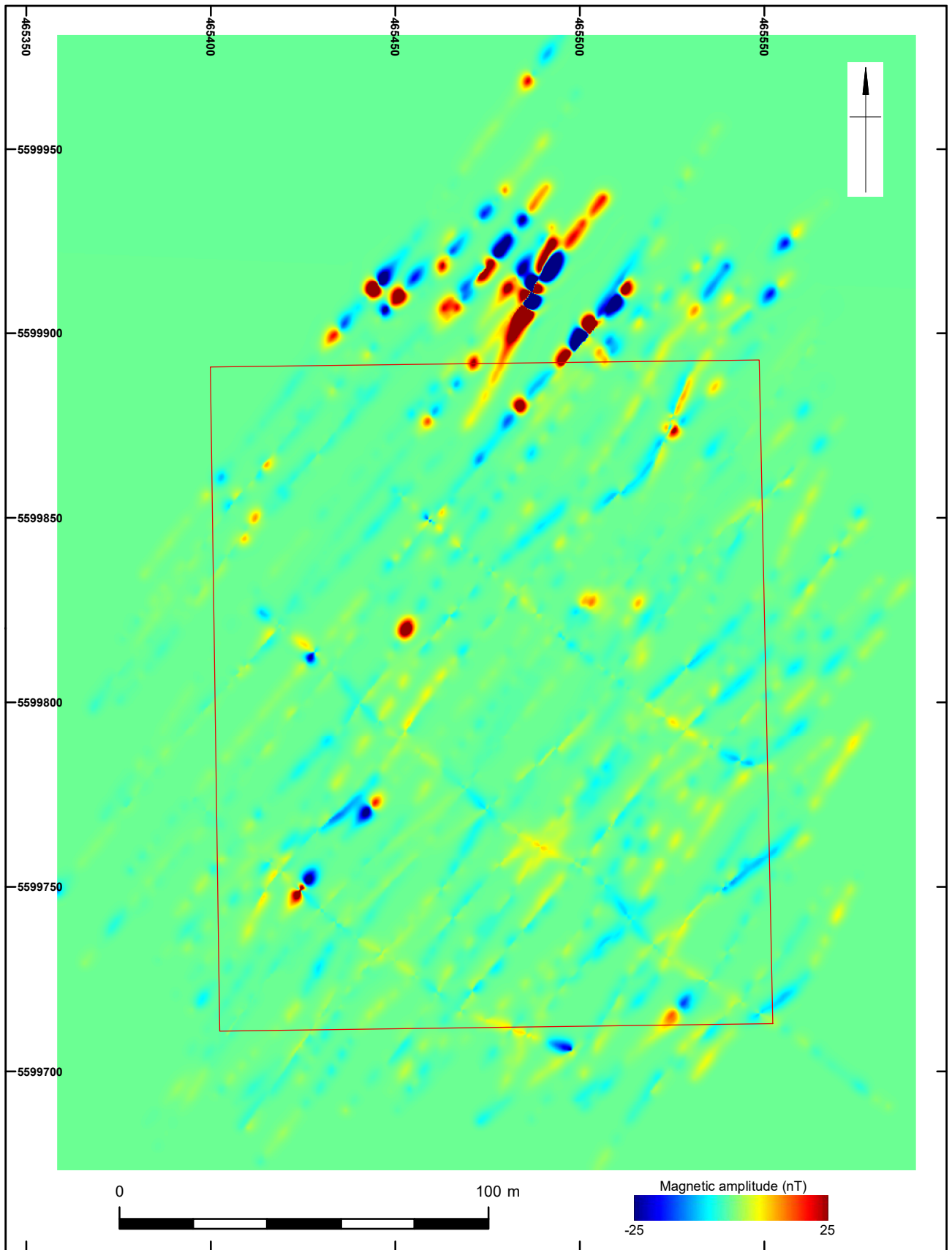
| ID | Classification | Easting | Northing | Archaeological Discrimination | Magnetic Amplitude (nT) | Notes |
|------|----------------|---------|----------|-------------------------------|-------------------------|--|
| 7019 | Magnetic | 465425 | 5599751 | A2 | 87 | Relatively symmetric dipole identified on one line of data. Possible part of a larger, complex anomaly with 7018 , however, as this cannot be confirmed without further investigation, they have been retained as two separate anomalies. No corresponding buried feature clearly identified, however it is located relatively close to an area of possible disturbance identified at the top of the interpreted bedrock. This has not been tagged due to its similarity to the surrounding bedrock, however the possibility of this representing buried items cannot be ruled out. Possibly ferrous debris which may be buried or on the seabed. |
| 7020 | Magnetic | 465526 | 5599717 | A2 | 32 | Symmetric dipole identified on one line of data. No corresponding feature identified on the SBP data. Possibly ferrous debris which may be buried or on the seabed. |

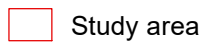
- Co-ordinates are in WGS84 UTM30N
- Depths are given below seabed (BSB)
- Positional accuracy estimated ± 5 m



Survey area location and trackplot

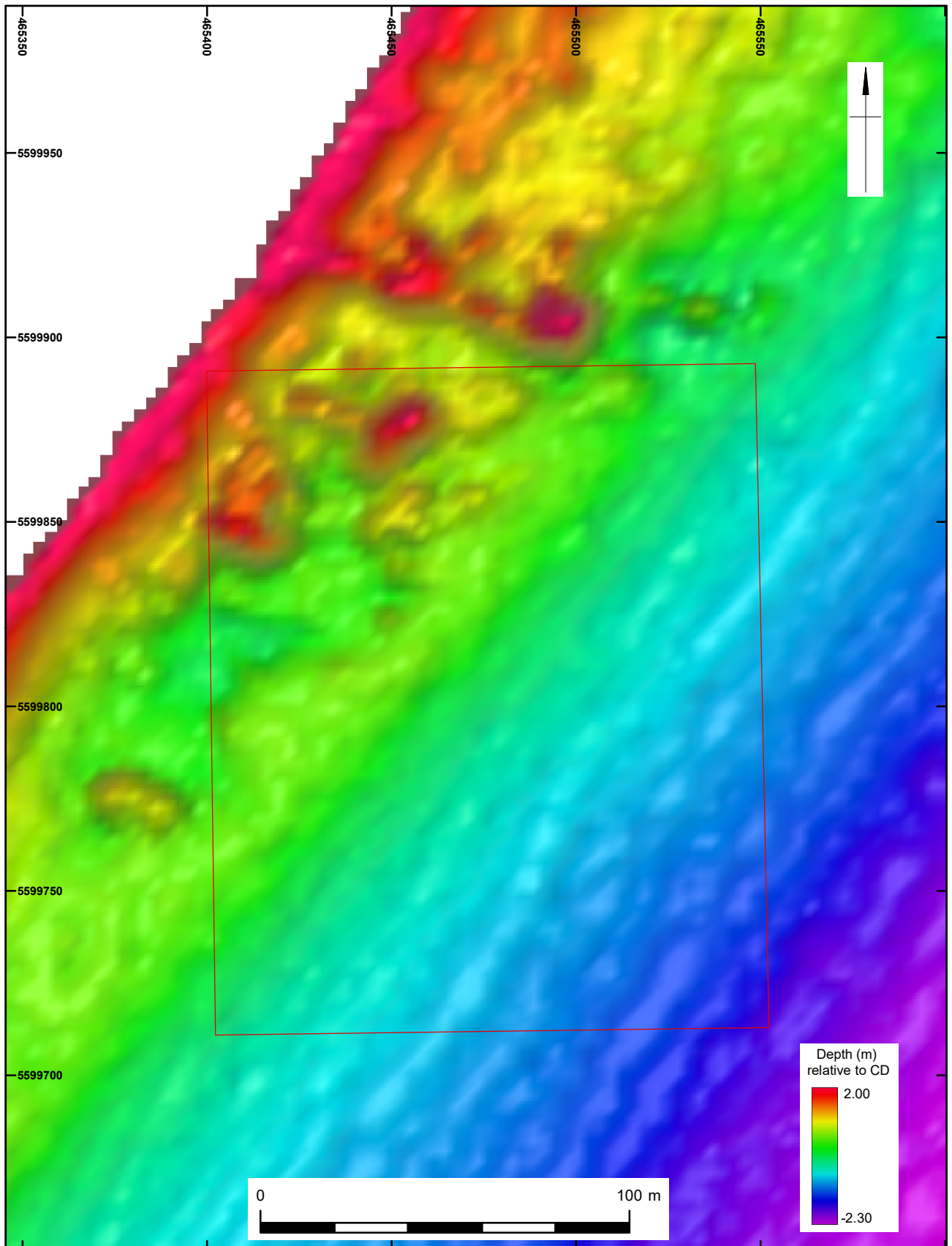
Figure 1





| | | | | |
|---|--|--|------------------|----|
|  | Coordinate system: WGS84 UTM30N Contains Ordnance Survey data © Crown copyright and database right 2019. This material is for client report only © Wessex Archaeology. No unauthorised reproduction. | | | |
| | Date: | 10/12/2019 | Revision Number: | 1 |
| | Scale: | 1:1500 at A4 | Illustrator: | KL |
| | Path: | W:\Projects\219670\GIS\FigsMXD\wreck survey\2019_11_13\fig02.mxd | | |

Gridded magnetometer data (± 25 nT)

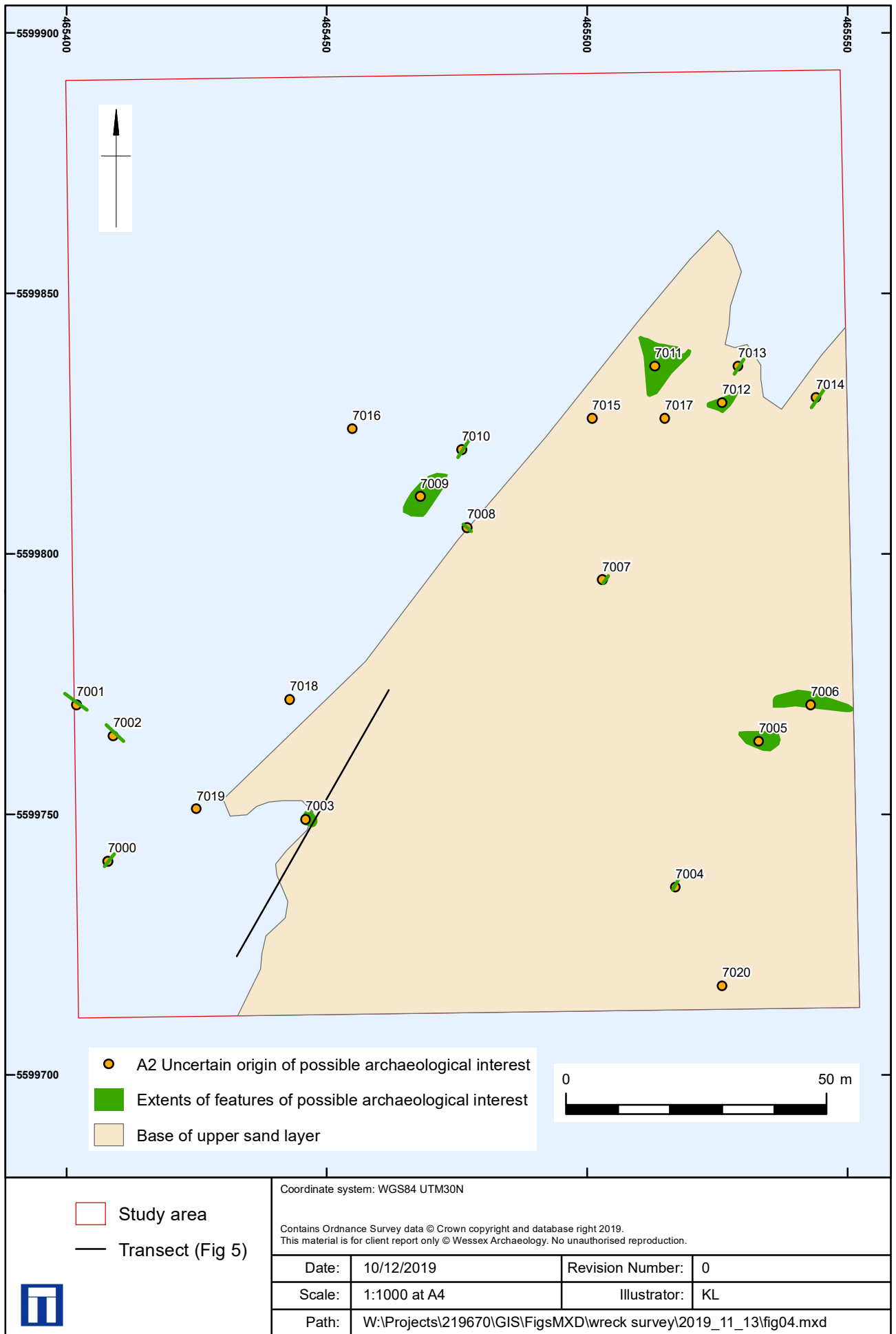
Figure 2



| | | | | |
|---|---|--|------------------|----|
|  Study area  | Coordinate system: WGS84 UTM30N | | | |
| | Contains Ordnance Survey data © Crown copyright and database right 2019. This material is for client report only © Wessex Archaeology. No unauthorised reproduction. | | | |
| | Date: | 10/12/2019 | Revision Number: | 0 |
| | Scale: | 1:1500 at A4 | Illustrator: | KL |
| Path: | | W:\Projects\219670\GIS\FigsMXD\wreck survey\2019_11_13\fig03.mxd | | |

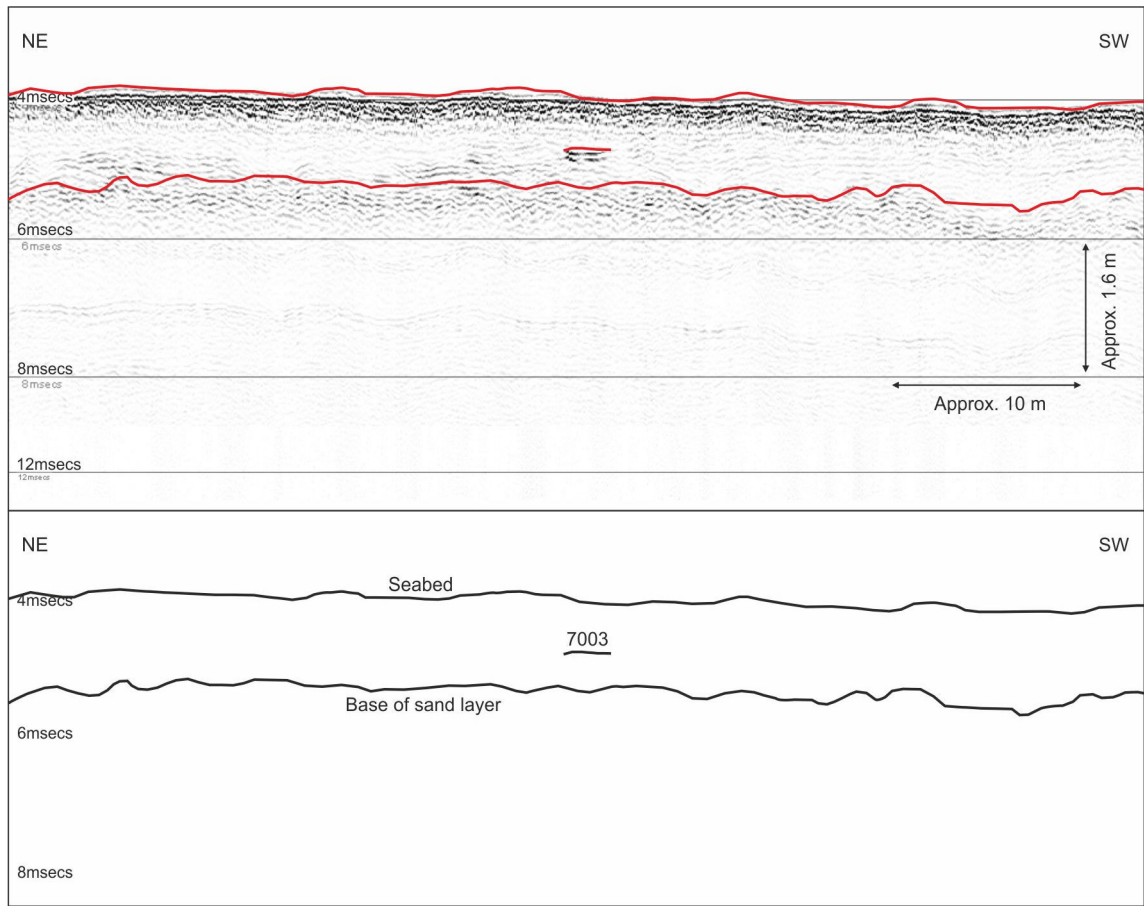
Gridded multibeam bathymetry data (3 m)

Figure 3

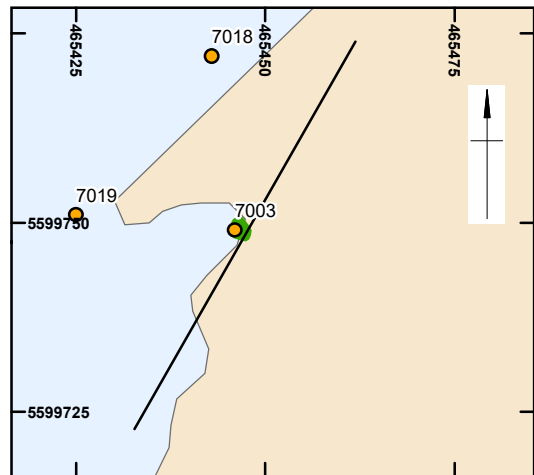


Features of potential archaeological interest

Figure 4



- Transect
- A2 Uncertain origin of possible archaeological interest
- Extents of features of possible archaeological interest
- Base of upper sand layer



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|--------|--|------------------|----|
| Date: | 10/12/2019 | Revision Number: | 0 |
| Scale: | Plan 1:1000 at A4 | Illustrator: | KL |
| Path: | W:\Projects\219670\GIS\FigsMXD\wreck survey\2019_11_13\fig05.mxd | | |

Parametric sonar data example – 7003

Figure 5



Network Rail

Network Rail Western Route

Western House

1 Holbrook Way

Swindon SN11BD

networkrail.co.uk



Wessex Archaeology Ltd

Portway House

Old Sarum Park

Salisbury

Wiltshire

SP4 6EB

wessexarch.co.uk