



An archaeological magnetometer survey

## Land at Castle Hill, Bradninch, Devon

Centred on NGR (E/N): 299788,104310

Report: 1702BRA-R-1

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16 December 2017

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## Contents

1. Survey description and summary .....	1
2. Survey aims and objectives .....	1
3. Methodology .....	2
4. Standards .....	2
5. Site description .....	2
6. Archaeological background.....	2
7. Results, discussion and conclusions .....	4
8. Disclaimer and copyright .....	4
9. Acknowledgements .....	4
10. Bibliography.....	4
Appendix 1 Figures .....	7
Appendix 2 Tables .....	13

## Figures

Figure 1: location map.....	8
Figure 2: survey interpretation .....	9
Figure 3: shade plot of processed data .....	10
Figure 4: contour plot of processed data .....	11
Figure 5: shade plot of minimally processed data .....	12

## Tables

Table 1: data analysis .....	14
Table 2: methodology information .....	15
Table 3: processed data metadata .....	15

## Project archive

Report .....	Adobe PDF format
Raw and processed grid & composite files .....	DW Consulting TerraSurveyor 3 formats
Minimal processing data plots and metadata .....	DW Consulting TerraSurveyor 3 formats
Final data processing data plots and metadata .....	DW Consulting TerraSurveyor 3 formats
GIS project, shape files and classification schema	
GIS project .....	Manifold 8 '.map' file
GIS shape files.....	ESRI standard
GIS classification schema.....	Adobe PDF format
AutoCAD version of the survey interpretation .....	AutoCAD DXF

*Website: [substrata.co.uk](http://substrata.co.uk)*

*For an overview of Substrata, our archaeological geophysical surveying techniques and the results we obtain.*

## 1 Survey description and summary

### 1.1 Survey

Type: twin-sensor fluxgate gradiometer  
Date: 19 May 2017  
Area: 1.4ha  
Lead surveyor: Tom Etheridge, AC Archaeology Ltd  
with John Valentin, AC Archaeology Ltd  
Author: Ross Dean BSc MSc MA MifA  
with John Valentin, AC Archaeology (Section 6)

### 1.2 Clients

AC Archaeology Ltd, 4 Halthaies Workshops, Bradninch Nr Exeter, Devon EX5 4QL

### 1.3 Location

Site: Land at Castle Hill  
Town: Bradninch  
District: Mid Devon  
County: Devon  
Nearest Postcode: EX5 4LP  
NGR: SS 99788 04310 (point)  
NGR (E/N): 299788,104310 (point)

### 1.4 Archive

OASIS number: substrat1-304216  
Archive: At the time of writing, the archive of this survey will be held by Substrata. Depending on local authority policy, an archive of the unprocessed data may be deposited with the Archaeological Data Service

### 1.5 Introduction

This report presents the results of an archaeological magnetometer survey at the above site. It has been prepared for AC Archaeology Ltd as part of a Bradninch community research project. The survey area location is shown in Figure 1.

Field name and earthwork evidence suggested that there may be an enclosure within the survey area (Section 6, below). This survey was designed to test for the presence and nature of any such enclosure.

### 1.6 Summary

*The magnetic responses across the survey area were sufficient to be able to differentiate between anomalies representing possible archaeological features and background magnetic responses.*

*Five magnetic anomaly groups were mapped as representing potential archaeological deposits or features. No evidence of an enclosure or similar archaeological feature was recorded in the dataset. One group is most likely to represent a stony deposit such as a hard track along the field boundary, a gravel-filled service trench or, less likely, a wall footing. The remaining groups have characteristics typical of fragmented archaeological deposits such as former field or enclosure boundaries of unknown date.*

## 2 Survey aims and objectives

### 2.1 Aims

To establish the presence or absence, extent and character of any archaeological features and deposits within the survey area.

### 2.2 Survey objectives

1. Complete a magnetometer survey across agreed parts of the survey area.

2. Identify any magnetic anomalies that may be related to archaeological deposits, structures or artefacts.
3. Within the limits of the techniques and dataset, archaeologically characterise any such anomalies or patterns of anomalies.
4. Accurately record the location of the identified anomalies.
5. Produce a report based on the survey that is sufficiently detailed to inform any subsequent development on the survey area about the location and possible archaeological character of the recorded anomalies.

### 3 Methodology

The work was undertaken in accordance with the survey methodology statement (Dean, 2017).

The survey grid location information and grid plan were recorded as part of the project in a suitable GIS system (Table 3).

Data processing was undertaken using appropriate software (Table 3), with all anomalies being digitised and geo-referenced. The final report (this document) includes a graphical and textual account of the techniques undertaken, the data obtained and an archaeological interpretation of that data and conclusions about any likely archaeology.

### 4 Standards

The standards used to complete this survey are defined by the Chartered Institute for Archaeologists (2014a) and Historic England (2010). The codes of approved practice that were followed are those of the Chartered Institute for Archaeologists (2014b) and Archaeology Data Service (undated).

### 5 Site description

#### 5.1 Landscape and land use

The survey area comprises two adjacent fields on the north-western side of the town of Bradninch, Devon (Figure 1). Both fields were under grass at the time of the survey. The land slopes northwest to southeast from approximately 130m to 100m AOD.

#### 5.2 Geology

The bedrock across the site comprises breccia of the Permian Cadbury Breccia Formation. Generically these rocks are brown to reddish-brown unbedded to very roughly bedded breccia, consisting of angular to subrounded pebbles and cobbles of Culm Sandstone in a very poorly sorted gritty, clayey, sandy, silt. The clasts are mainly locally derived Culm Sandstone generally not exceeding 0.3m diameter; other clasts include vein quartz, chert and fossiliferous sandstone of Pilton Beds type (British Geological Survey, undated).

The superficial deposits for the site are not recorded in the source used (ibid).

### 6 Archaeological background

#### 6.1 Historic landscape characterisation

‘Medieval enclosures based on strip fields’: This area was probably first enclosed with hedge-banks during the later middle ages. The curving form of the hedge-banks suggests that earlier it may have been farmed as open strip-fields (Devon County Council, undated a).

#### 6.2 Summary of archaeological background

The main archaeological interest in the site is that both fields contain the ‘castle’ field name on the 1840s Bradninch parish tithe map and accompanying apportionment (Devon County Council, undated b). The westerly field is named Higher Castle and the one to the east is Lower Castle. The Devon County Council Historic Environment Record entry for the site (MDV 7363) states that there is a local tradition for a castle at Bradninch, and the place-name castle hill was surrounded by a number of 'castle' field names on the tithe map. In addition, a possible circular enclosure was visible as a slight earthwork bank at Castle Hill, Bradninch, on aerial photographs of 1967 (MDV 108251). It was located within the field named ‘Lower

Castle' on the tithe apportionment for Bradninch. The possible enclosure was defined by a bank between 5 and 10 metres broad enclosing an area approximately 40 metres in diameter. The eastern edge of the possible enclosure, closest to an extant field boundary, was less clearly visible. The date of the earthworks is unknown but it is potentially of post-Roman to medieval date. The possible enclosure was not clearly visible on aerial photographs of later date available to the survey, although slight hints of very subtle earthworks might be visible on a digital mosaic based on aerial photographs taken in 1999-2000.

Other recorded archaeological sites in the vicinity include a square possible enclosure of late prehistoric or Romano-British form recorded as a soilmark on aerial photographs approximately 180m to the north (MDV 29773) and an oval enclosure, also visible as a soilmark, approximately 500m to the southwest (MDV 108253).

## 7 Results, discussion and conclusions

### 7.1 Scope and definitions

This survey was designed to record magnetic anomalies. A magnetic anomaly is a local variation in the Earth's magnetic field. Such variations can result from changes in the magnetism of the underlying solid geology, superficial geology and other near-surface deposits including those altered and created by past human activities. Near-surface artefacts can also create magnetic anomalies.

The terms 'archaeological deposit', 'structure' and 'feature' refer to any artefacts, material deposits or disturbance of natural deposits thought to be the result of human activity, excluding recent land maintenance and farming.

Magnetic anomalies cannot be regarded as physical archaeological deposits, structures or features and the dimensions of the anomalies shown do not represent the dimensions of any associated archaeology.

The analysis presented below identifies and characterises anomalies and anomaly groups that may relate to archaeological deposits, structures and features.

The reader is referred to section 8.

### 7.2 Results

Figure 2 shows the interpretation of the survey data which includes the anomaly groups identified as possibly relating to archaeological deposits along with their identifying numbers. Table 1 is an extract of the detailed analysis of the survey data sourced from the attribute tables of the GIS project provided in the project archive.

Figure 2 along with Table 1 comprise the analysis of the survey data.

Figures 3 and 4 are plots of processed data as specified in Table 3. Figure 5 is a plot of the unprocessed data with its metadata.

### 7.3 Discussion

#### 7.3.1 General points

##### Discussion scope

Not all anomalies or anomaly groups identified in Table 1 are necessarily discussed below. All identified anomaly groups are recorded in the GIS project held the survey archive.

##### Data collection

Data collection along the survey area edges was restricted as shown in the figures due to the presence of magnetic materials within and adjacent to boundaries. Strong magnetic responses mapped close to the boundaries are likely to relate to these materials except where otherwise indicated in Figure 2 and Table 1.

##### Anomaly characterisation and mapping

There are a number of anomaly groups that could be interpreted as relating to large postholes or pits although most will have natural origins. Anomalies of this sort were mapped as potential archaeology when they were associated with other significant anomaly groups or otherwise formed recognisable patterns as listed in Table 1.

Anomalies thought to relate to natural features and recent man-made objects such as manholes, water management equipment, drains, cables and other services were only mapped where they comprised significant magnetic responses across the dataset that needed clarification.

Numerous dipole magnetic anomalies are scattered across the data set. These are likely to represent recent ferrous objects. They are only mapped if they could influence the analysis of anomaly groups thought to have an archaeological origin.

#### 7.3.2 Data relating to historic maps and other records

No data related to historic maps or other records. No corroborating evidence was recorded in the survey data for the potential enclosure discussed in Section 6.

#### 7.3.3 Data with no previous archaeological provenance

Magnetic anomaly group **1** is likely to represent a wall footing, a service trench with gravel fill or hard track along field edge.

Groups **2 to 5** are most likely to represent fragments of former field or enclosure boundaries of unknown date.

#### 7.4 Conclusions

The magnetic responses across the survey area were sufficient to be able to differentiate between anomalies representing possible archaeological features and background magnetic responses.

Five magnetic anomaly groups were mapped as representing potential archaeological deposits or features. No evidence of an enclosure or similar archaeological feature was recorded in the dataset. One group (1) is most likely to represent a stony deposit such as a hard track along the field boundary, a gravel-filled service trench or, less likely, a wall footing. The remaining groups (2 to 5) have characteristics typical of fragmented archaeological deposits such as former field or enclosure boundaries of unknown date.

## 8 Disclaimer and copyright

The description and discussion of the results presented in this report are the authors, based on his interpretation of the survey data. Every effort has been made to provide accurate descriptions and interpretations of the geophysical data set. The nature of archaeological geophysical surveying is such that interpretations based on geophysical data, while informative, can only be provisional. Geophysical surveys are a cost-effective early step in the multi-phase process that is archaeology. The evaluation programme of which this survey is part may also be informed by other archaeological assessment work and analysis. It must be presumed that more archaeological features will be evaluated than those specified in this report.

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## 9 Acknowledgements

Substrata would like to thank John Valentin of AC Archaeology Ltd for commissioning us to complete this survey.

## 10 Bibliography

Archaeology Data Service (undated) *Archaeology Data Service/Digital Antiquity Guides to Good Practice: Geophysical Data in Archaeology* [Online], Available: [http://guides.archaeologydataservice.ac.uk/g2gp/Geophysics\\_Toc](http://guides.archaeologydataservice.ac.uk/g2gp/Geophysics_Toc) [December 2017]

British Geological Survey (undated) *Geology of Britain viewer, 1:50000 scale data*, [Online], Available: [http://www.bgs.ac.uk/discovering\\_Geology/geologyOfBritain/viewer.html](http://www.bgs.ac.uk/discovering_Geology/geologyOfBritain/viewer.html) [December 2017]

Chartered Institute for Archaeologists (2014a) *Standard and guidance archaeological geophysical survey*. Reading: Author [Online], Available: [http://www.archaeologists.net/sites/default/files/CIfAS&GGeophysics\\_1.pdf](http://www.archaeologists.net/sites/default/files/CIfAS&GGeophysics_1.pdf) [December 2017]

Chartered Institute for Archaeologists (2014b) *Code of conduct*. Reading: Author [Online], <http://www.archaeologists.net/sites/default/files/CodesofConduct.pdf> [December 2017]

Clark, A. (2000) *Seeing Beneath the Soil, Prospecting methods in archaeology*. London: Routledge

Dean, R. (2017) *A survey method statement for a detailed magnetometer survey at Castle Hill, Bradninch, Devon*. Substrata Ltd unpublished document 1702BRA-M-1

Devon County Council (undated a) *Devon & Dartmoor Historic Environment Record* [Online], Available: <https://new.devon.gov.uk/historicenvironment/> [December 2017]

Devon County Council (undated b) *Tithe Maps and Apportionments* [Online], Available: <http://www.devon.gov.uk/tithemaps.htm> [December 2017]

Historic England (2010) *Geophysical Survey in Archaeological Field Evaluation* [Online], Available: <https://content.historicengland.org.uk/images-books/publications/geophysical-survey-in-archaeological-field-evaluation/geophysics-guidelines.pdf/> [December 2017]

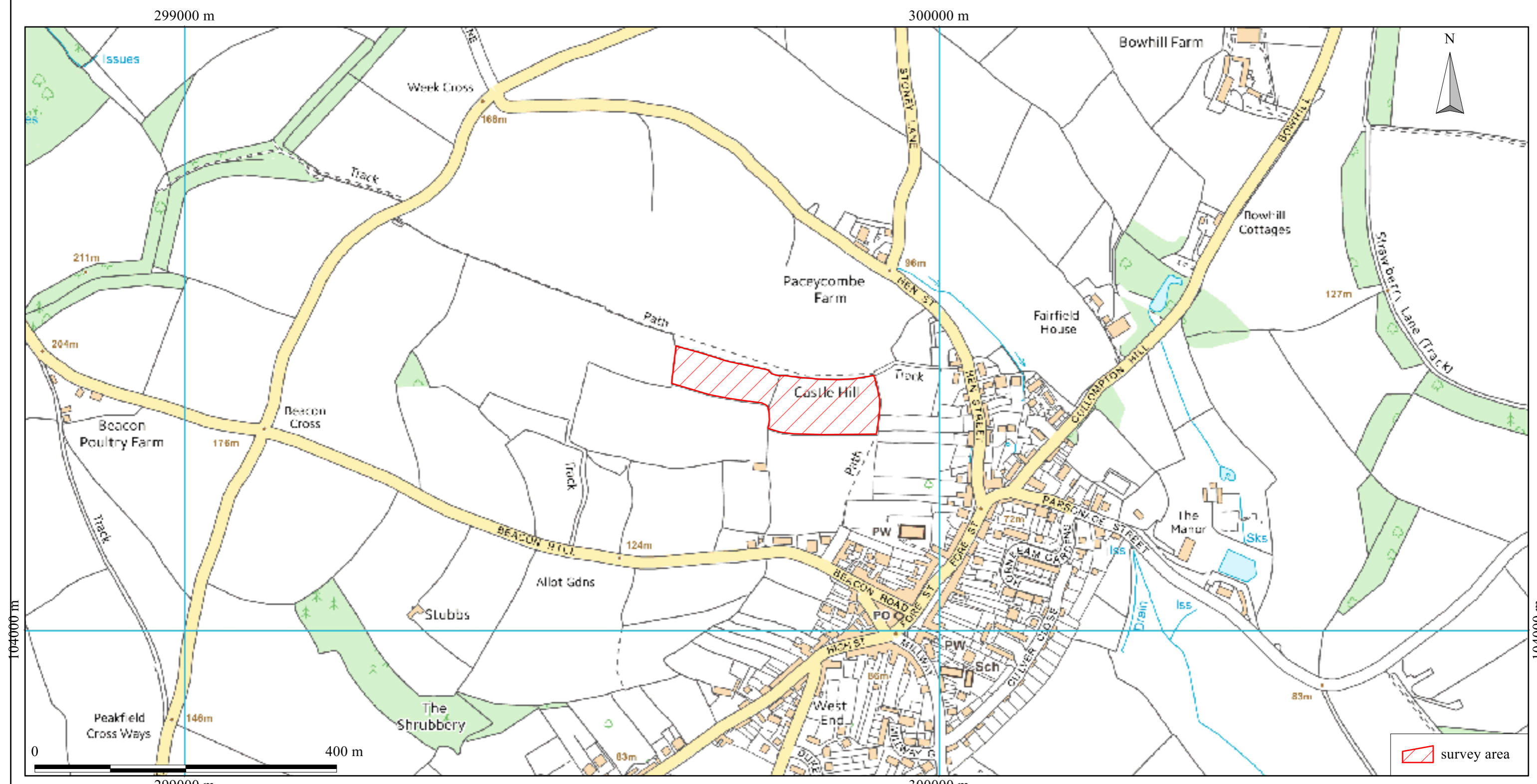


## Appendix 1     Figures

### General Guidance

The anomalies represented in the survey plots provided in this appendix are magnetic anomalies. The apparent size of such anomalies and anomaly patterns are unlikely to correspond exactly with the dimensions of any associated archaeological features .

A rough rule for interpreting magnetic anomalies is that the width of an anomaly at half its maximum reading is equal to the width of the buried feature, or its depth if this is greater (Clark, 2000: 83). Caution must be applied when using this rule as it depends on the anomalies being clearly identifiable and distinct from adjacent anomalies. In northern latitudes the position of the maximum of a magnetic anomaly will be displaced slightly to the south of any associated physical feature.



British Grid  
 centre X: 299784.93 m, centre Y: 104303.27 m

Scale: 1:5000 @ A3. Spatial Units: Meter. Do not scale off this drawing

Geophysical survey: Copyright Substrata Limited.  
 Base map: Ordnance Survey data © Crown copyright and database right 2017

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Figure 1: location map

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British Grid  
 centre X: 299784.93 m, centre Y: 104303.27 m

Scale: 1:800 @ A3. Spatial Units: Meter. Do not scale off this drawing

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Notes:

1. All interpretations are provisional and represent potential archaeological deposits.
2. 'Anomaly type' is a description of the magnetic anomaly. See the report text or GIS for an archaeological characterisation.
3. Anomalies designated "likely archaeology" have supporting evidence e.g. historical maps and or visible earthworks.
4. Anomalies likely to represent geological or other natural deposits are not mapped unless relevant to potential archaeological events or deposits.

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Figure 2: magnetometer survey interpretation

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British Grid  
 centre X: 299784.72 m, centre Y: 104310.89 m

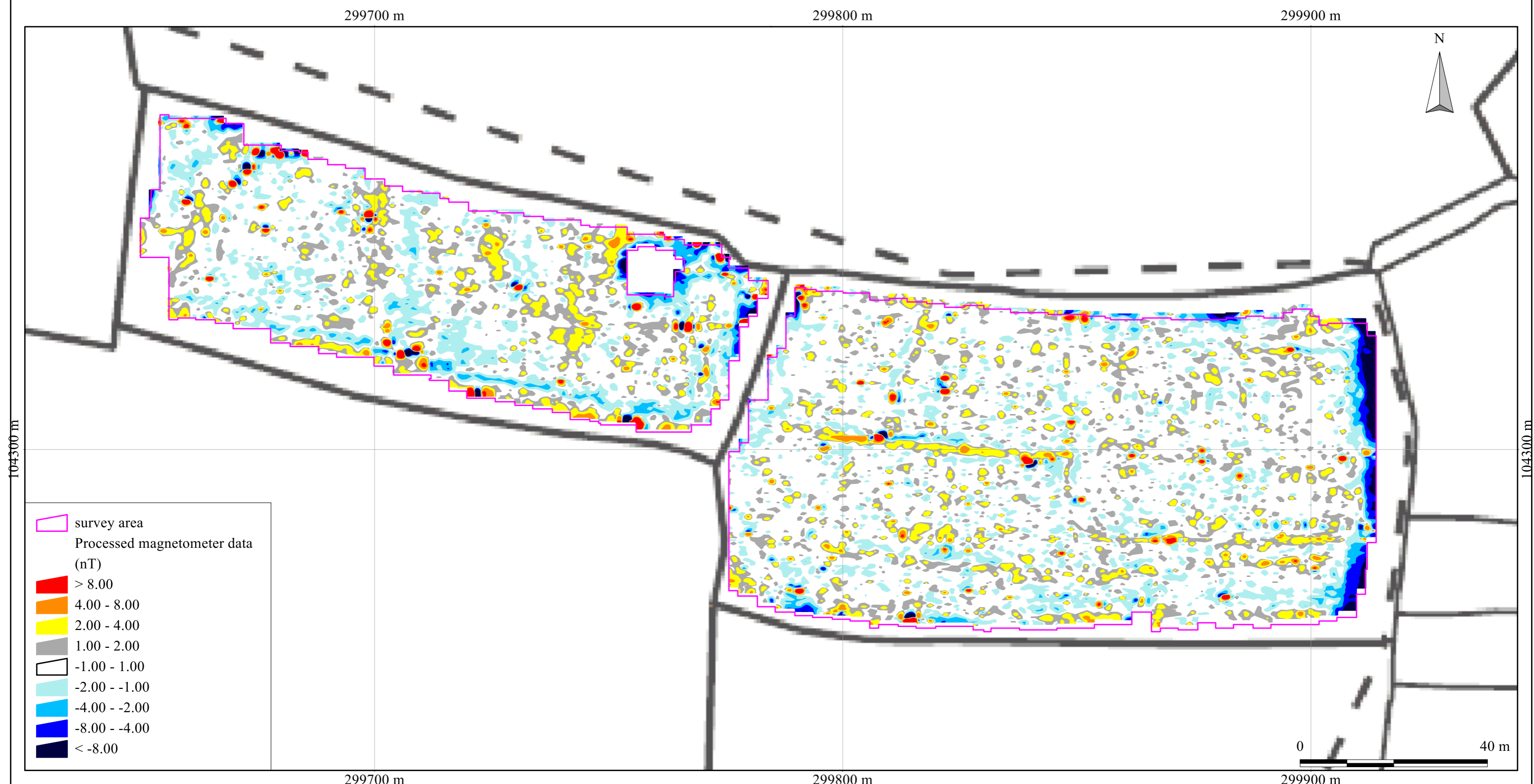
Scale: 1:800 @ A3. Spatial Units: Meter. Do not scale off this drawing

Geophysical survey: Copyright Substrata Limited.  
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Figure 3: shade plot of processed magnetometer data

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 Email: geophysics@substrata.co.uk  
 Web: substrata.co.uk



British Grid  
 centre X: 299784.72 m, centre Y: 104310.89 m

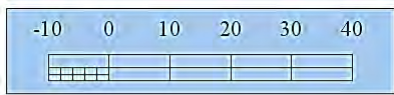
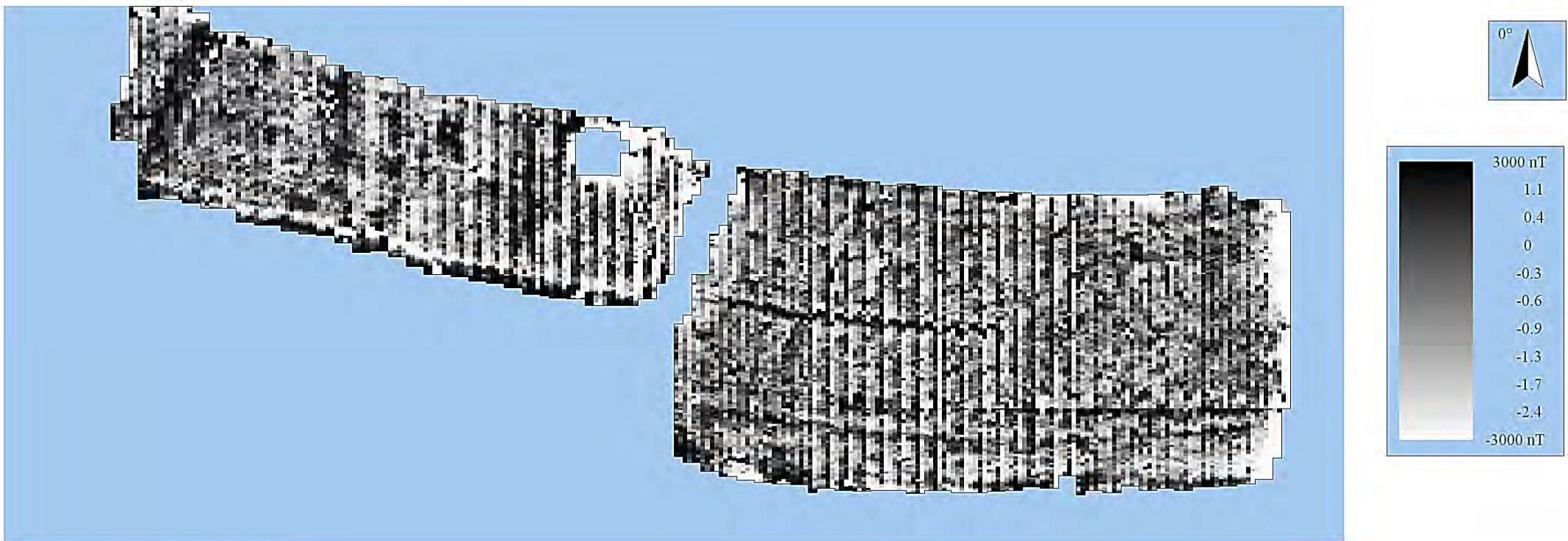
Scale: 1:800 @ A3. Spatial Units: Meter. Do not scale off this drawing

Geophysical survey: Copyright Substrata Limited.  
 Base map: Ordnance Survey data © Crown copyright  
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Figure 4: contour plot of processed magnetometer data

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Instrument type:	Bartington grad601-2	Processes:	1
Units:	nT		1 Base Layer
Direction of 1st Traverse:	0 deg		
Collection Method:	ZigZag		
Sensors:	2 @ 0.00 m spacing.		
Dummy Value:	2047.5		
Dimensions			
Grid Size:	30 m x 30 m		
X Interval:	0.25 m		
Y Interval:	1 m		
Stats			
Max:	3000.00		
Min:	-3000.00		
Std Dev:	57.56		
Mean:	-0.60		
Median:	-0.60		
Surveyed Area:	1.3874 ha		
PROGRAM			
Name:	TerraSurveyor		
Version:	3.0.33.6		

Figure 5: shade plot of unprocessed magnetometer data

## Appendix 2 Tables

Site: An archaeological magnetometer survey  
 Land at Castle Hill, Bradninch, Devon  
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 Report: 1702BRA-R-1

anomaly group	associated anomalies	anomaly characterisation certainty & class	anomaly form	additional archaeological characterisation	comments	supporting evidence
1		possible, negative	disrupted linear	wall footing, service trench or recent vehicle disturbance		
2		possible, positive	disrupted linear	ditch?		
3		possible, positive	return	field or enclosure boundary		
4		possible, positive	disrupted curvilinear	field or enclosure boundary		
5		possible, positive	disrupted linear	field or enclosure boundary		

Table 1: data analysis



<b>Grid</b> <i>Method of Fixing:</i> DGPS set-out using pre-planned survey grids and Ordnance Survey coordinates. <i>Composition:</i> 30m by 30m grids <i>Recording:</i> Geo-referenced and recorded using digital map tiles. <i>DGPS used:</i> Spectra Precision PM5V2 GPS with external antenna and survey pole and DigiTerra Explorer 7 as the survey control program.	
<b>Equipment</b> <i>Instrument:</i> Bartington Instruments grad601-2 <i>Firmware:</i> version 6.1	<b>Data Capture</b> <i>Sample Interval:</i> 0.125m <i>Traverse Interval:</i> 1 metre <i>Traverse Method:</i> zigzag <i>Traverse Orientation:</i> GN
<b>Data Processing, Analysis and Presentation Software</b> QCAD Professional 3 DW Consulting TerraSurveyor3 Manifold System 8 GIS Microsoft Corp. Office Excel 2013 Microsoft Corp. Office Publisher 2013 Adobe Systems Inc Adobe Acrobat 9 Pro Extended	

Table 2: methodology information

<b>Instrument</b> Type: Bartington Grad-601 gradiometer Units: nT Direction of 1st Traverse: see below Collection Method: ZigZag Sensors: 2 @ 1.00 m spacing. Dummy Value: 32702	
<b>Program</b> Name: TerraSurveyor Version: 3.0.33.6	
<b>Statistics</b> Max: 66.02 Min: -64.53 Std Dev: 3.19 Mean: -0.04 Median: 0.00 Surveyed Area: 1.4ha	<b>Processing</b> 1 Base Layer 2 Clip at 1.00 SD 3 De Stagger: Grids: a18.xgd a21.xgd By: 0 intervals, -50.00cm 4 De Stagger: Grids: a8.xgd By: 0 intervals, -25.00cm 5 DeStripe Median Sensors: Grids: All 6 Interpolate: Match X & Y Doubled.

Table 3: processed data metadata