

Substrata

Archaeological Geophysical Surveyors

An archaeological magnetometer survey

**Land at Vingoe's Lane
Madron, Cornwall**

Centred on NGR (E/N): 145440,32110 (point)

Report: 1602MAD-R-1

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02 March 2016

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Project archive

Report.....	Adobe PDF format
Copies of report figures.....	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

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: 15 and 16 February 2016
Area: 0.51ha
Lead surveyor: Mark Edwards
Author: Ross Dean BSc MSc MA MifA

1.2 Client

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

1.3 Location

Site: Land at Vingoe's Lane
Village: Madron
Civil Parish: Madron
County: Cornwall
Nearest Postcode: TR20 8RU
NGR: SW 454 321
Ordnance Survey NGR (E/N): 145440,32110 (point)

1.4 Archive

OASIS number: substrat1-244396
Archive: At the time of writing, the archive of this survey will be held by Substrata.

1.5 Introduction

This report was commissioned by AC Archaeology Ltd on behalf of clients. The site location is shown in Figure 1.

1.6 Summary

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

Six magnetic anomaly groups were mapped as representing relatively recent ground disturbance and surface or buried deposits of ferrous material. No anomalies were assessed as representing archaeological deposits or features.

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 site. The results of the survey and any subsequent trial trenching will be reviewed and used to inform any ensuing mitigation.

2.2 Objectives

1. Complete a magnetometer survey across agreed parts of the site.
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 site about the location and possible archaeological character of the recorded anomalies.

3 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/Digital Antiquity Guides (undated).

4 Site description

4.1 Landscape and land use

The site is located to the northeast of Madron Churchtown and is bounded by roads and houses to the south and west. Agricultural fields lie to the north. To the east of the area the ground descends steeply to a valley trending north-north-west to south-south-east in which the Chyandour Brook flows south-south-east (Figure 1). The site comprises one agricultural field with a total area of approximately 0.51ha. The field lies between approximately 115m and 120m AOD and is relatively flat. At the time of the survey the ground was under rough pasture.

4.2 Geology

The site has a split solid geology of granite of the Permian and Carboniferous Land's End Intrusion to the north and rocks of the Devonian Mylor Slate Formation to the south comprising hornfels slate and hornfels siltstone. The superficial geology is not recorded in the source used (British Geological Survey, undated).

5 Archaeological background

5.1 Historic landscape characterisation

Farmland: Prehistoric

The agricultural heartland, with farming settlements documented before the 17th century AD and whose field patterns are morphologically distinct from the generally straight-sided fields of later enclosure and are of either Medieval (AD 410 to AD 1066) or Prehistoric (pre AD 43) origins (Cornwall Council, undated).

5.2 Historical and archaeological background

An historic environment assessment of an area of 1000m around the site (hereafter the 'assessment area') was produced by AC Archaeology Ltd (Costen, 2016) as part of the same programme of work as this report and is the main source for the discussion below.

Archaeological sites, buildings, historic parks and gardens, conservation areas, registered battlefields and other aspects of the historic environment that are considered significant because of their historic, archaeological, architectural or artistic interest are considered *heritage assets*. *Designated heritage assets* are afforded protection as either scheduled monuments, listed buildings or through their inclusion within conservation areas. *Non-designated heritage assets* are potential archaeological remains and historic landscapes.

5.2.1 Heritage assets within the site

No heritage assets were recorded within the site at the time the AC Archaeology historic environment assessment was completed.

5.2.2 Heritage assets within 1000m of the site

A possible Prehistoric to Bronze Age (before 600 BC) ploughed out barrow is situated on a southeast facing slope in a field west of Bosoljack (Historic Environment Record MCO51255 at National Grid Reference SW 45423 32950, approximately 800m north of the survey area). It is visible on aerial photographs as a cropmark ditch. The date and function of the feature are not certain. It may be the remains of a ploughed out round barrow. There is some evidence for an Iron Age round near this site and it may be associated with this (see MCO7646 below).

The Tithe Award for Gulval records the field-name 'Gambler' at Bosoljack. This is listed as a possible Bronze Age (2,300 BC to 600 BC) barrow site but there are no known remains (MCO2195 at SW 45650 32600, approximately 500m north-north-east of the survey area).

Two sites of possible Iron Age (600 BC to AD 410) to Romano-British (AD 43 to AD 410) rounds are recorded in the Historic Environment Record based on field names in the Tithe Award for Gulval. The field-name of 'Round Field' is recorded at SW 45500 32720, approximately 600m north of the survey area, although there are no known traces of earthworks (MCO7647). 'Castle Field' is recorded at SW 45500 32960, approximately 800m north of the survey area, also suggesting the possible site of a round. Again there is no extant evidence (MCO7646). Another possible round from this period is recorded at Heamoor approximately 900m southeast of the survey area (MCO8026 at SW 46080 31410).

Ten settlements within the assessment area were first recorded in the Medieval period (AD 1066 to AD 1485). There are three field systems and boundaries recorded of possible Medieval date in the assessment area. A Prehistoric or Medieval field system recorded at Heamoor is visible as a series of linear and curvilinear field boundaries on aerial photographs (MCO51219 at SW 45798 31249, approximately 900m south-south-east of the survey area). At Boskenning the remains of linear boundaries are visible on aerial photographs as low earth banks. They lie within an area classed as Anciently Enclosed Land (MCO51254 at SW 45784 32853, approximately 800m northeast of the survey area). At Bosoljack a series of parallel linear boundaries are visible as earth and stone banks on aerial photographs. The boundaries may have formed part of a strip field system most likely of late Medieval date (MCO51257 at SW 45277 33015, approximately 850m north of the survey area).

The remains of two Post-medieval (AD 1485 to AD 1900) extractive pits are visible on aerial photographs as earth and stone works at SW 45669 32313, approximately 400m northeast of the survey area. The function of these features is vague, they could be considered to be either the remnants of Post-medieval quarrying activities or the remains of a mine shaft (MCO51228). Four Post-medieval stamping mills are recorded for the processing of tin ore extracted from mines. Two are in Landithy the Higher Mill (MCO29135 at SW 4558 3217, approximately 200m north-north-east of the survey area) and the Lower Mill (MCO29136 at SW 4558 3217, approximately 100m northeast of the survey area). A third stamping mill is recorded (MCO29144 at SW 45530 32260, approximately 200m north-north-east of the survey area) on the Madron Tithe Map, where a building to the south is linked by a possible leat. A stamping mill at Kennels Cottage is shown on the Ordnance Survey map of 1809 and the tithe map of 1844 (MCO29145 at SW 45270 32670, approximately 600m north-north-west of the survey area).

6 Results, discussion and conclusions

This survey was designed to record magnetic anomalies. The anomalies themselves cannot be regarded as actual archaeological features and the dimensions of the anomalies shown do not represent the dimensions of any associated archaeological features. The analysis presented below identifies and characterises anomalies and anomaly groups that may relate to archaeological deposits, structures and features.

Archaeological deposits, structures and features refer to any artefacts, material deposits or disturbance of natural deposits thought to be the result of human activity and not undertaken as recent land maintenance or farming.

The reader is referred to section 7.

6.1 Results

Figure 2 shows the interpretation of the survey data. It includes the anomaly groups identified as relating to man made deposits along with their 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 and Table 1 comprise the analysis of the survey data.

Figures 3 and 4 are plots of processed data as specified in Table 3. These plots represent different views of the data that were used to assess potential archaeology.

6.2 Discussion

6.2.1 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 site edges was restricted as shown in Figures 3 and 4 due to the presence of magnetic materials adjacent to the site. Strong magnetic responses mapped close to survey boundaries are likely to relate to these materials except where otherwise indicated in Figure 2.

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 are only mapped as potential archaeology if they are clustered in groups or otherwise form recognisable patterns.

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. If mapped, they are listed in Table 1 but are not discussed below.

Anomalies thought to relate to natural features were not mapped.

Data trends

A series of linear trends in the data across the site are likely to relate to former ploughing and other relatively recent disturbance as listed in Table 1.

6.2.2 Data relating to archaeological deposits or structures

No magnetic anomalies recorded in the survey data were characterised as relating to potential archaeological deposits or features.

6.3 Conclusions

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

Six magnetic anomaly groups were mapped as representing relatively recent ground disturbance and surface or buried deposits of ferrous material. No anomalies were assessed as representing archaeological deposits or features.

7 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.

Ross Dean, trading as Substrata, will assign copyright to the client upon written request but retains the right to be identified as the author of all project documentation and reports as defined in the Copyright, Designs and Patents Act 1988 (Chapter IV, s.79). This report contains material that is non-Substrata copyright or the intellectual property of third parties. Such material is labelled with the appropriate copyright and is non-transferrable by Substrata.

8 Acknowledgements

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

9 Bibliography

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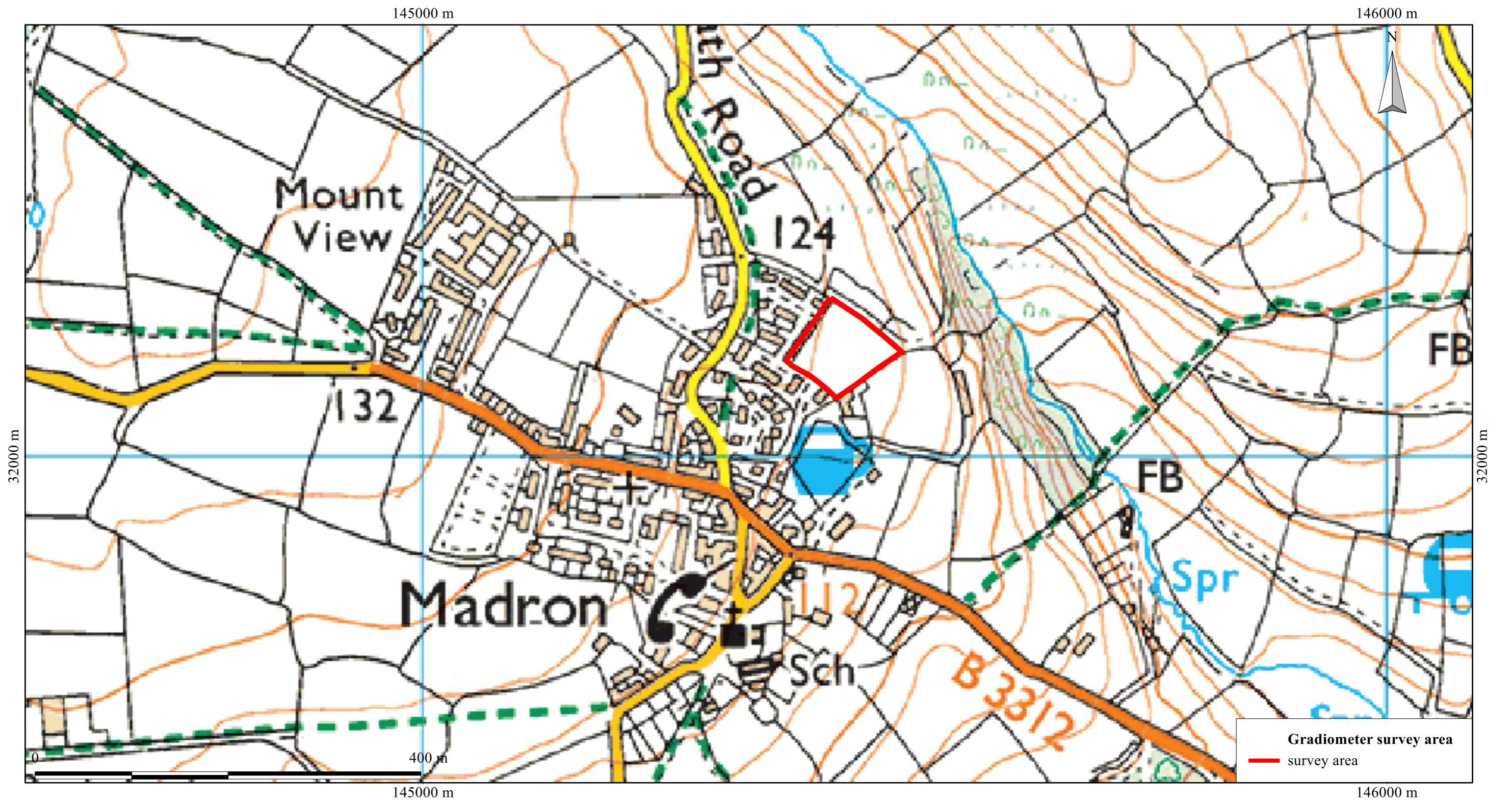
Historic England (2010) *Geophysical Survey in Archaeological Field Evaluation*, [Online], Available: <https://content.historicengland.org.uk/images-books/publications/geophysical-survey-in-archaeological-field-evaluation/geophysics-guidelines.pdf/> [January 2016]

Appendix 1 Supporting plots

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: 145338.02 m, centre Y: 32054.37 m

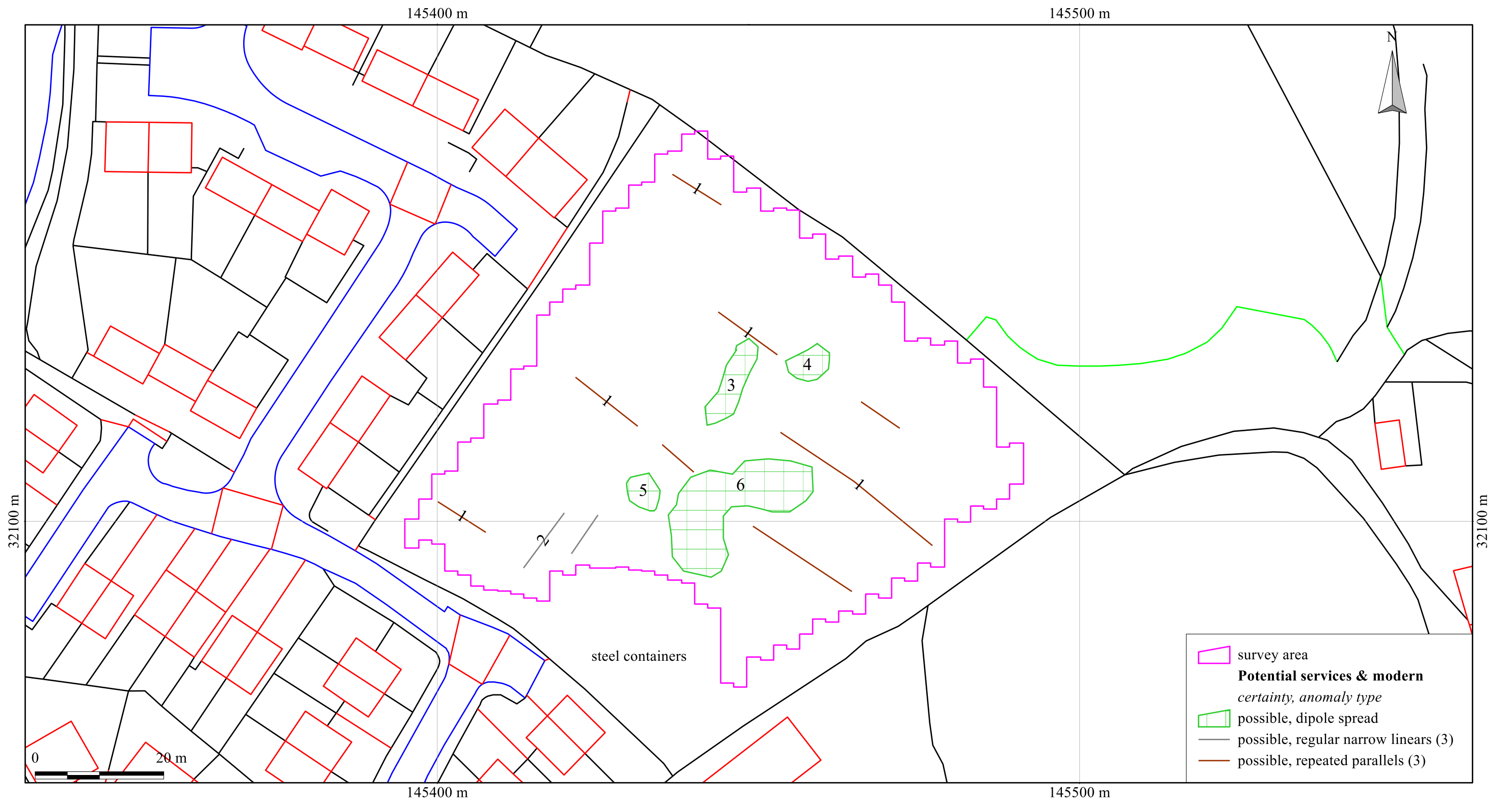
Scale: 1:4000 @ A3. Spatial Units: Meter. Do not scale off this drawing

Geophysical survey: Copyright Substrata 2016.
 Base map: Ordnance Survey (c) Crown Copyright 2016,
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An archaeological gradiometer survey
 Land at Vingoe's Lane, Madron, Cornwall
 Centred on NGR (E/N): 145440,32110 (point)
 Report: 1602MAD-R-1

Figure 1: location map

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British Grid
 centre X: 145448.51 m, centre Y: 32118.29 m

Scale: 1:600 @ A3. Spatial Units: Meter. Do not scale off this drawing

Geophysical survey: Copyright Substrata 2016.
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Notes:

1. All interpretations are provisional and represent potential archaeological deposits.
2. Anomalies designated "likely archaeology" have supporting evidence e.g. historical maps and or visible earthworks.
3. Representative; not all instances are mapped.
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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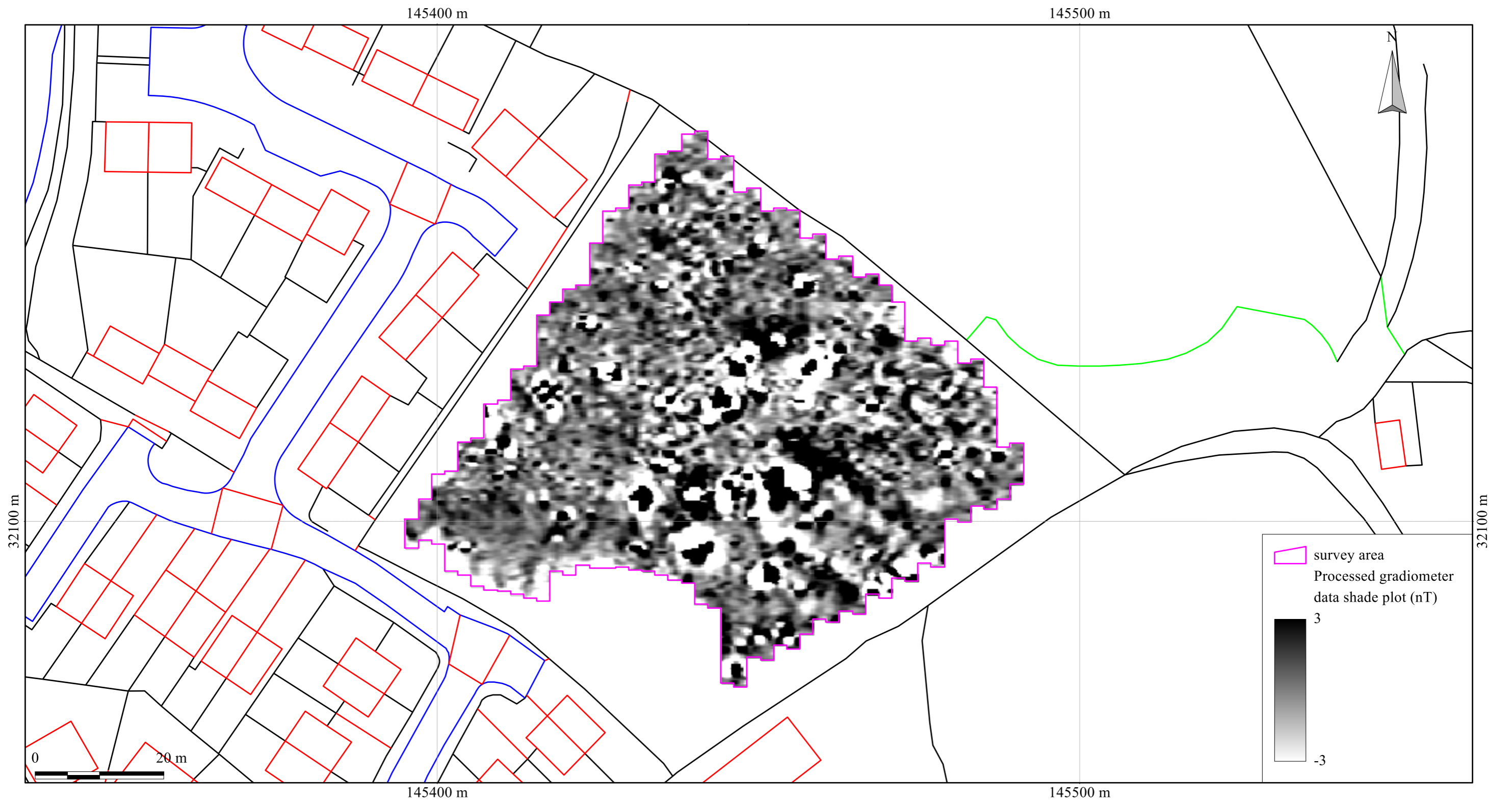
Figure 2: survey interpretation

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Site: An archaeological magnetometer survey
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anomaly group	anomaly characterisation certainty & class	anomaly form	additional archaeological characterisation	comments
1	possible, repeated parallels	linear trend	recent ploughing disturbance	
2	possible, regular narrow linears	linear trend	recent ground disturbance	anomaly groups represent recent ploughing disturbance, vehicle disturbance or possibly field drains
3	possible, dipole spread		recent ferrous material	anomaly groups represent surface or buried deposits of relatively recent ferrous material
4	possible, dipole spread		recent ferrous material	anomaly groups represent surface or buried deposits of relatively recent ferrous material
5	possible, dipole spread		recent ferrous material	anomaly groups represent surface or buried deposits of relatively recent ferrous material
6	possible, dipole spread		recent ferrous material	anomaly groups represent surface or buried deposits of relatively recent ferrous material

Table 1: data analysis



British Grid
 centre X: 145448.51 m, centre Y: 32118.29 m

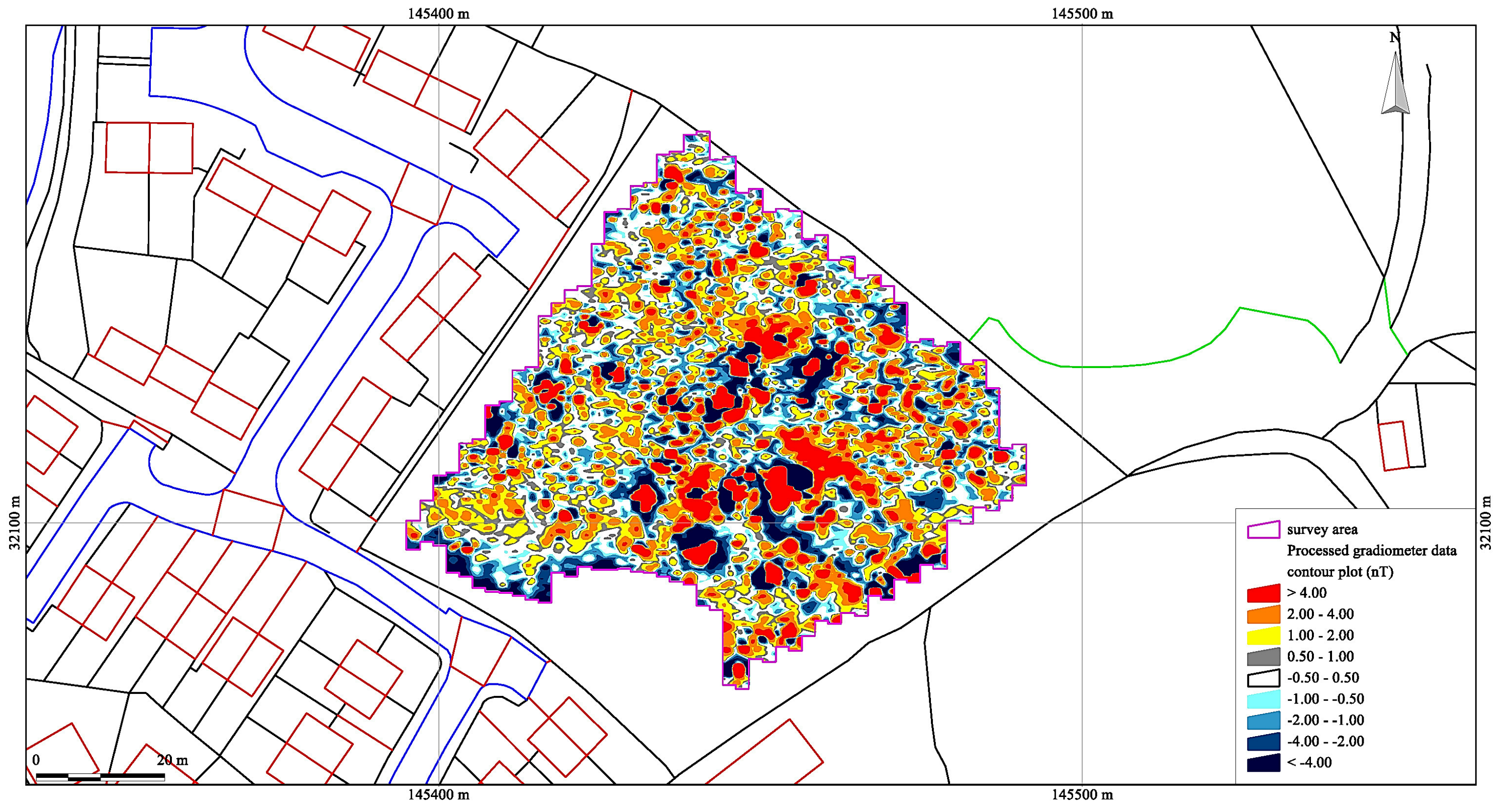
Scale: 1:600 @ A3. Spatial Units: Meter. Do not scale off this drawing

Geophysical survey: Copyright Substrata 2016.
 Base map: Ordnance Survey (c) Crown Copyright 2016,
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An archaeological magnetometer survey
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Figure 3: shade plot of processed data

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British Grid
centre X: 145448.51 m, centre Y: 32118.29 m

Scale: 1:600 @ A3. Spatial Units: Meter. Do not scale off this drawing

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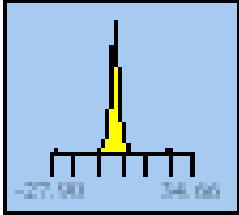
Figure 4: contour plot of processed data

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Appendix 2 Methodology Summary

Table 2: methodology summary	
<p>Documents Survey methodology statement: Dean (2016)</p>	
<p>Methodology</p> <ol style="list-style-type: none"> 1. The work was undertaken in accordance with the survey methodology statement. The geophysical (magnetometer) survey was undertaken with reference to standard guidance provided by the Chartered Institute for Archaeologists (2014) and Archaeology Data Service/ Digital Antiquity Guides (undated). 2. The survey grid location information and grid plan was recorded as part of the project in a suitable GIS system. 3. Data processing was undertaken using appropriate software, with all anomalies being digitised and geo-referenced. The final report included 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. 	
<p>Grid <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.</p>	
<p>Equipment <i>Instrument:</i> Bartington Instruments grad601-2 <i>Firmware:</i> version 6.1</p>	<p>Data Capture <i>Sample Interval:</i> 0.25m <i>Traverse Interval:</i> 1 metre <i>Traverse Method:</i> zigzag <i>Traverse Orientation:</i> GN</p>
<p>Data Processing, Analysis and Presentation Software IntelliCAD Technology Consortium IntelliCAD 8.0 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</p>	

Appendix 3 Data processing

Table 3: magnetometer survey - processed data metadata	
<p>SITE Instrument 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</p> <p>PROGRAM Name: TerraSurveyor Version: 3.0.29.1</p>	
<p>Stats Max: 34.66 Min: -27.90 Std Dev: 6.00 Mean: -0.11 Median: 0.00</p> 	<p>Processes: 6 1 Base Layer 2 Clip at 1.00 SD 3 Clip at 1.00 SD 4 De Stagger: Grids: All Mode: Both By: -1 intervals 5 De Stagger: Grids: All Mode: Both By: -1 intervals 6 DeStripe Median Traverse: Grids: All</p>

Appendix 4 Unprocessed data plot

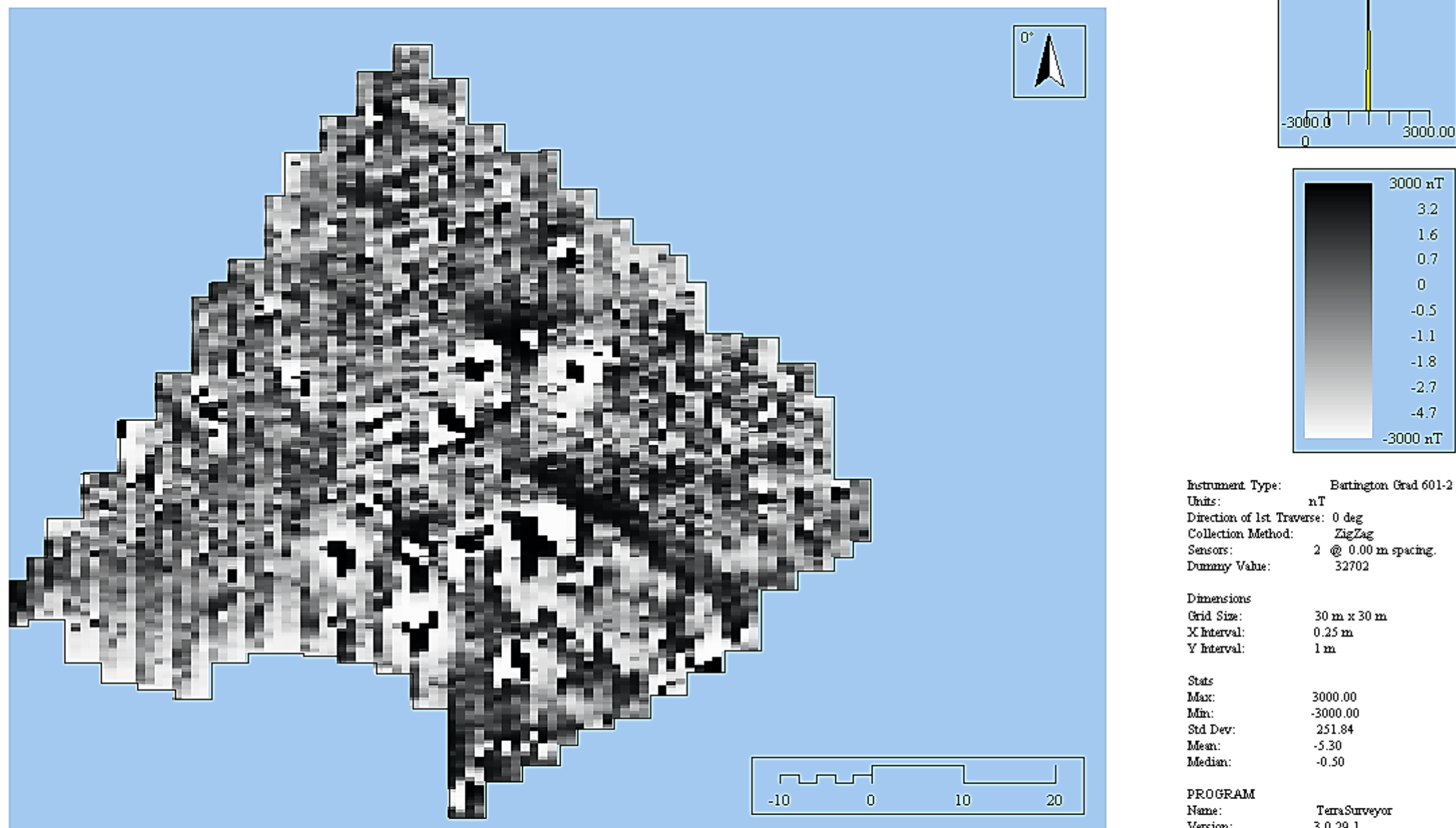


Figure 5: shade plot of unprocessed data

Processes: 1
1 Base Layer