

# Substrata

Archaeological Geophysical Surveyors

An archaeological magnetometer survey

## Land at Culmstock Road Hemyock, Devon

Centred on NGR (E/N): 313215,113280 (point)

Report: 1605HEM-R-1

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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](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: 9 May 2016  
Area: 1.4ha  
Lead surveyor: Mark Edwards BA  
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 Culmstock Road  
Village: Hemyock  
Civil Parish: Hemyock  
District: Mid Devon  
County: Devon  
Nearest Postcode: EX15 3RE  
NGR: ST 13215 13280  
Ordnance Survey NGR (E/N): 313215,113280 (point)

### 1.4 Archive

OASIS number: substrat1-252806  
Archive: At the time of writing, the archive of this survey will be held by Substrata.

### 1.5 Introduction

This report presents the results of an archaeological magnetometer survey at the above site, hereafter referred to as the survey area. It has been prepared for AC archaeology on behalf of clients. The survey area location is shown in Figure 1.

### 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.*

*Two magnetic anomaly groups represent possible linear archaeological deposits. They are isolated in the dataset and cannot be characterised further. A further anomaly group coincides with, and almost certainly represents, an area used to store topsoil during the recent construction of adjacent houses. The remaining traces of the topsoil are likely to include debris from an historical iron working site excavated prior to construction which would explain the recorded magnetic response.*

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

### 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 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 survey area encompassed one field and a small section of an adjacent field of agricultural land to the south of Culmstock Road, on the western outskirts of the village of Hemyock. The land sloped gently down to the north from approximately 160m to 140m AOD (Figure 1).

#### 4.2 Geology

The survey area has a solid geology of Triassic Mercia Mudstone. These rocks are dominantly red, less commonly green-grey, mudstones and subordinate siltstones with thick halite-bearing units in some basinal areas. Thin beds of gypsum/anhydrite are widespread; sandstones are also present. The superficial geology is not recorded across most of the survey area but is mapped as Quaternary Diamicton colluvium on the western boundary of the area (British Geological Survey, undated).

### 5 Archaeological background

#### 5.1 Historic landscape characterisation

Post-medieval enclosures.

Enclosures of post-medieval date. The fields were laid out in the 18th and 19th centuries and commonly have many surveyed, dead-straight, field boundaries (Devon County Council, undated).

#### 5.2 Historical and archaeological background

The following is a summary of Devon Country Council Historic Environment Record (HER) entries sourced from The Heritage Gateway (Historic England, undated) and thought potentially relevant to the interpretation of the geophysical data recorded during this survey.

An iron working site was excavated in 2012 by AC Archaeology Ltd to the immediate north of the survey area and to the south of Culmstock Road. This work is reported by Stead and Payne (2012) and Rainbird and Young (2016) and is included in the discussion below.

##### 5.2.1 Terminology

Archaeological sites, buildings, historic parks and gardens, conservation areas, registered battlefields and other aspects of the historic environment that are 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.

All bearings are relative to the Ordnance Survey National Grid Reference (NGR) centre point of the site which is recorded in Section 1 as an easting/northing (E/N) and as a ten-figure NGR, both of which define a 1m square with its south-western corner on the reference point. Most of the NGRs used within the HER are six-figure references which define a 100m square with its south-western corner on the reference point. Occasionally four-figure NGRs are

provided in the HER which define a 1000m square as above. The distances and bearings cited below relative to the application area centre point are to the south-western corner of the square defined by the NGR quoted in the HER entry.

#### 5.2.2 Heritage assets within the survey area

No heritage assets have been recorded within the survey area.

#### 5.2.3 Heritage assets within 500m of the survey area

##### Iron and pottery manufacturing

An iron working site was excavated in 2012 by AC Archaeology Ltd to the north of the survey area and to the south of Culmstock Road (National Grid Reference ST 1325 1335, distance and bearing from survey area centre point 78m on N27) prior to the construction of a housing development completed before to this magnetometer survey. An area of 40m by 15m was stripped of topsoil revealing the remains of slagpit furnaces, pits and gullies which were sealed beneath a deposit of slag and fuel waste derived from iron smelting activity (Stead and Payne, 2012). The dating evidence indicated that smelting was in the period between the late 7th and late 9th centuries, overlapping between AD 695-864 (Rainbird and Young, 2016). The excavation provided clear evidence for iron smelting, with a significant area of smelting debris present in the north-west corner of the field, where a subsequent accumulation of colluvium at the base of the field appeared to have protected it and the underlying features from disturbance by ploughing. The debris included furnace and tap slag, as well as vitrified furnace lining which suggested the presence nearby of furnaces and/or hearths. The evidence suggested that the main focus of iron smelting activity lay slightly to the north of the excavation site. There was no evidence for buildings associated with the metalworking and the small amount of finds indicate that domestic settlement was at a distance. The results of the excavation, along with work on neighbouring sites (see below), showed that Hemyock was a focus for ironworking in Saxon and later medieval times and was part of the ironworking industries of the broader Blackdown Hills area (Historical Environment Record MDV103065; Stead and Payne, 2012); Rainbird and Young, 2016).

An archaeological evaluation at the former Halls Engineering Works, Market Square, Hemyock recovered a spread of slag based industrial waste from the west side of the site. The slag may have been imported to the site to fill an extensive depression and included fragments of furnace lining which could be of Saxon date (early medieval, between 410 AD and 1066 AD) (MDV71156, ST 135 132, 296m on N106).

Evaluation trenches across an extensive earthwork forming a platform in a field to the east of 'Castle Dene', near Hemyock Castle, showed it to comprise a mound of red clay overlain by a deep topsoil. The clay may have represented a dump of excavated material from the castle moat or have been a stockpile of raw material for the pottery or more likely the iron industry. The platform sealed a buried soil deposit from which pottery dated to between the 12th and 14th centuries (MDV72287, ST 135 133, 286m on N85) and large quantities of slag were recovered either derived from the castle or from an area of iron-working activity nearby (MDV76408, ST 135 133, 286m on N85).

Excavations in advance of redevelopment at Churchills Farm revealed an area of iron works with furnace bases, tap channels and large quantities of iron slag. To the north a number of pits, drains and ditches were also associated with quantities of slag and pottery dating to the 12th-13th centuries. These features were covered by a layer of dark soil through which further pits had been cut that contained pottery waste of probable late 15th century date (MDV114773, ST 136 131, 425m on N115). On the same site a layer containing significant quantities of ironworking debris, including tap slag, cake slag and furnace lining but without in-situ furnaces or other structures was recorded. This debris is likely to be waste material from nearby ironworking activities. Pottery recovered from the trenches dated the debris to the 15th or 16th century (MDV78413, ST 136 131, 425m on N115). Significant quantities of 16th to 17th century pottery were recovered from layers and deposits which overlay the ironworking debris layers. A number of waster sherds and pieces of ceramic kiln furniture were recovered with the pottery which are indicative of a pottery manufacturing site in the locality (MDV78415, ST 136 131, 425m on N115). Further deposits of pottery waste were found

during the excavation included roof and floor tiles along with kiln furniture ((MDV114774, ST 136 131, 425m on N115).

Pieces of tap and furnace slag dated between 1401 AD to 2009 AD were recovered from evaluation trenches on land at 3 Broadway, Hemyock are indicative of iron working in the vicinity (MDV80653, ST 136 132, 393m on N102).

#### Other historical assets

Hemyock Castle (MDV1894, Scheduled Monument 1004583, ST 135 132, 296m on N106) is a roughly rectangular structure with a well-defined moat dating from the 14th century. The principle remains comprise the circular towers flanking the main (east) entrance and a corner tower at the north east angle. There are also the remains of four other circular towers and stretches of curtain wall. The castle has been dated as early medieval to post-medieval (between 1066 AD and 1750 AD). Within the walls is a post medieval farmhouse.

A linear feature at ST 135 131 (337m on N122) aligned east to west and visible as a slight scarp with possible irregular raised area at the western end close to the stream was recorded in 2004. The feature does not follow former field boundaries so may be of recent origin or predate the map evidence. An excavation in 2005 by Exeter Archaeology found evidence of agricultural land use of the site with possible tenement plots to the north and a spread of slag based industrial waste was recovered to the west. The site was dated between 1751 AD and 2009 AD (MDV70228).

A post-medieval to modern (1751 AD onwards) gravel pit has been mapped at ST 131 131, 214m on N213 (MDV35303).

## 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.

The terms 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 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 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 survey area edges was restricted as shown in Figures 3 and 4 due to the presence of magnetic materials adjacent to the survey area. 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.

Numerous dipole magnetic anomalies are scattered across the data set. These are likely to represent recent buried ferrous objects and such patterns are frequently found in close proximity to settlements.

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

No anomaly groups coincided with features documented on historical maps or in other historic records.

#### 6.2.3 Data with no previous archaeological provenance

Magnetic anomalies **1** and **2** are fragmentary and sparsely distributed in the survey area making it impossible to provide an archaeological characterisation beyond that recorded in Table 1.

Magnetic anomaly group **101** is almost certainly a modern deposit. It coincides with an area understood to have been used to temporarily store topsoil during the construction of the adjacent houses. This material would have included debris from an historical iron working site excavated prior to construction as discussed in Section 5.2.3.

#### 6.3 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.

Two magnetic anomaly groups represent possible linear archaeological deposits. They are isolated in the dataset and cannot be characterised further. A further anomaly group coincides with, and almost certainly represents, an area used to store topsoil during the recent construction of adjacent houses. The remaining traces of the topsoil are likely to include debris from an historical iron working site excavated prior to construction which would explain the recorded magnetic response.



## 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 of AC Archaeology Ltd for commissioning us to complete this survey.

## 9 Bibliography

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) [May 2016]

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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> [May 2016]

Rainbird, P. and Young, P. (2016) *Saxon Iron Smelting Furnaces at Hemyock, Devon*, forthcoming

Stead, P. and Payne, N. (2012) *Land to the south of Culmstock Road, Hemyock, Devon, NGR ST 1325 1335, Results of archaeological trench evaluation, Planning ref. Mid Devon District Council 12/01334/MFUL*, AC Archaeology Ltd unpublished report ACD476/2/0

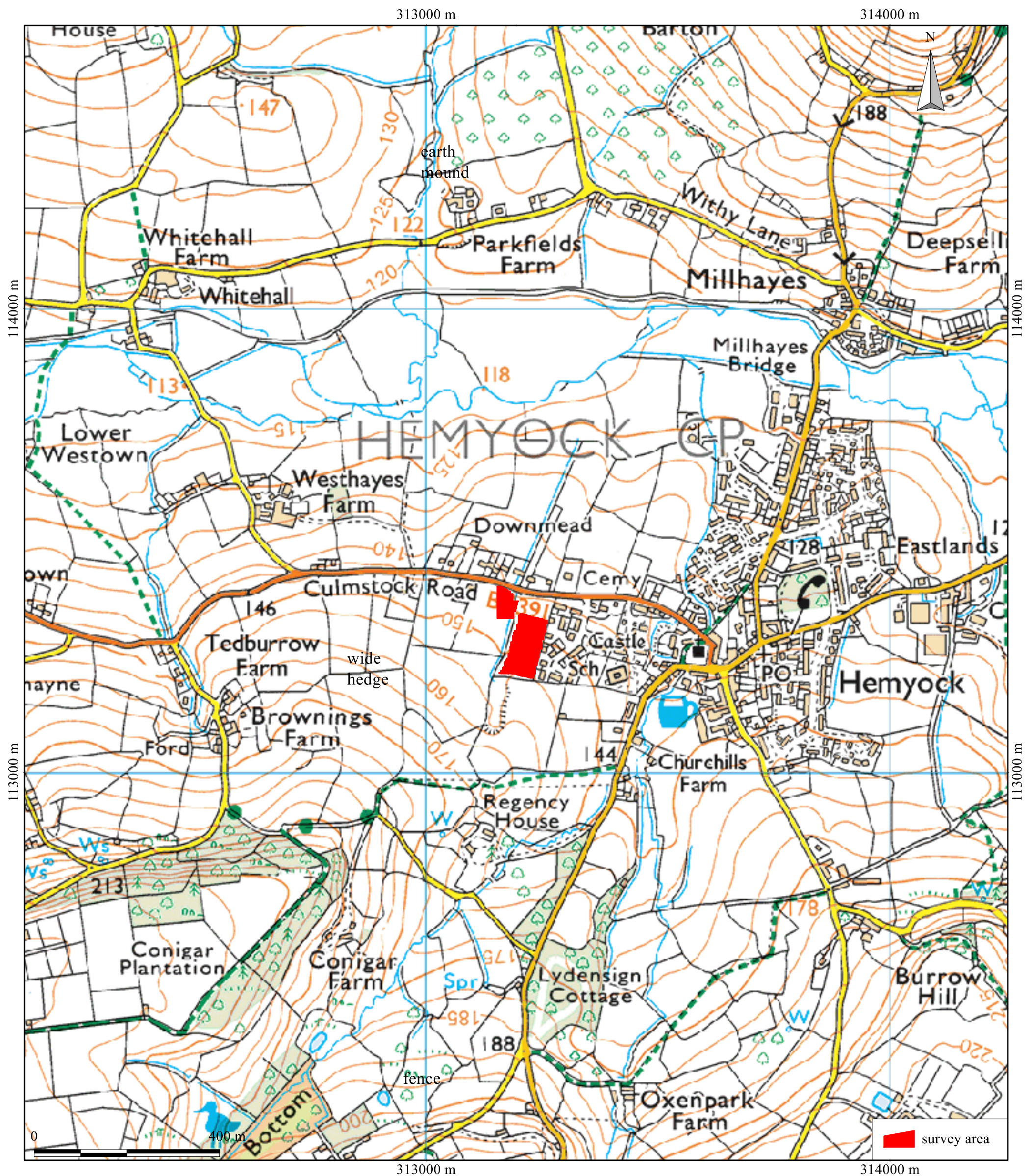
## Appendix 1      Supporting plots

### 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: 313193.87 m, centre Y: 113387.13 m

Geophysical survey: Copyright Substrata 2016.  
Base map: © Crown copyright and/or database right 2016  
Supplied by UK Map Centre

Scale: 1:8000 @ A3. Spatial Units: Meter. Do not scale off this drawing

An archaeological magnetometer survey  
Land at Culmstock Road, Hemyock, Devon  
Centred on NGR (E/N): 313215,113280 (point)  
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Figure 1: location map

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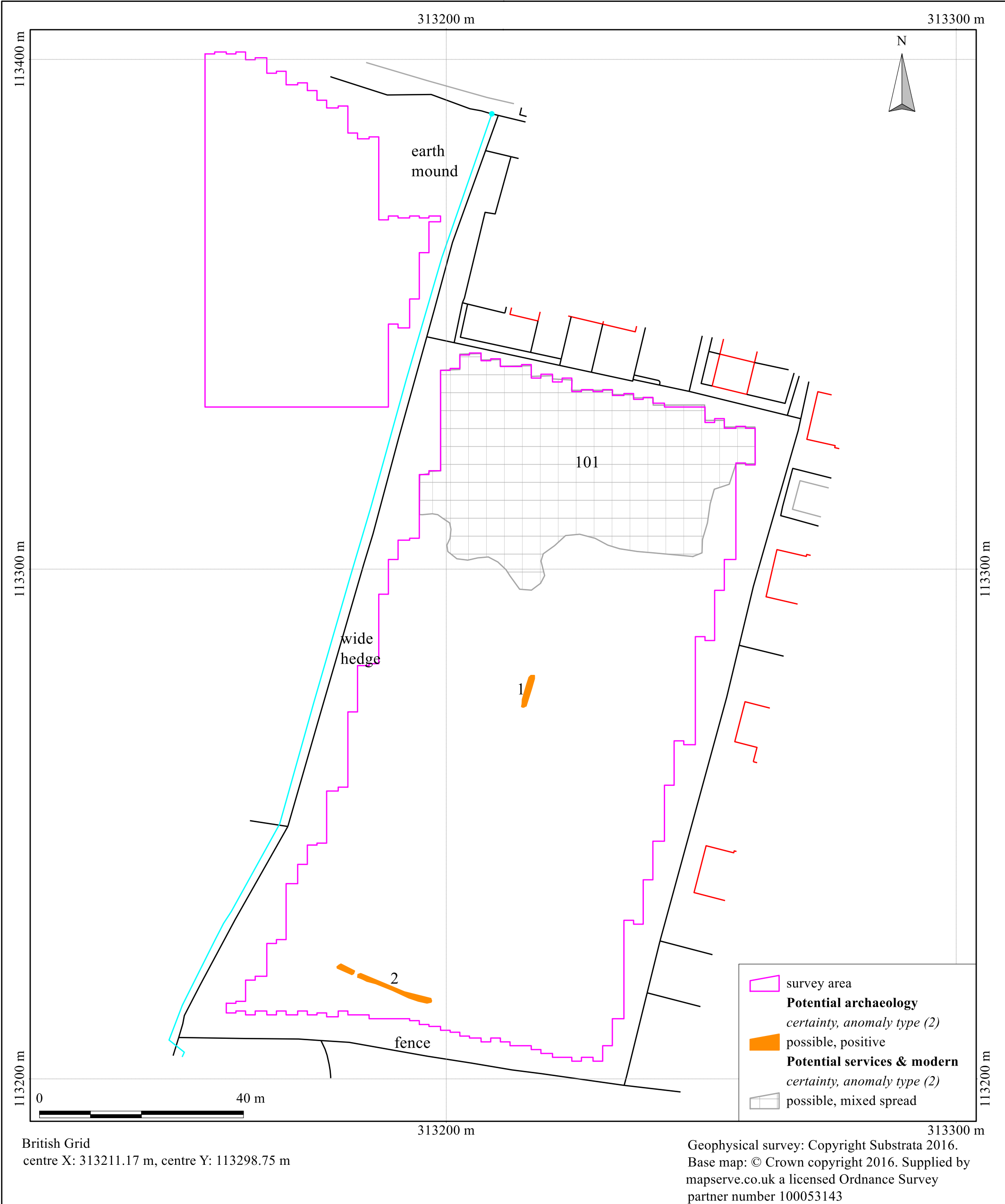


Figure 2: survey interpretation

Site: An archaeological magnetometer survey  
Land at Culmstock Road, Hemyock, Devon  
Centred on NGR (E/N): 313215,113280 (point)  
Report: 1605HEM-R-1

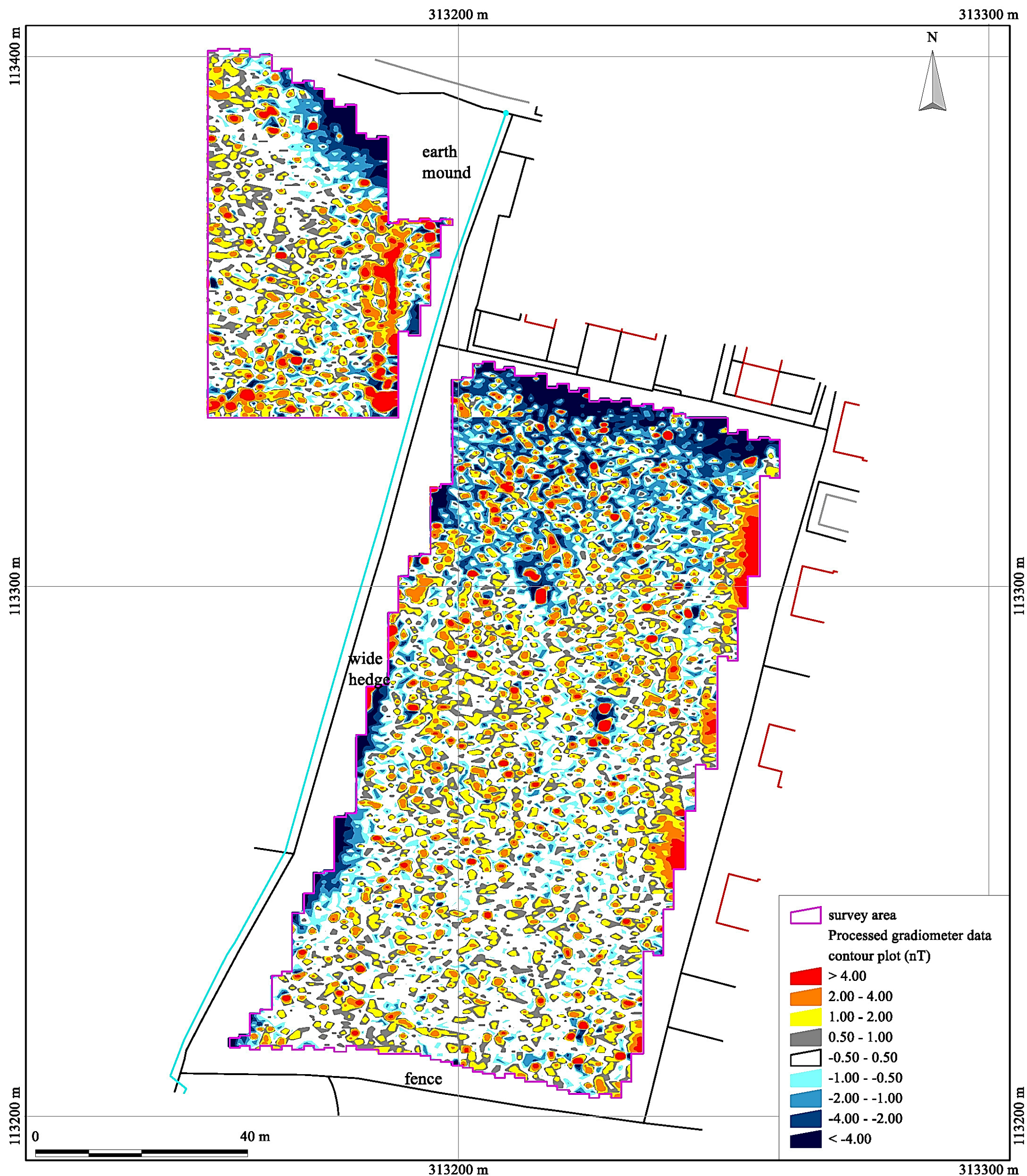
anomaly group	anomaly characterisation certainty & class	anomaly form	additional archaeological characterisation	comments	supporting evidence
1	possible, positive	disrupted linear			
2	possible, positive	linear			
101	possible, mixed spread	irregular	area of temporary topsoil storage displaying irregular evidence of ferrous material	It is understood that the anomaly group coincides with an area used to temporarily store topsoil during the construction of the adjacent houses. This material would have included debris from an historical iron working site excavated prior to construction.	HER MDV103065, Stead and Payne (2012), Rainbird & Young (2016)

Table 1: data analysis



Figure 3: shade plot of processed data



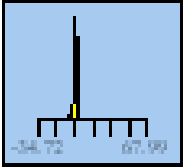


## Appendix 2 Methodology Summary

Table 2: methodology summary	
<b>Documents</b> Survey methodology statement: Dean (2016)	
<b>Methodology</b> <ol style="list-style-type: none"> <li>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).</li> <li>2. The survey grid location information and grid plan was recorded as part of the project in a suitable GIS system.</li> <li>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.</li> </ol>	
<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> 0.25m <i>Traverse Interval:</i> 1 metre <i>Traverse Method:</i> zigzag <i>Traverse Orientation:</i> GN
<b>Data Processing, Analysis and Presentation Software</b> 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	



## Appendix 3 Data processing

Table 3: magnetometer survey - processed data metadata	
<p><b>SITE</b></p> <p>Instrument Type: Bartington Grad-601 gradiometer</p> <p>Units: nT</p> <p>Direction of 1st Traverse: see below</p> <p>Collection Method: ZigZag</p> <p>Sensors: 2 @ 1.00 m spacing.</p> <p>Dummy Value: 32702</p> <p><b>PROGRAM</b></p> <p>Name: TerraSurveyor</p> <p>Version: 3.0.29.1</p>	
<p><b>Stats</b></p> <p>Max: 67.99</p> <p>Min: -34.72</p> <p>Std Dev: 2.45</p> <p>Mean: -0.31</p> <p>Median: -0.11</p>	
<p><b>Processes: 9</b></p> <ol style="list-style-type: none"> <li>1 Base Layer</li> <li>2 De Stagger: Grids: All Mode: Both By: -2 intervals</li> <li>3 DeStripe Median Sensors: All</li> <li>4 Edge Match (Area: Top 30, Left 480, Bottom 119, Right 599) to Left edge</li> <li>5 Edge Match (Area: Top 60, Left 600, Bottom 89, Right 719) to Left edge</li> <li>6 De Stagger: Grids: a9.xgd a20.xgd a6.xgd a10.xgd a19.xgd Mode: Both By: -1 intervals</li> <li>7 Edge Match (Area: Top 0, Left 240, Bottom 29, Right 359) to Bottom edge</li> <li>8 Edge Match (Area: Top 0, Left 240, Bottom 29, Right 359) to Left edge</li> <li>9 Interpolate: Match X &amp; Y Doubled.</li> </ol>	

## Appendix 4 Unprocessed data plot

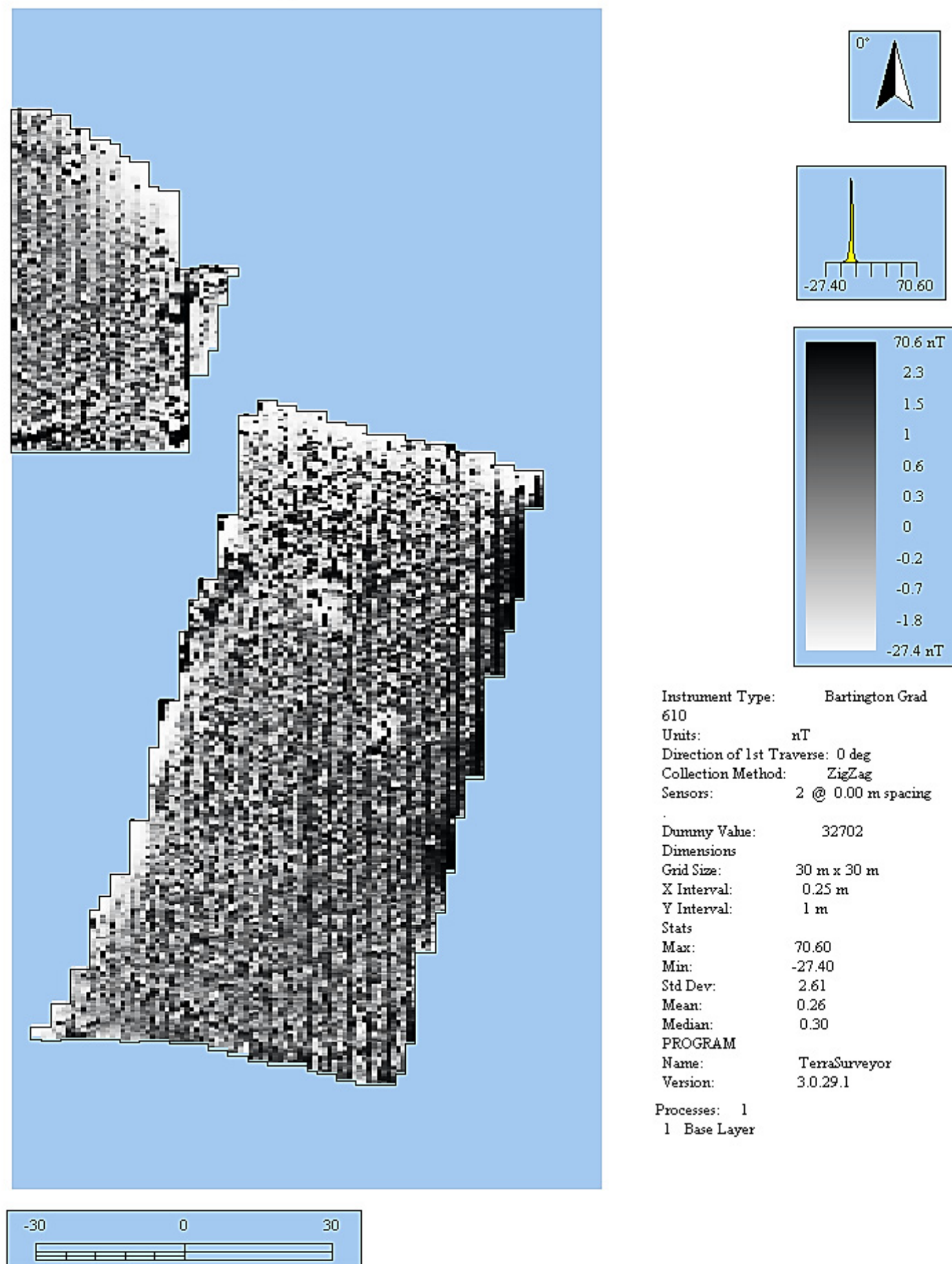


Figure 5: shade plot of unprocessed data