

Substrata

Archaeological Geophysical Surveyors

An archaeological magnetometer survey
**Land north of Newnham on Severn
Forest of Dean, Gloucestershire**

Centred on NGR 369201,212200

Report: 1805NEW-R-1

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7 June 2018

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1 Introduction

This report presents the results of an archaeological geophysical survey at the site listed in Section 2 and shown in Figure 1, hereafter referred to as the 'Survey Area'. It was commissioned by AC Archaeology Limited on behalf of clients.

The survey and report were completed in compliance with a Survey Method Statement (Dean, 2018).

2 Survey description

2.1 Survey

Method:	shallow depth magnetometer
Instrument:	twin-sensor fluxgate gradiometer
Date:	25 and 31 May 2018
Area:	4.3ha

2.2 Location

Survey Area name:	Land north of Newnham on Severn
Civil parish:	Newnham
District:	Forest of Dean
County:	Gloucestershire
Nearest Postcode:	GL14 1BN
NGR:	SO 69201 12200 (point)
NGR (E/N):	369201,212200 (point)
Historic environment designation:	none

2.3 Client

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

3 Summary

A magnetometer survey was selected to provide a relatively fast and cost-effective evaluation of any buried archaeology across the Survey Area (see Section 12). The magnetic anomaly groups pertaining to potential buried archaeology were georeferenced to the Ordnance Survey National Grid, mapped, characterised and assigned with an appropriate degree of certainty in conformance with the survey aims and objectives set out in Section 4.

The differences in magnetic responses across the Survey Area were sufficient to be able to differentiate between anomalies representing possible buried archaeology and background magnetic responses.

Three magnetic anomaly groups have been characterised as possibly representing potential buried archaeology such as ditches associated with former field boundaries although natural origins are equally likely. Four groups are likely to represent traces of former cultivation. One of these probably represents ridge-and-furrow ploughing with a different trend to the adjacent modern field boundaries. The remaining three groups may represent either orchard banks or ridge-and-furrow ploughing in line with extant field boundaries.

4 Aims and objectives

4.1 Aims

Within the framework set out in Chartered Institute for Archaeologists (2014a), complete an archaeological geophysical survey and report which will, as far as possible, establish the presence or absence, extent and character of any buried archaeology within the survey area.

4.2 Survey objectives

1. Complete a magnetometer survey across the Survey Area.
2. Identify any magnetic anomalies that may be related to buried archaeology.
3. Within the limits of the technique 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.

5 Standards

The standards used to complete this survey are defined by the Chartered Institute for Archaeologists (2014a) and Historic England (2008). The codes of approved practice that were followed are those of the Chartered Institute for Archaeologists (2014b) and Archaeology Data Service (undated).

6 Methodology

The magnetometer survey was undertaken in accordance with a Survey Method Statement (Dean, 2018) to achieve the aims and objectives set out in Section 4 using the standards and guidance specified in Section 5. The survey method was selected to provide a relatively fast and cost-effective evaluation of any buried archaeology across the Survey Area (see Section 12).

Data processing was undertaken using appropriate software (Table 2), 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. The survey and report conform to the Chartered Institute for Archaeologists standard for geophysical survey (CIfA, 2014a).

7 Survey Area

7.1 Location

The Survey Area comprises five fields to the northeast of Newnham on Severn as shown in Figure 1. The fields were designated Plots 1 to 5 as shown in Figure 2.

7.2 Geology

The bedrock across the Survey Area comprises rocks of the Triassic Mercia Mudstone Group. Generically they comprise 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 deposits across the remainder of the Survey Area are not recorded in the source used (British Geological Survey, undated).

7.3 Soils and near-surface deposits

‘Slightly acid loamy and clayey soils with slightly impeded drainage’ (Cranfield, undated).

No site-relevant geotechnical reports or borehole logs of near-surface deposits are currently available.

7.4 Topography

The fields are situated on a low, east-west spur on the western bank of the River Severn. The land slopes from approximately 26m AOD in the north and west to approximately 16m AOD in the east and south.

7.5 Land use

At the time of the survey, the Survey Area was sheep pasture. The Survey Area is confined by fenced and hedged boundaries. Some internal divisions have been created using wire fencing.

8 Archaeological background

8.1 Historic Environment Status

None.

8.2 Historic landscape characterisation

Plots 1, 2 and 4

Regular, organised enclosure ignoring former unenclosed cultivation patterns recorded on 18th or 19th century maps.

Plots 3 and 5

Regular, organised enclosure of rich, wet grassland ignoring former unenclosed cultivation patterns and with an absence of a parliamentary enclosure.

(Archaeology Data Service, undated b).

8.3 Summary of the archaeological assets adjacent to the Survey Area

An archaeological desk-based assessment was produced by CGMS Consulting (Thomas 2017) for the site, now slightly modified to produce the current Survey Area. The report concludes that there are no designated or non-designated archaeological assets within the site or its immediate surrounds.

9 Results

9.1 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 dimensions of magnetic anomalies mapped as representing potential buried archaeology do not represent the dimensions of any associated archaeology.

The analysis presented below identifies and characterises anomalies and anomaly groups that may relate to buried archaeology.

9.2 Analysis

Figure 2 shows the interpretation of the survey data and include 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 the processed data as specified in Table 3. Figure 5 is a plot of minimally processed data as specified in Table 4. Figure 6 shows the location of the survey grid and the designations of the grid data files.

10 Discussion

10.1 General points

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 in 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

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 mapped as potential

archaeology when they are 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 are only mapped where they comprise significant magnetic responses across the dataset that need clarification.

Numerous dipole magnetic anomalies are present within the dataset. 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.

10.2 Data relating to historic maps and other records

Anomaly groups **101** and **102** reflect slight earthworks noted by the surveyors and have been recorded on LiDAR images (Thomas 2017). These two groups may represent either raised banks associated with a former orchard or with former ridge-and-furrow ploughing. Ridge-and-furrow has been recorded in the vicinity (ibid) and orchards were mapped in all five Plots between 1884 and 1955 as noted in Table 1.

Group **103** was visible as earthworks noted by the surveyors and have been recorded on LiDAR images (ibid). The width of these earthworks implies ridge-and-furrow rather than orchard banks and the trend is different to the adjacent modern field boundaries.

10.3 Data with no previous archaeological provenance

Magnetic anomaly groups **1**, **2** and **3** may represent disrupted linear archaeological deposits such as ditches associated with former field boundaries but they could equally reflect natural deposits.

Group **104** had no associated visible earthworks but has similar magnetic responses to 101 and 102 (Section 10.2) and may represent either raised banks associated with a former orchard or with former ridge-and-furrow ploughing.

Group **304** is indicative of disturbed ground and stony deposits (probably rubble) and is likely to reflect relatively recent activity.

11 Conclusions

The differences in magnetic responses across the Survey Area were sufficient to be able to differentiate between anomalies representing possible buried archaeology and background magnetic responses.

Three magnetic anomaly groups (1, 2 and 3) have been characterised as possibly representing potential buried archaeology such as ditches associated with former field boundaries although natural origins are equally likely. Four groups are likely to represent traces of former cultivation. One of these (103) represents ridge-and-furrow ploughing with a different trend to the adjacent modern field boundaries. The remaining three groups (101, 102 and 104) may represent either orchard banks or ridge-and-furrow ploughing in line with extant field boundaries.

12 Disclaimer

The description and discussion of the results presented in this report are the authors', based on their 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 programme of archaeological work of

which this survey is part may also be informed by other archaeological work and analysis. It must be presumed that more archaeological features will be found than those specified in this report.

13 Copyright

Substrata Ltd 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 Limited copyright or the intellectual property of third parties. Such material is labelled with the appropriate copyright and is non-transferrable by Substrata Ltd.

14 Archive

14.1 Online Access to the Index of archaeological investigationS (OASIS)

OASIS ID: substrat1-319039

The OASIS entry has been completed and the boundary file and report uploaded with six months delay in publication.

14.2 Substrata Limited archive

A full archive of this survey will be held by Substrata Limited on cloud and local hard drive storage as specified in Appendix 3.

14.3 Archaeological Data Service (ADS)

Depending on local authority policy, an archive may be deposited with the ADS as specified in Appendix 3.

14.4 Historic Environment Record (HER)

Subject to any contractual requirements on confidentiality, a PDF or printed copy of the report will be submitted to the appropriate HER within six months of completion.

15 Acknowledgements

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

16 Bibliography

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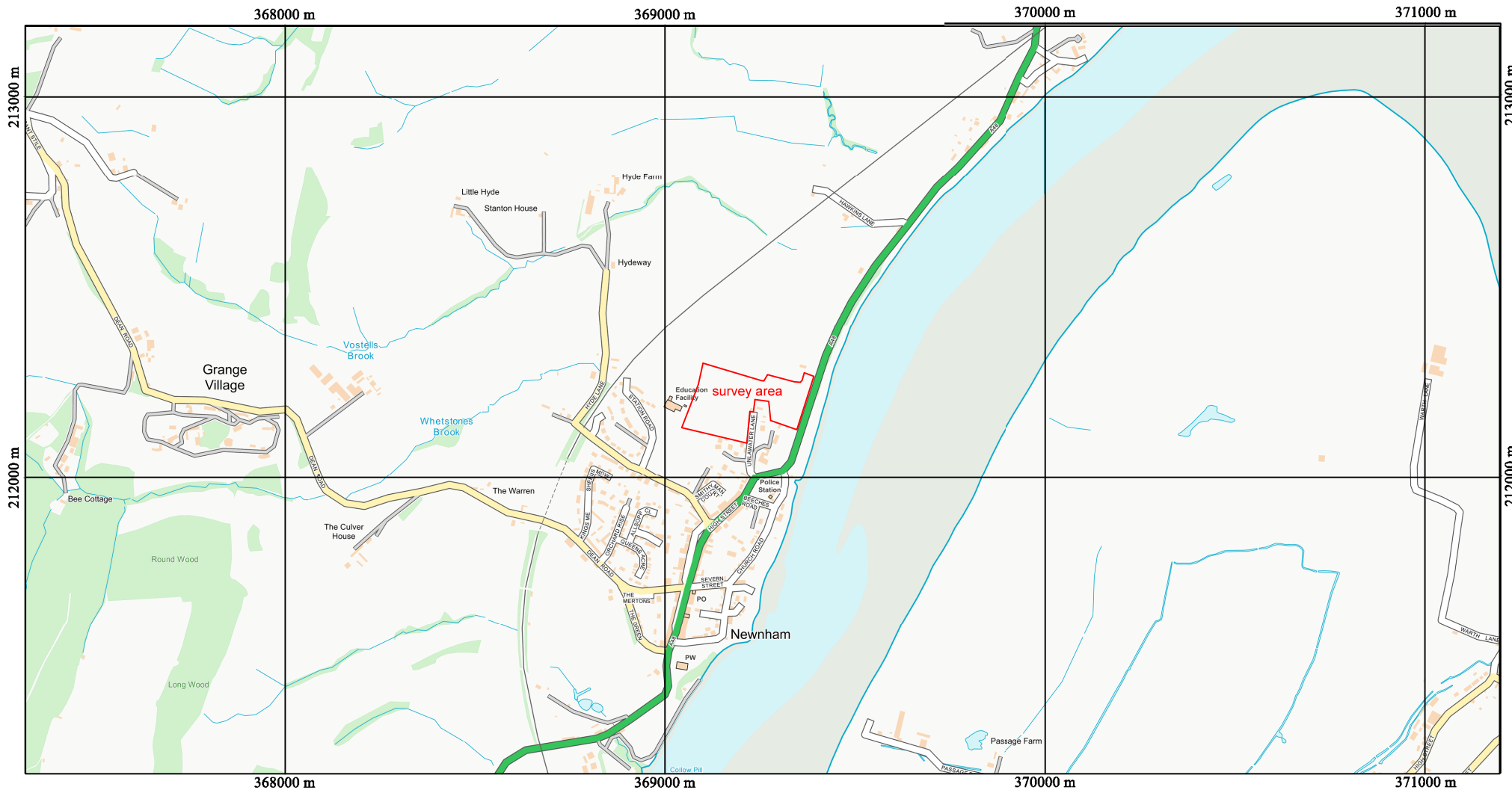
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Appendix 1 Figures

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: 369256.79 m, centre Y: 212204.33 m

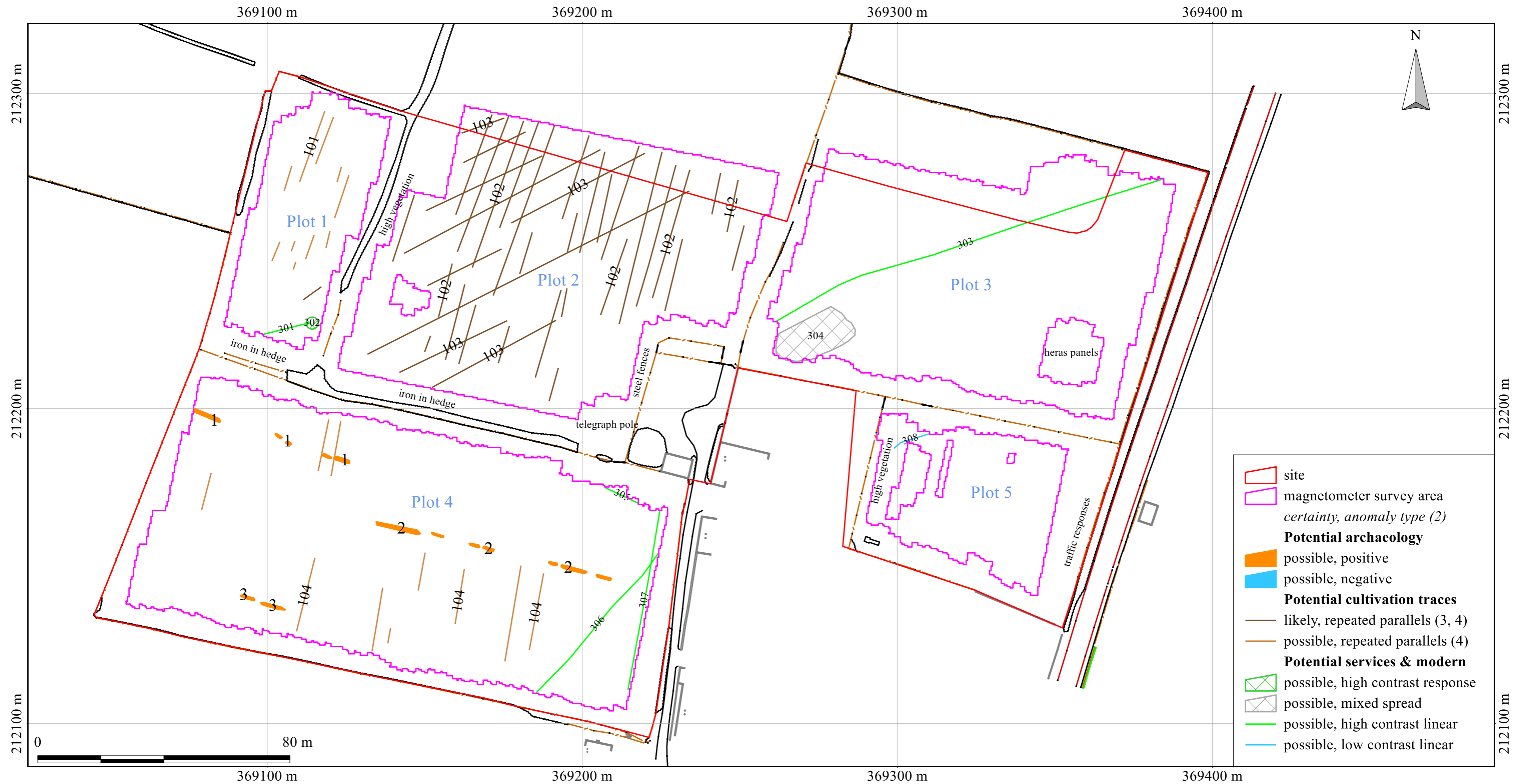
Scale: 1:10000 @ A3. Spatial Units: Meter. Do not scale off this drawing

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An archaeological magnetometer survey
 Land north of Newnham on Severn
 Forest of Dean, Gloucestershire
 Centred on NGR: 369201,212200
 Report: 1805NEW-R-1

Figure 1: location map

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British Grid
centre X: 369256.79 m, centre Y: 212204.33 m

Notes: Scale: 1:1200 @ A3. Spatial Units: Meter. Do not scale off this drawing

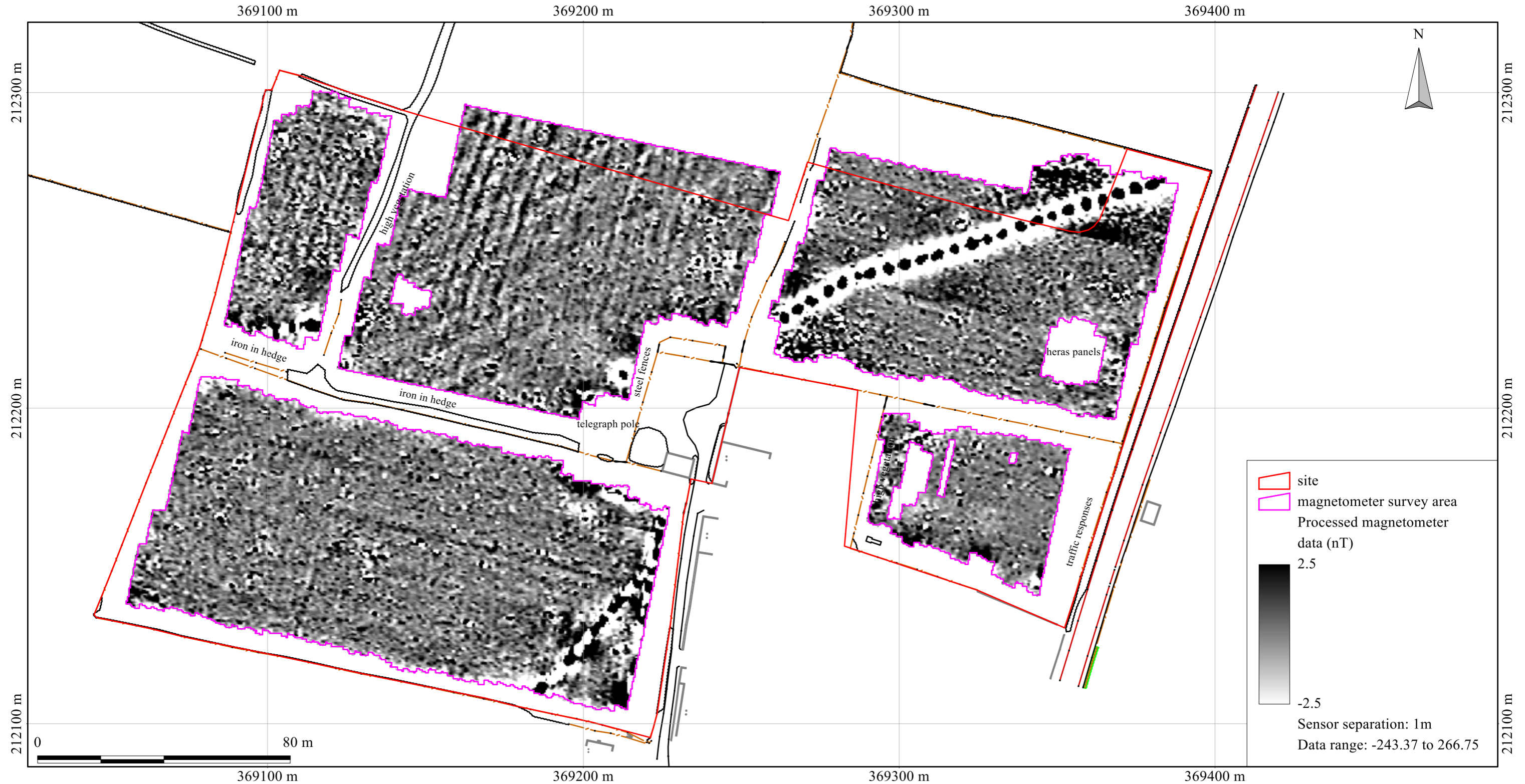
1. All interpretations are provisional and represent potential archaeological deposits.
2. 'Anomaly type' is a description of the magnetic anomaly. See the report text or GIS for an archaeological characterisation.
3. Anomalies designated "likely archaeology" have supporting evidence e.g. historical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

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Forest of Dean, Gloucestershire
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Figure 2: survey interpretation

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British Grid
 centre X: 369256.79 m, centre Y: 212204.33 m

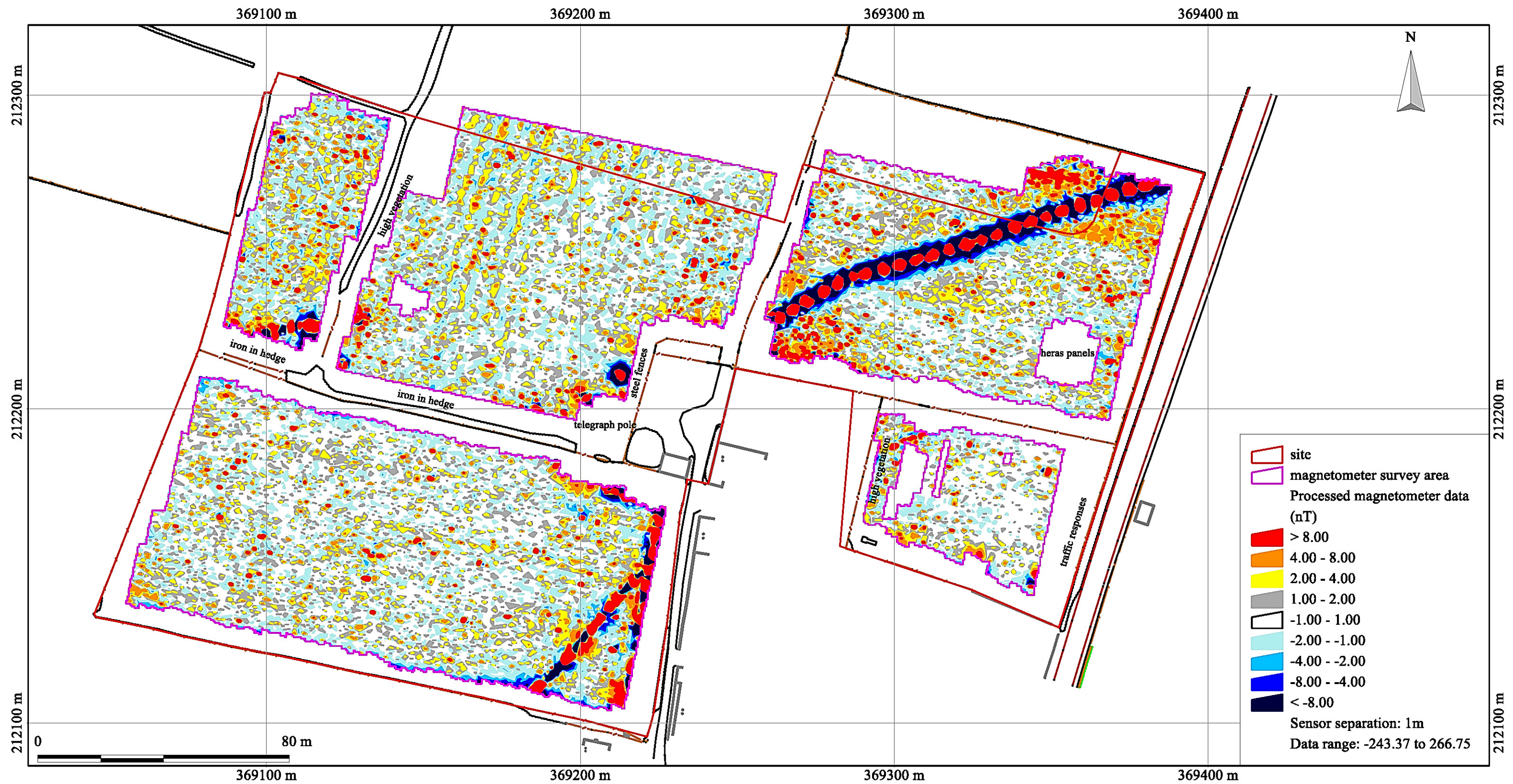
Scale: 1:1200 @ A3. Spatial Units: Meter. Do not scale off this drawing

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Figure 3: shade plot of processed data

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British Grid
 centre X: 369256.79 m, centre Y: 212204.33 m

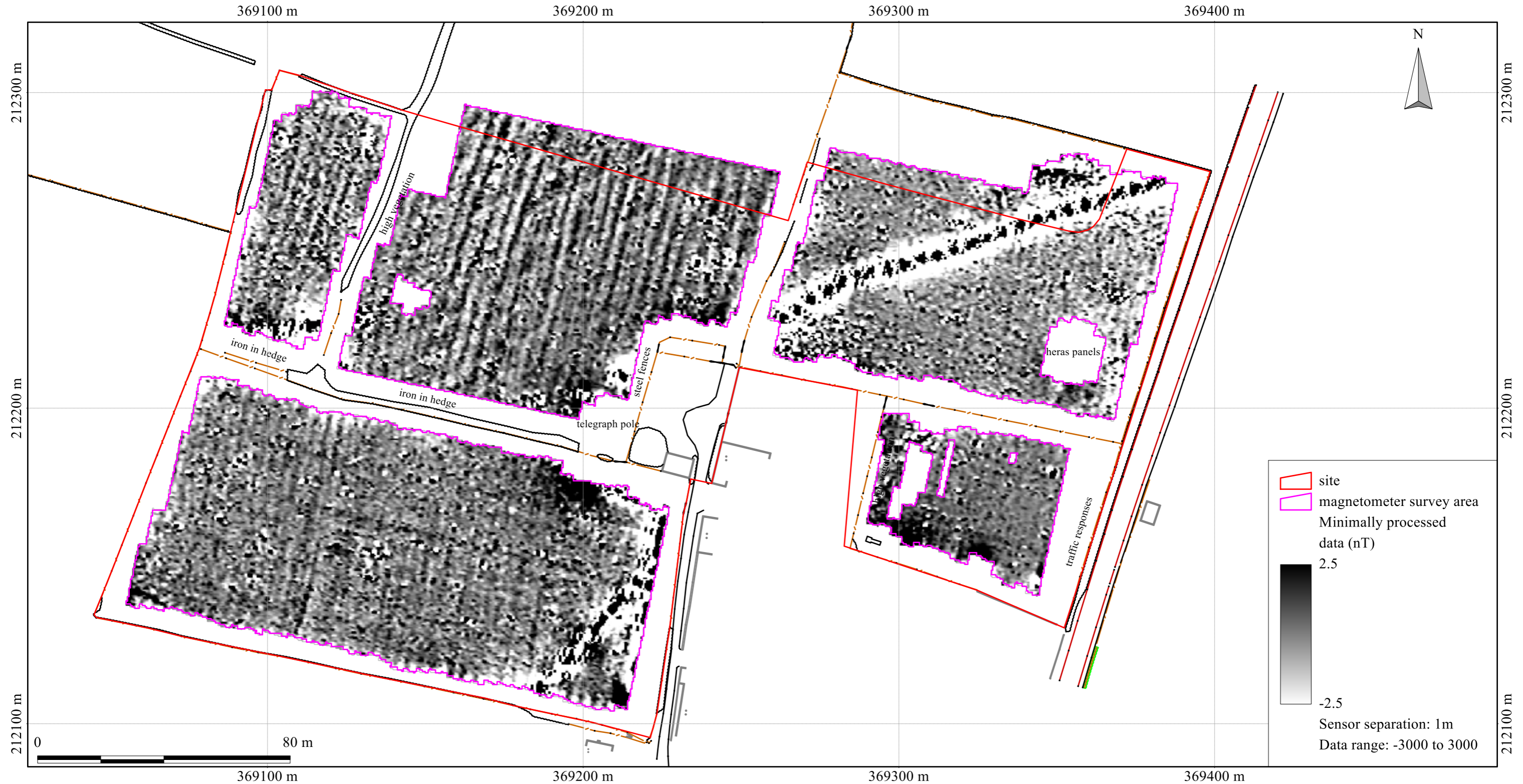
Scale: 1:1200 @ A3. Spatial Units: Meter. Do not scale off this drawing

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An archaeological magnetometer survey
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Figure 4: contour map of processed data

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British Grid
 centre X: 369256.79 m, centre Y: 212204.33 m

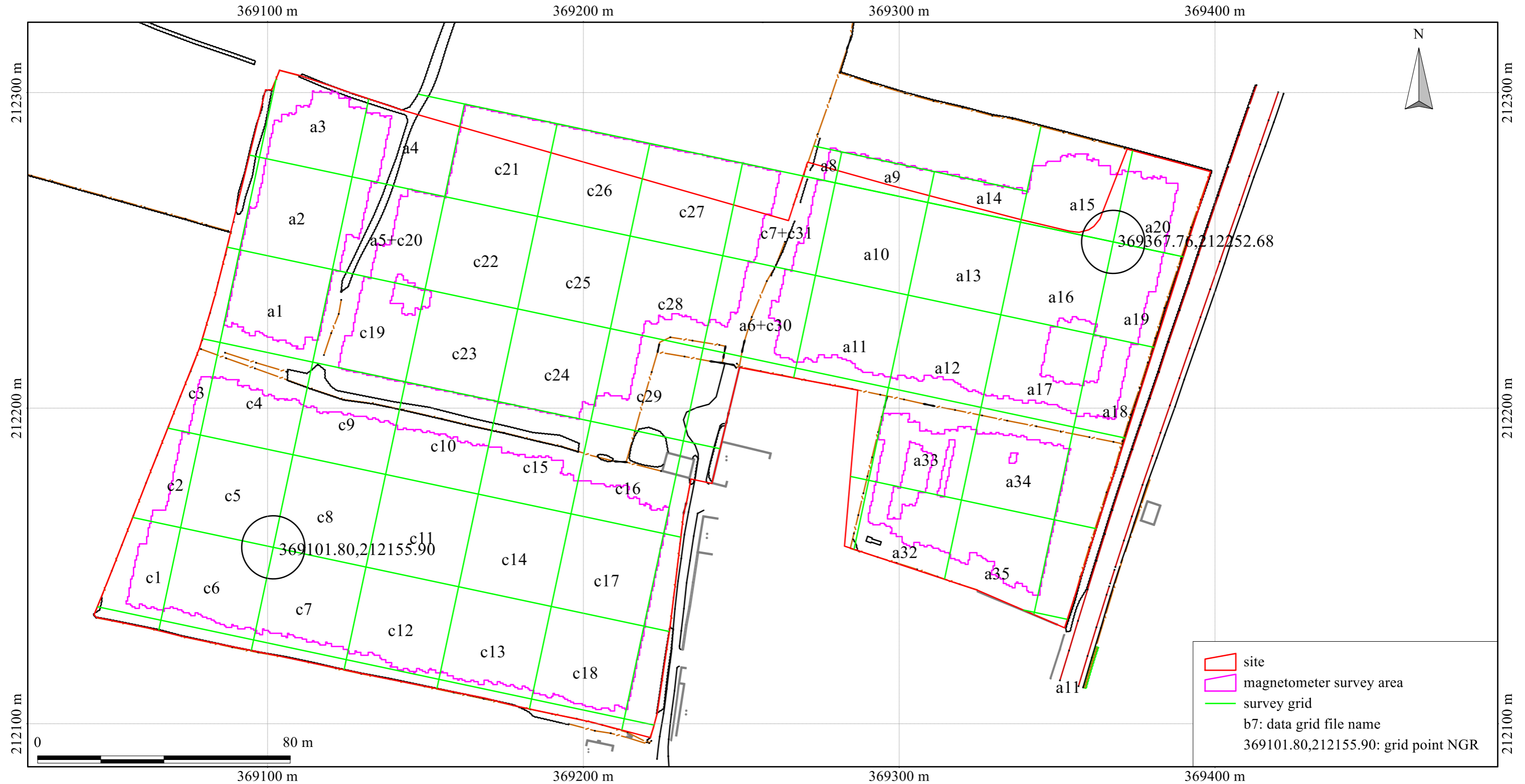
Scale: 1:1200 @ A3. Spatial Units: Meter. Do not scale off this drawing

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An archaeological magnetometer survey
 Land north of Newnham on Severn
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 Centred on NGR: 369201,212200
 Report: 1805NEW-R-1

Figure 5: shade plot of minimally processed data

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British Grid
 centre X: 369256.79 m, centre Y: 212204.33 m

Scale: 1:1200 @ A3. Spatial Units: Meter. Do not scale off this drawing

Geophysical survey: Copyright Substrata Limited.
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An archaeological magnetometer survey
 Land north of Newnham on Severn
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Figure 6: survey grid plan and location

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Appendix 2 Tables

Site: An archaeological magnetometer survey
Land north of Newnham on Severn
Forest of Dean, Gloucestershire
Centred on NGR: 369201,212200
Report 1805NEW-R-1

anomaly group	plot	anomaly characterisation certainty & class	anomaly form	additional archaeological characterisation	comments	supporting evidence
1	4	possible, positive	disrupted linear	linear buried archaeology or natural deposits	anomaly group may represent buried archaeology such as a ditch but natural origins are equally likely	
2	4	possible, positive	disrupted linear	linear buried archaeology or natural deposits	anomaly group may represent buried archaeology such as a ditch but natural origins are equally likely	
3	4	possible, positive	disrupted linear	linear buried archaeology or natural deposits	anomaly group may represent buried archaeology such as a ditch but natural origins are equally likely	
101	1	possible, repeated parallels		orchard banks or ridge-and-furrow partially extant	an orchard was mapped over all the plots between 1884 and 1955 with a partial clearance of plot 2 between 1922 and 1955	surveyor observation and Ordnance Survey maps 1884 1:2500 to 1955 1:10560
102	2	likely, repeated parallels		orchard banks or ridge-and-furrow partially extant	an orchard was mapped over all the plots between 1884 and 1955 with a partial clearance of plot 2 between 1922 and 1955	Ordnance Survey maps 1884 1:2500 to 1955 1:10560, surveyor observation and recorded on LiDAR plots (CgMs 2017)
103	2	likely, repeated parallels		ridge-and-furrow partially extant	anomaly group represents partially extant ridge-and-furrow	surveyor observation and recorded on LiDAR plots (CgMs 2017)
104	4	possible, repeated parallels		cultivation traces - possibly orchard banks or ridge-and-furrow with more recent ploughing	an orchard was mapped over all the plots between 1884 and 1955 with a partial clearance of plot 2 between 1922 and 1955	Ordnance Survey maps 1884 1:2500 to 1955 1:10560
301	1	possible, high contrast linear		ferrous service pipe or cable		
302	1	possible, high contrast response		ferrous material - may be part of a service		
303	3	possible, high contrast linear		ferrous service pipe or cable		
304	3	possible, mixed spread		disturbed ground and/or stony deposit		
305	4	possible, high contrast linear		ferrous service pipe or cable		
306	4	possible, high contrast linear		ferrous service pipe or cable		
307	4	possible, high contrast linear		ferrous service pipe or cable		
308	5	possible, low contrast linear		service trench		

Table 1: data analysis

<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> GN12</p>
<p>Data Processing, Analysis and Presentation Software IntelliCAD 8.4 DW Consulting TerraSurveyor3 Manifold System 8 GIS Microsoft Corp. Office 365: Excel, Publisher, Word Adobe Systems Inc Adobe Acrobat 9 Pro Extended</p>	

Table 2: methodology information

Instrument	
Type:	Bartington Grad-601 gradiometer
Units:	nT
Direction of 1st Traverse:	see below
Collection Method:	ZigZag
Sensors:	2 @ 1.00 m spacing, each with 1m separation
Dummy Value:	32702
Program	
Name:	TerraSurveyor
Version:	3.0.33.6
<u>Statistics</u>	<u>Processing</u>
Max:	226.75
Min:	-243.37
Std Dev:	18.99
Mean:	0.32
Median:	0.00
	Processes: 4
	1 Base Layer
	2 Clip at 1.00 SD
	3 DeStripe Median Traverse: Grids: All
	4 De Stagger: Grids: All By: 0 intervals, 50.00cm
	Interpolate match x & y double is imposed on export to the GIS

Table 3: processed data metadata

Instrument	
Type:	Bartington Grad-601 gradiometer
Units:	nT
Direction of 1st Traverse:	see below
Collection Method:	ZigZag
Sensors:	2 @ 1.00 m spacing, each with 1m separation
Dummy Value:	32702
Program	
Name:	TerraSurveyor
Version:	3.0.33.6
Statistics	Processing
Max:	3000.00
Min:	-3000.00
Std Dev:	213.77
Mean:	3.70
Median:	-0.10
	1 Base Layer
	Interpolate match x & y double is imposed on export to the GIS

Table 4: minimally processed data metadata

Appendix 3 Project archive contents

A3.1 Substrata Limited archive

A full archive of this survey will be held by Substrata Limited on cloud and local hard drive storage as follows:

Report:	Adobe PDF format
Raw grid & composite files:	DW Consulting TerraSurveyor 3 format xyz files
Final data processing composite files: (excluding interpolation processes)	DW Consulting TerraSurveyor 3 format xyz files
GIS project:	GIS project Manifold 8 .map format ESRI shape files
AutoCAD version of the survey interpretation: (if generated)	AutoCAD DXF
All project working files:	various (Table 2)

A3.2 Online Access to the Index of archaeological investigationS (OASIS)

Metadata:	online form
Georeferenced survey boundary file:	ESRI shape file
Report:	Adobe PDF format

A3.3 Archaeological Data Service

Depending on local authority policy, an archive may be deposited with the ADS as follows:

Raw data composite file:	xyz file
Processed data plot:	rendered images in TIFF format
Survey grid plot:	image in TIFF format
Details of data processing:	image in TIFF format
Interpretation plot:	rendered images in TIFF format
Metadata:	Microsoft Excel format

A3.4 Historic Environment Record (HER)

Subject to any contractual requirements on confidentiality, a PDF copy of the report will be submitted to the appropriate HER within 6 months of the completion of this report via the OASIS process or by other means, depending on the relevant HER process.