

**Substrata**

Archaeological Geophysical Surveyors

An archaeological magnetometer survey

**Land off Brickyard Lane  
Starcross, Devon**

Centred on NGR: 297286,081678

Report: 1804STA-R-1

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## 1 Introduction

This report presents the results of an archaeological geophysical survey at the site listed in Section 4 and shown in Figure 1, hereafter referred to as the 'Survey Area'. The survey was commissioned by AC Archaeology Ltd on behalf of clients. The commissioning of this report was in keeping with the National Planning Policy Framework, Chapter 16, Paragraph 189 (Ministry of Housing, Communities & Local Government, 2018). The survey and report were completed in compliance with a Survey Method Statement (Substrata Ltd, 2018).

## 2 Client

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## 3 Copyright

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## 4 Survey type and location

### 4.1 Survey

Method:	shallow depth magnetometer survey
Instrument:	twin-sensor fluxgate gradiometer
Date:	6 September 2018
Area:	1.8ha
Survey resolution:	1m by 0.25m

### 4.2 Location

Name:	Land off Brickyard Lane
Town:	Starcross
Civil Parish:	Starcross
District:	Teignbridge
County:	Devon
Nearest Postcode:	EX6 8SA
Survey centre NGR:	SX 97286 81678 (point)
Survey centre NGR (E/N):	297286,081678 (point)
Historic environment designation:	None
OASIS ID:	substrat1-329442

## 5 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 14). The magnetic anomaly groups pertaining to potential buried archaeology and other relevant features 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 7.

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.

No magnetic anomaly groups were characterised as representing potential buried archaeology.

## 6 Standards

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

## 7 Survey aims and objectives

### 7.1 Aims

1. Within the framework set out in Chartered Institute for Archaeologists (2014b) and Europae Archaeologiae Consilium (undated), 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.
2. Provide sufficient information on the nature of any archaeological remains to facilitate the assessment of their interest prior to the determination of the planning application.

### 7.2 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.

## 8 Methodology

The magnetometer survey was undertaken in accordance a Survey Method Statement (Substrata Ltd, 2018) using the standards specified in Section 6 to achieve the aims and objectives set out in Section 7. The survey method was selected to provide a relatively fast and cost-effective evaluation of any buried archaeology across the Survey Area (see Section 14).

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 (2014b).

## 9 Survey Area

### 9.1 Location and description

The Survey Area comprises part of one field on the western side of Starcross (Figure 1). The Survey Area is bound to the north by a Devon bank with a field and Brickyard Lane beyond. A mix of fencing and walls bound the eastern side of the site with a children's playground, housing and gardens beyond. The rest of the field lies beyond the southern and eastern boundaries of the Survey Area. The Survey Area slopes from approximately 7m aOD on its western side to approximately 5m aOD on its eastern side. The field was under stubble at the time of the survey

### 9.2 Geology and sub-surface deposits

The solid geology across the Survey Area is the Permian Dawlish Sandstone Formation which comprises reddish brown sands and sandstones, cross-bedded, with intercalated thin lenses and beds of breccia and mudstone. The superficial geology across most of the site is Quaternary River Terrace Deposits which are typically composed of sand and gravel, locally with lenses of silt, clay or peat. A west-east trending band of Quaternary Alluvium crosses the northern part of the Survey Area. Alluvium can include deposits of clay, silt, sand and gravel in various proportions depending on depositional conditions (British Geological Survey, undated).

No relevant geotechnical reports or borehole logs of near-surface deposits within 500m of the Survey Area were available at the time of writing.

### 9.3 Soils

The topsoil is 'freely draining slightly acid loamy soil' (LandIS, undated).

## 10 Archaeological background

### 10.1 Historic landscape characterisation

#### 'Modern enclosures'

Modern enclosures that have been created by adapting earlier fields of probable post-medieval date which were themselves laid out in the eighteenth and nineteenth centuries and commonly had many surveyed, dead-straight field boundaries (Devon County Council, undated)

### 10.2 Summary of the archaeological background

This section summarises heritage assets that are thought relevant to the survey data analysis and is not designed to be a comprehensive description of the archaeological background.

An Historic Environment Assessment for the programme of work that includes this survey was completed by AC Archaeology (2018). The Assessment included an analysis of the recorded heritage assets, cartographic evidence, other documentary evidence and field name evidence within the site and a study area extending to 1000m around the site. The following is taken from the Assessment and an examination of the Devon County Historic Environment Record (HER) via Devon County Council (undated) and Historic England (undated). Historic maps were consulted using AC Archaeology (2018) and Old-Maps (undated). Whilst providing a useful context for the data analysis, detailed publication in commercial reports of information from the on-line sources is not permitted.

There are no known designated or undesignated heritage assets situated within the Survey Area. There is cartographic evidence for former field boundaries recorded on the 1840 Kenton tithe map but not on later historic Ordnance Survey maps (AC Archaeology Ltd 2018). These boundaries were not recorded in the dataset of this survey.

A former quarry was recorded just to the north of the Survey Area on historic Ordnance Survey maps published between 1890 (1:2,500) and 1955 (1:2,500) (Old-Maps undated). It is visible as two in-filled pits on aerial photographs and LiDAR derived images (AC Archaeology Ltd 2018, pp13; HER MDV105779).

Approximately 685m west-north-west of the Survey Area a triple-ditched enclosure of probable later prehistoric date is visible as cropmarks on aerial photographs from 1975 onwards (ibid, pp 1; HER MDV17726).

## 11 Results

### 11.1 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 differences in the magnetic properties 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.

### 11.2 Analysis

Figure 2 shows the interpretation of the survey data and includes the anomaly groups identified as possibly relating to buried archaeology 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 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 grid data files.

## 12 Discussion

### 12.1 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 magnetic materials within and adjacent to the plot boundaries. Strong magnetic responses mapped close to the boundaries are likely to relate to the magnetic 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 well defined in the data, 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.

#### Data trends

An approximately north to south set of parallel, linear anomalies are likely to represent relatively recent ploughing disturbance.

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

No anomaly groups were assessed as representing previously recorded heritage assets.

### 12.3 Data with no previous archaeological provenance

No anomaly groups were characterised as representing potential buried archaeology.

Anomaly groups 201, 301 and 302 were included in Figure 2 to make it clear that they did not represent potential archaeology.

## 13 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. No anomaly groups were characterised as representing potential buried archaeology.

## 14 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.

## 15 Archive

### 15.1 Online Access to the Index of archaeological investigationS (OASIS)

OASIS ID: substrat1-329442

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

### 15.2 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.

### 15.3 Archaeological Data Service (ADS)

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

### 15.4 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.

## 16 Acknowledgements

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

## 17 Bibliography

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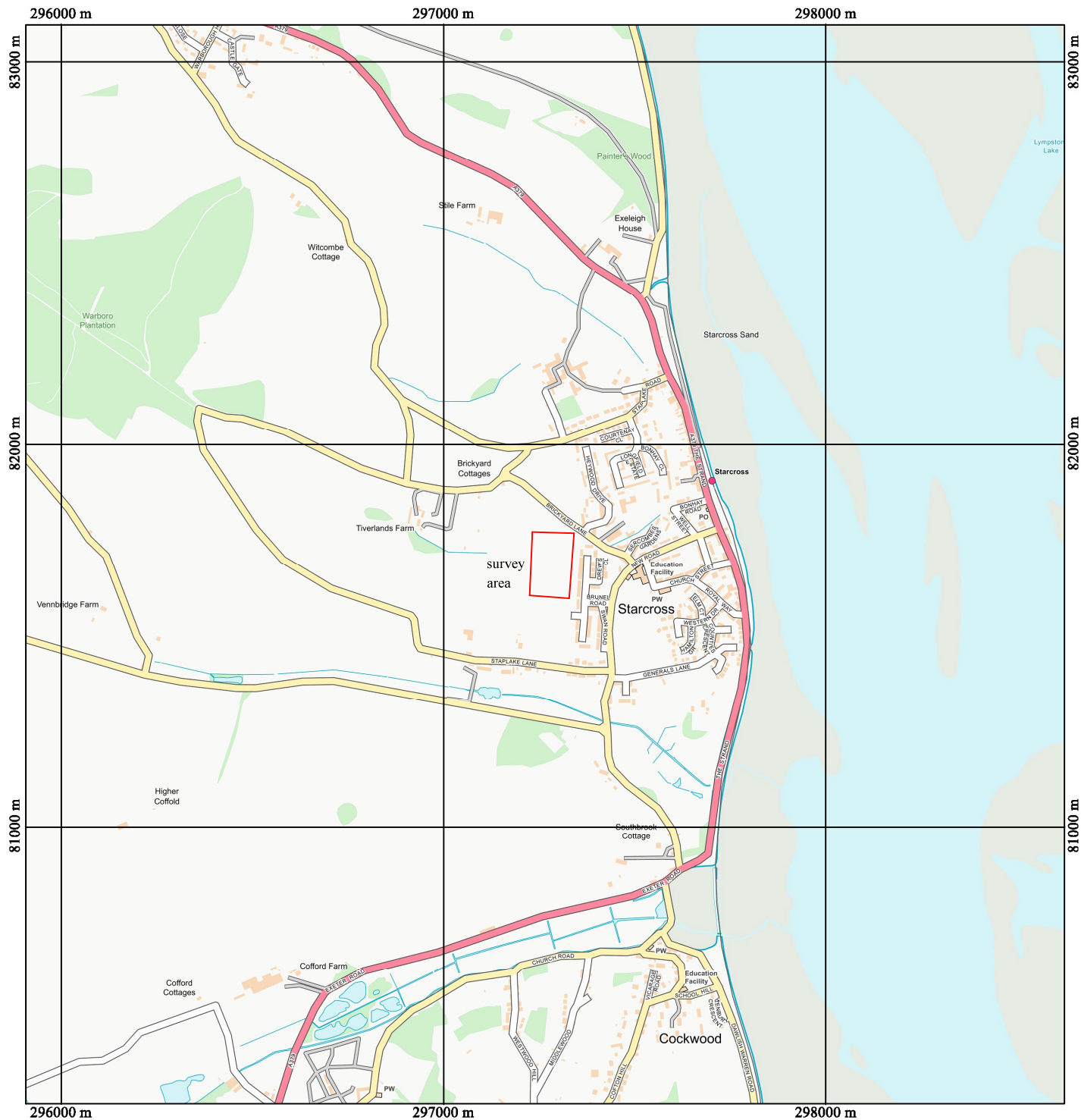


## Appendix 1     Figures

### 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: 297265.72 m, centre Y: 81686.16 m

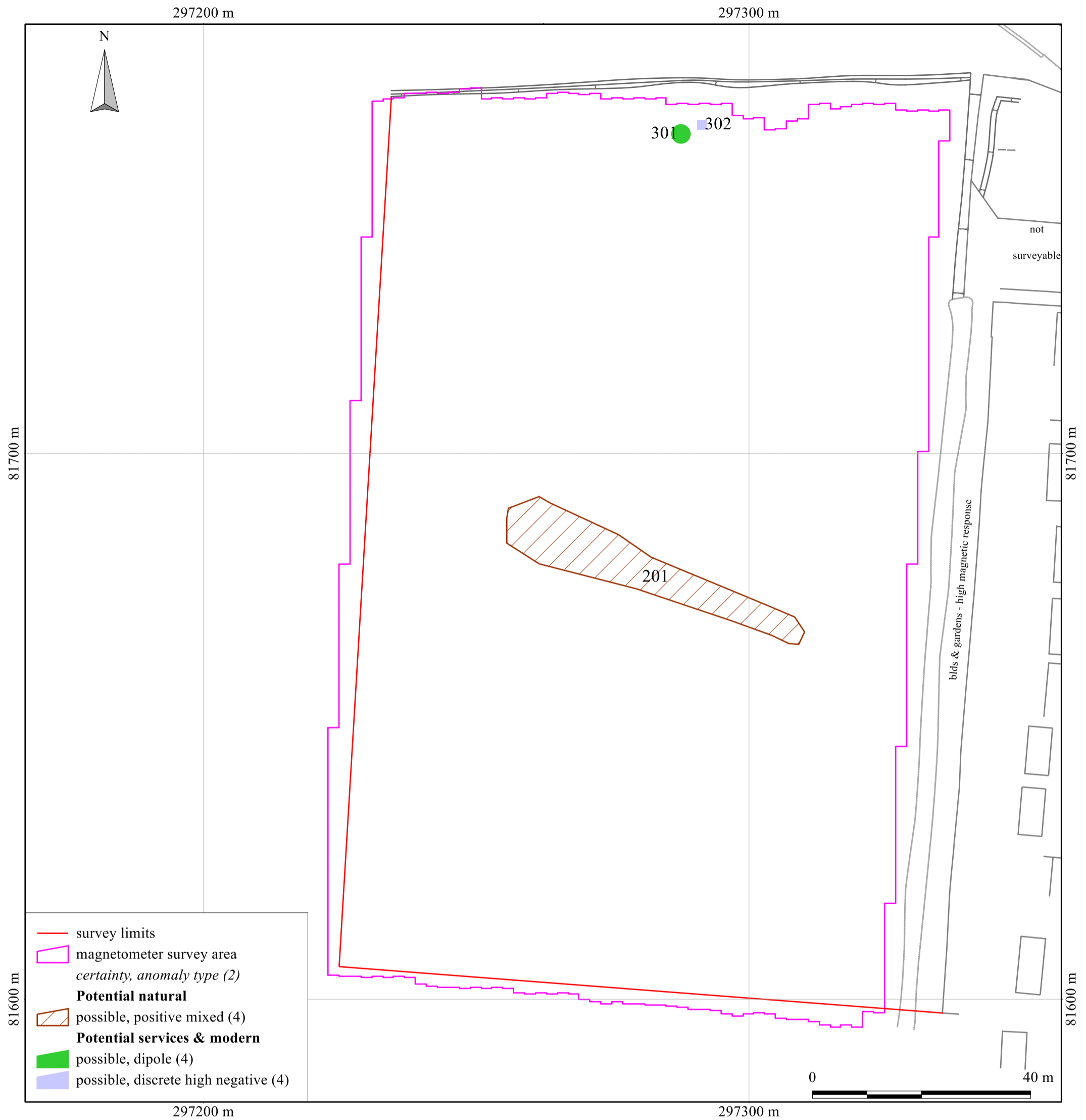
Geophysical survey: Copyright Substrata Ltd.  
 Base map: West Country Land Surveys Ltd.  
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Scale: 1:10000 @ A3. Spatial Units: Meter. Do not scale off this drawing

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Figure 1: location map



British Grid  
 centre X: 297262.28 m, centre Y: 81679.92 m

Geophysical survey: Copyright Substrata Ltd.  
 Base map: West Country Land Surveys Ltd.  
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Scale: 1:700 @ A3. Spatial Units: Meter. Do not scale off this drawing

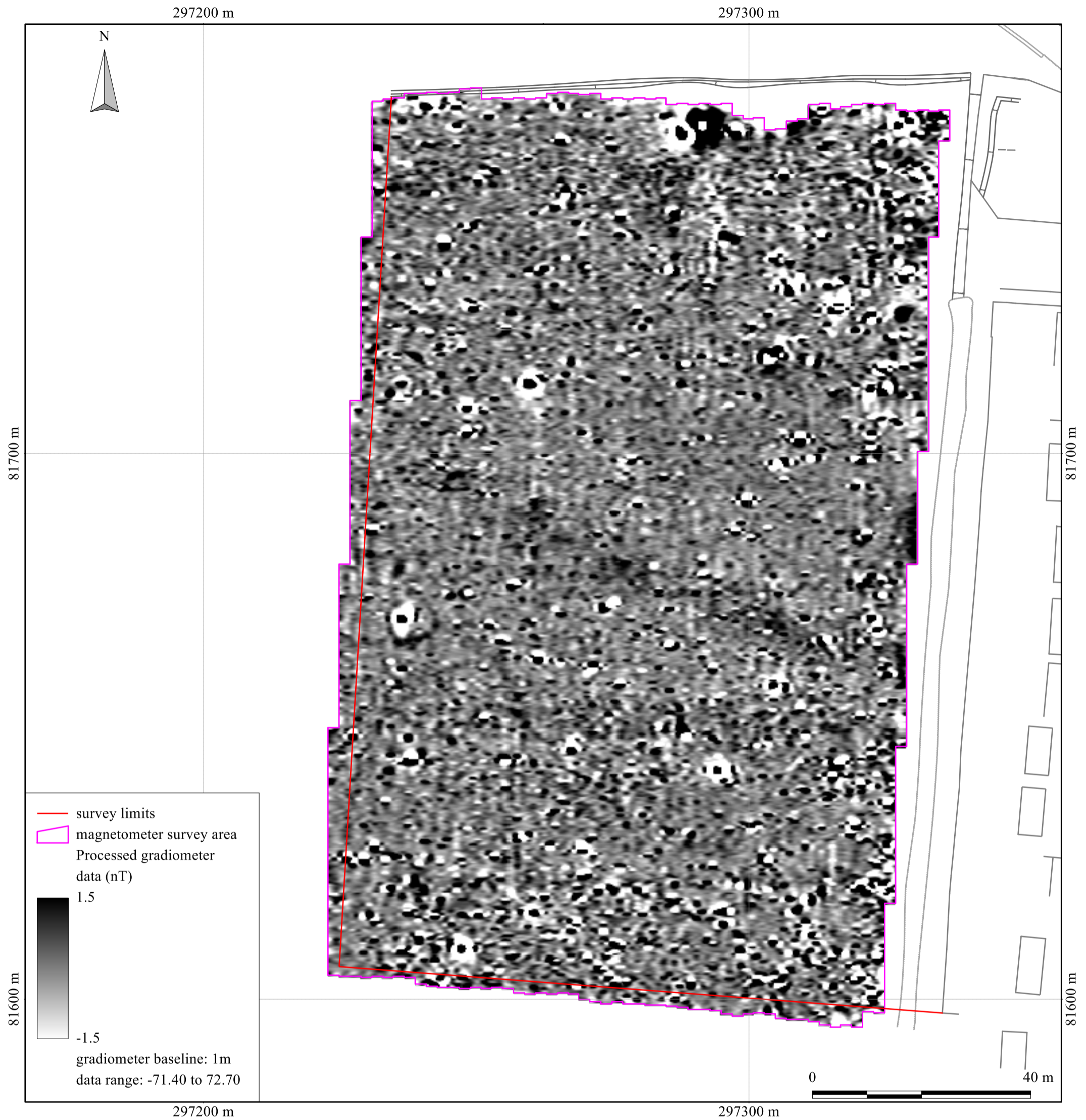
Notes:

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. 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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Figure 2: survey interpretation



British Grid  
 centre X: 297262.28 m, centre Y: 81679.92 m

Geophysical survey: Copyright Substrata Ltd.  
 Base map: West Country Land Surveys Ltd.  
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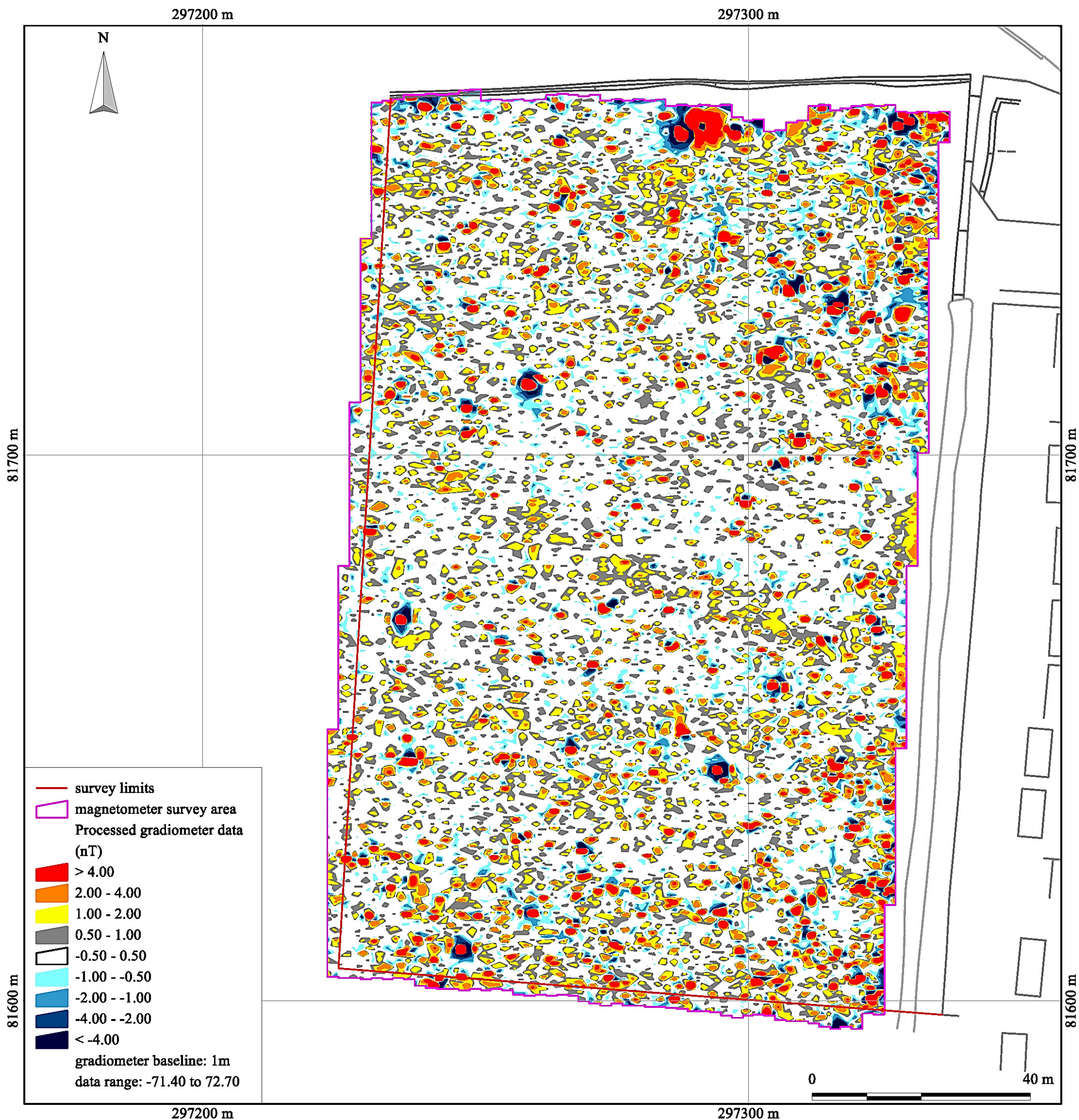
Scale: 1:700 @ A3. Spatial Units: Meter. Do not scale off this drawing

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Figure 3: shade plot of processed data



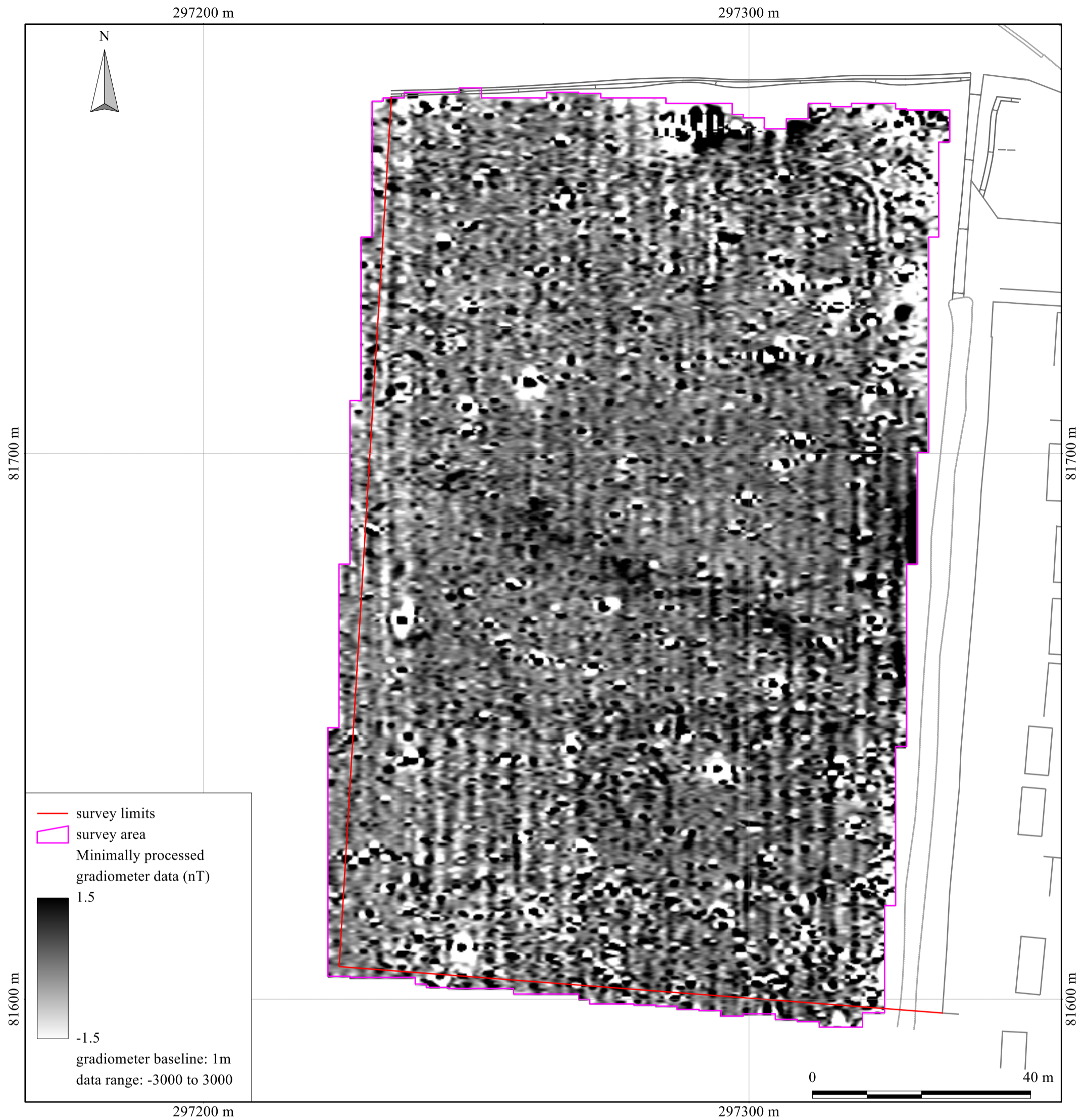


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Figure 4: contour plot of processed data





British Grid  
centre X: 297262.28 m, centre Y: 81679.92 m

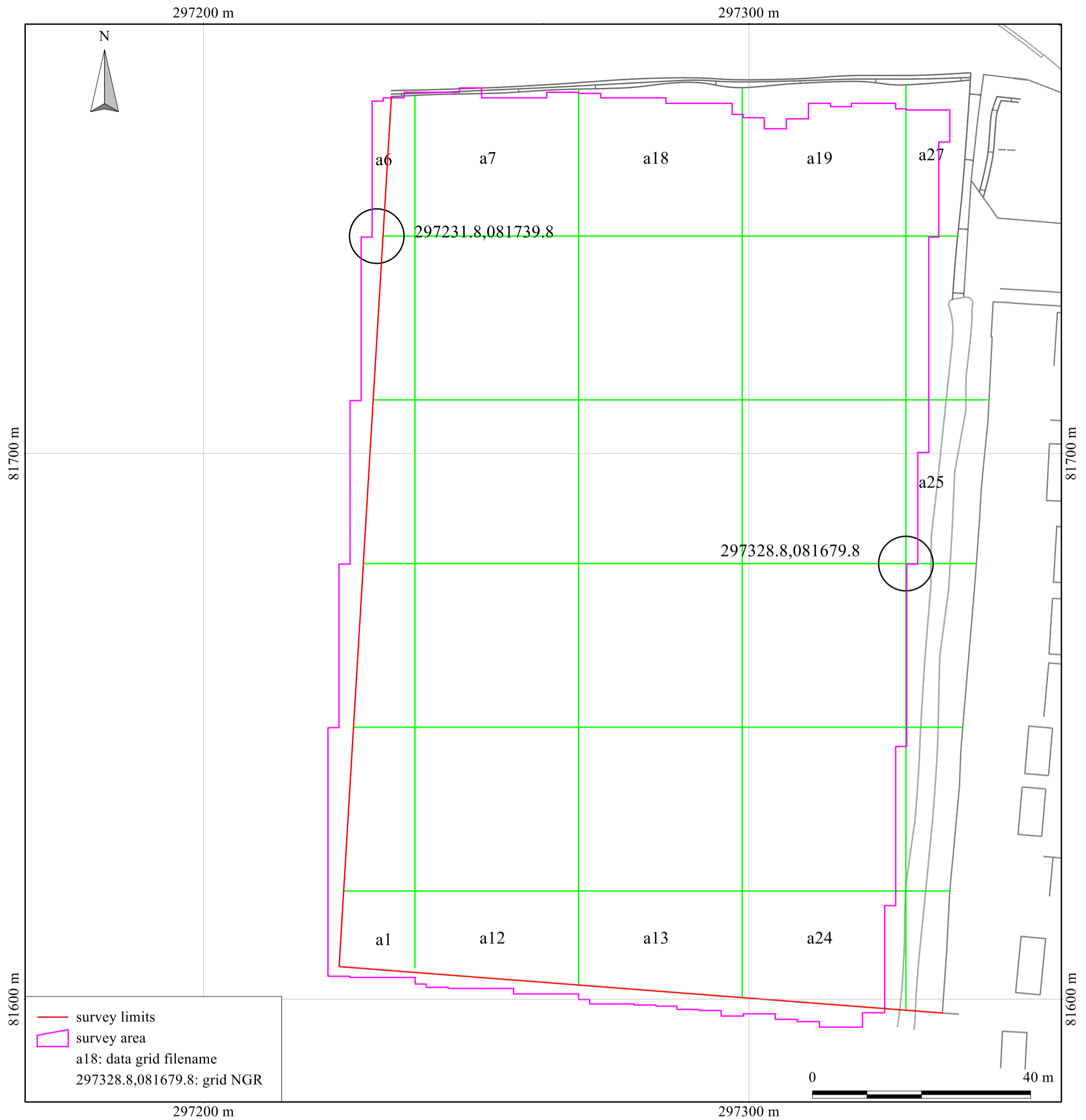
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Scale: 1:700 @ A3. Spatial Units: Meter. Do not scale off this drawing

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Figure 5: shade plot of minimally processed data



British Grid  
 centre X: 297262.28 m, centre Y: 81679.92 m

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Scale: 1:700 @ A3. Spatial Units: Meter. Do not scale off this drawing

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Figure 6: survey grid plan and location

## Appendix 2 Tables



Site: Land off Brickyard Lane, Starcross, Devon  
Centred on NGR: 297286,081678

anomaly group	anomaly characterisation certainty & class	anomaly form	additional archaeological characterisation
201	possible, positive mixed	broad linear	natural deposits
301	possible, dipole		iron or steel
302	possible, discrete high negative		concrete

Table 1: data analysis

<p><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.</p>	
<p><b>Equipment</b>  <i>Instrument:</i> Bartington Instruments grad601-2  <i>Firmware:</i> version 6.1</p>	<p><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</p>
<p><b>Data Processing, Analysis and Presentation Software</b>                  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

Filename:	1804STA proc.xcp
Description:	
Instrument Type:	Bartington Grad 601
Units:	nT
Direction of 1st Traverse:	0 deg
Collection Method:	ZigZag
Sensors:	2 @ 1.00 m spacing.
Dummy Value:	32702
Dimensions	
Composite Size (readings):	720 x 150
Survey Size (meters):	180 m x 150 m
Grid Size:	30 m x 30 m
X Interval:	0.25 m
Y Interval:	1 m
Stats	
Max:	72.70
Min:	-71.40
Std Dev:	4.02
Mean:	0.08
Median:	0.00
Composite Area:	2.7 ha
Surveyed Area:	1.7102 ha
PROGRAM	
Name:	TerraSurveyor
Version:	3.0.33.6
Processes: 4	
1	Base Layer
2	Clip at 1.00 SD
3	DeStripe Median Sensors: Grids: All
4	De Stagger: Grids: All By: 0 intervals, 25.00cm

Table 3: processed data metadata

Filename:	1804STA unproc.xcp
Description:	
Instrument Type:	Bartington Grad 601
Units:	nT
Direction of 1st Traverse:	0 deg
Collection Method:	ZigZag
Sensors:	2 @ 1.00 m spacing.
Dummy Value:	32702
Dimensions	
Composite Size (readings):	720 x 150
Survey Size (meters):	180 m x 150 m
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:	71.15
Mean:	0.45
Median:	0.10
Composite Area:	2.7 ha
Surveyed Area:	1.713 ha
PROGRAM	
Name:	TerraSurveyor
Version:	3.0.33.6
Processes: 1	
1 Base Layer	

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 (.pdf), Microsoft Publisher (.pub)
Raw grid data files:	DW Consulting TerraSurveyor 3 (.xgd) and CSV (.xyz)
Raw data composite files:	CSV (.xyz)
Minimally processed data composite files:	DW Consulting TerraSurveyor 3 (.xgd) and CSV (.xyz)
Final data processing composite files:	DW Consulting TerraSurveyor 3 (.xgd) and CSV (.xyz)
GIS project:	GIS project Manifold 8 (.map)
Survey interpretation:	ESRI shape files
AutoCAD version of the survey interpretation: (if generated)	AutoCAD (.dwg)
All project working files:	IntelliCAD 8.4 Microsoft Corp. Office 365: Excel, Publisher, Word Adobe Systems Inc Adobe Acrobat 9 Pro Extended

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

Metadata:	online form
Georeferenced survey boundary file:	ESRI shape file
Report:	Adobe PDF (.pdf)

### A3.3 Archaeological Data Service

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

Raw data composite file:	CSV (xyz)
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.