

# Substrata

Archaeological Geophysical Surveyors

An archaeological magnetometer survey

## Land off New Launceston Road, Tavistock, Devon

Centred on NGR (E/N): 247160,74570 (point)

Report: 1602NEW-R-1

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01 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](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: 15 and 16 February 2016  
Area: 5.8ha  
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 off New Launceston Road  
Town: Tavistock  
Civil Parish: Tavistock  
District: West Devon  
County: Devon  
Nearest Postcode: PL19 8LU  
NGR: SX 472 746  
Ordnance Survey NGR (E/N): 247160,74570 (point)

### 1.4 Archive

OASIS number: substrat1-244363  
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.*

*Eleven magnetic anomaly groups were mapped as representing possible archaeological deposits or structures. Of these, one is likely to represent a former field boundary mapped on historical Ordnance Survey maps. One anomaly group may represent part of an enclosure or field corner and another group may represent either a Devon bank field boundary or a ditched, stony track. The remainder are typical of anomalies representing former field and enclosure boundaries of unknown origin and possibly of more than one phase of land enclosure.*

## 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 Survey 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 situated within the parish of Tavistock on the northwest edge of the town and comprises three agricultural fields with a total area of approximately 5.8ha as shown in Figure 1. It lies between approximately 130m and 143m OD and descends from the northeast to the southwest.

The field designations A, B and C shown in Figure 2 follow are those used in an historic environment assessment produced by AC Archaeology Ltd as part of the same programme of work as this report (Costen, 2016).

#### 4.2 Geology

The site has a solid geology of interbedded, dark grey sandstone and mudstone with scattered siltstone beds of the Carboniferous St Mellion Formation. The superficial geology is not recorded in the source used (British Geological Survey, undated).

### 5 Archaeological background

#### 5.1 Historic landscape characterisation

Fields A and B: medieval (AD 1066 to AD 1485) enclosures based on strip fields.

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

Field C: post-medieval (AD 1486 to AD 1900) enclosures

Enclosures of post-medieval date. Fields laid out in the eighteenth and nineteenth centuries which commonly have many surveyed dead-straight field boundaries (ibid).

#### 5.2 Historical and archaeological background

An historical 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

The assessment area included parts of the Cornwall and West Devon Mining Landscape World Heritage Site, copper mining being undertaken in the surrounding area from the 1800s onwards. The assessment area also included part of a Conservation Area. As is suggested by the presence of the World Heritage Site and Conservation Area, Tavistock has an abundance of recorded heritage assets and 267 are recorded within the AC Archaeology assessment area.

There are two Scheduled Monuments within the assessment area: Tavistock Abbey and a group of inscribed stones. Both are located within the Tavistock Conservation Area and have early medieval (AD 411 to AD 1065) origins.

The majority of the heritage assets discussed in the AC Archaeology assessment are not directly relevant to this magnetometer survey. Two assets may have a bearing on the survey data. One is a rectangular single-ditched enclosure which was recorded as a cropmark in the Parish of Gulworthy and thought to be of prehistoric date (before AD 43) (HER entry MDV50089 at NGR SX4646 7394, approximately 950m southwest of the site). The other is a record of a medieval farmstead in the Parish of Gullworthy (MDV16970 at SX 4673 7453, approximately 400m west of the site).

## 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 and structures.

*Archaeological structures, features and deposits* 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 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.

Part of Area B could not be surveyed because of boggy ground conditions.

##### 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 all three areas are likely to relate to former ploughing disturbance, some of which may relate to ridge-and-furrow ploughing although relatively recent ploughing is also represented.

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

Magnetic anomaly group **7** coincides with, and likely represents, a field boundary recorded on historic Ordnance Survey maps as listed in Table 1.

#### 6.2.3 Data with no previous archaeological provenance

Magnetic anomaly groups **1**, **2**, **5** and **6** may represent either an archaeological linear deposit such as a ditch or remnants of ridge-and-furrow ploughing.

Group **9** may represent either a Devon bank field boundary or a ditched, stony track.

Group **11** is most likely to represent two archaeological deposits forming a return. Such anomaly patterns often indicate the presence of an enclosure or field corner.

The remaining magnetic anomalies mapped as possible archaeological deposits or structures are typical of anomalies representing former field and enclosure boundaries of unknown origin and possibly of more than one phase of land enclosure.

### 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.

Eleven magnetic anomaly groups were mapped as representing possible archaeological deposits or structures. Of these, one is likely to represent a former field boundary mapped on historical Ordnance Survey maps. One anomaly group may represent part of an enclosure or field corner and another group may represent either a Devon bank field boundary or a ditched, stony track. The remainder are typical of anomalies representing former field and enclosure boundaries of unknown origin and possibly of more than one phase of land enclosure.

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

## 9 Bibliography

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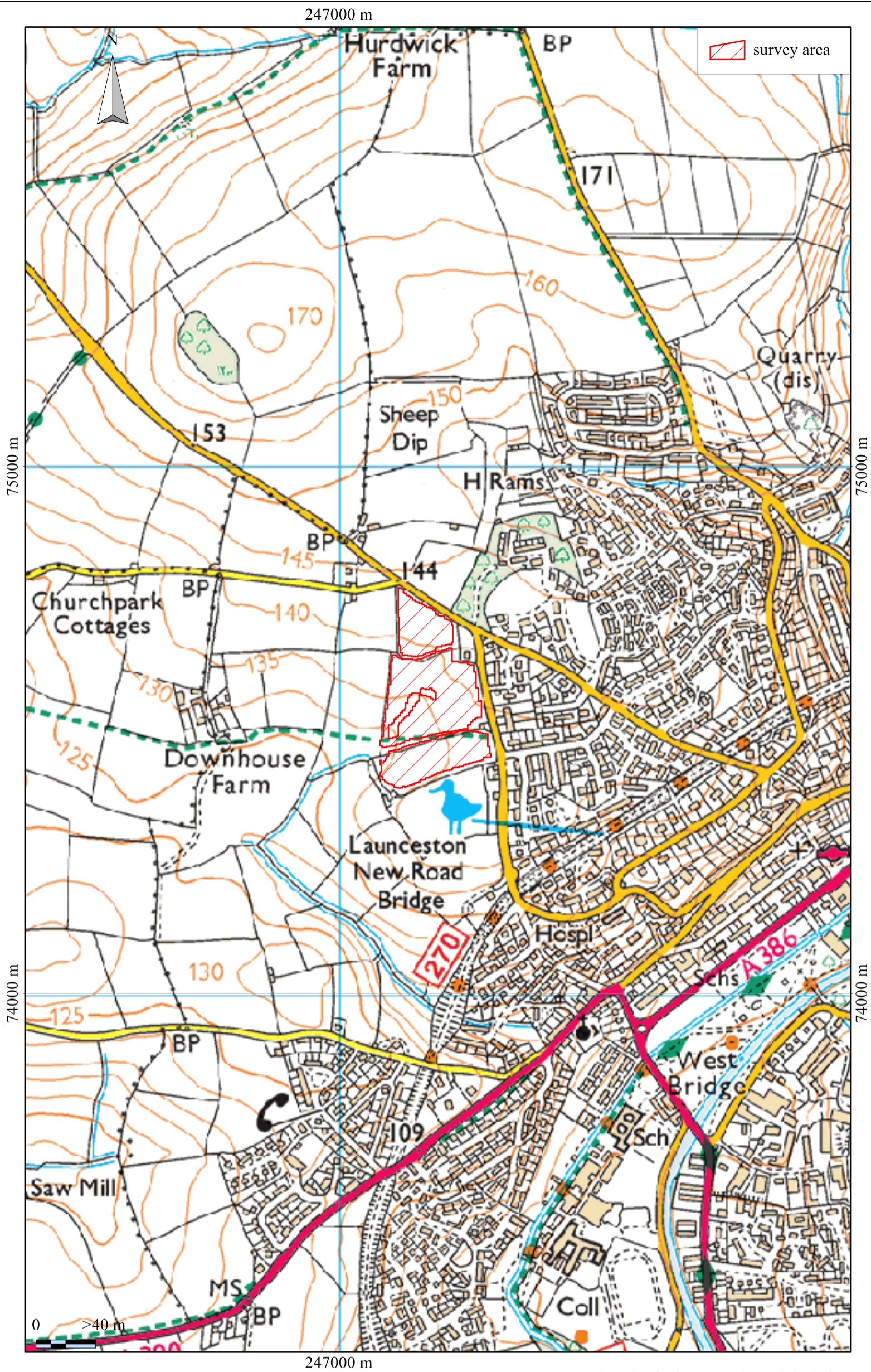


## Appendix 1 Supporting plots

### 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: 247188.03 m, centre Y: 74576.69 m

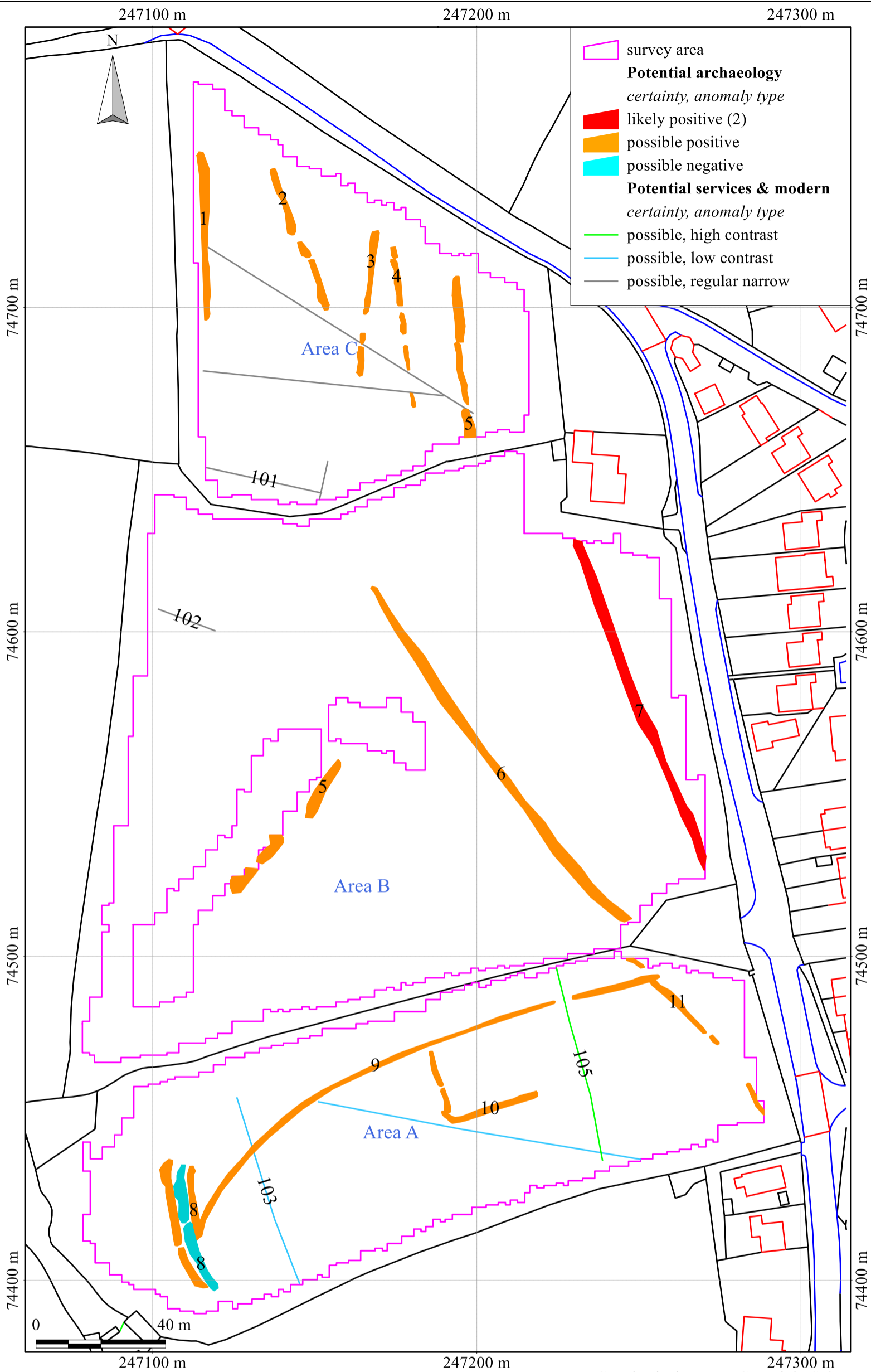
Geophysical survey: Copyright Substrata 2016.  
Base map: Ordnance Survey (c) Crown Copyright 2016,  
Licence number 100022432. All rights reserved.

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

An archaeological gradiometer survey  
Land off New Launceston Road, Tavistock, Devon  
Centred on NGR (E/N): 247160,0745670 (point)  
Report: 1602NEW-R-1

Figure 1: location map

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British Grid  
centre X: 247188.03 m, centre Y: 74582.19 m

Geophysical survey: Copyright Substrata 2016.  
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Scale: 1:1300 @ A3. Spatial Units: Meter. Do not scale off this drawing

- 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. 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 gradiometer survey  
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area	anomaly group	anomaly characterisation certainty & class	anomaly form	additional archaeological characterisation	comments	supporting evidence
C	1	possible, positive	linear	either a linear deposit or historical ploughing	anomaly group may represent ridge-and-furrow ploughing	
C	2	possible, positive	disrupted linear	either a linear deposit or historical ploughing	anomaly group may represent ridge-and-furrow ploughing	
C	3	possible, positive	disrupted linear	linear deposit or drainage		
C	4	possible, positive	disrupted linear	linear deposit or drainage		
C	5	possible, positive	disrupted linear	historical ploughing with possible linear deposit	anomaly group may represent ridge-and-furrow ploughing	
B	6	possible, positive	disrupted linear	either a linear deposit or historical ploughing	anomaly group may represent ridge-and-furrow ploughing	
B	7	possible, positive	linear	linear deposit		
B	8	likely, positive	linear	field boundary	anomaly group coincides with and likely represents a field boundary mapped by the Ordnance Survey between 1882 and 1938	Ordnance Survey maps 1882 1:2500 to 1938 1:10560
A	9	possible, positive/negative/positive	disrupted linear	Devon bank field boundary or ditched track		
A	10	possible, positive	disrupted curvilinear			
A	11	possible, positive	return	enclosure or field boundary	these anomaly groups appear to form a return and so may represent part of a former enclosure or field boundary	
A	12	possible, positive				
C	101		possible, regular narrow	linear		field drain
B	102		possible, regular narrow	linear	anomaly group most likely to represent a field drain but may represent a service trench	field drain
A	103		possible, low contrast	linear		service trench
A	104		possible, low contrast	linear		service trench
A	105		possible, high contrast	linear		ferrous drain, pipe or cable

Table 1: data analysis



British Grid  
centre X: 247188.03 m, centre Y: 74582.19 m

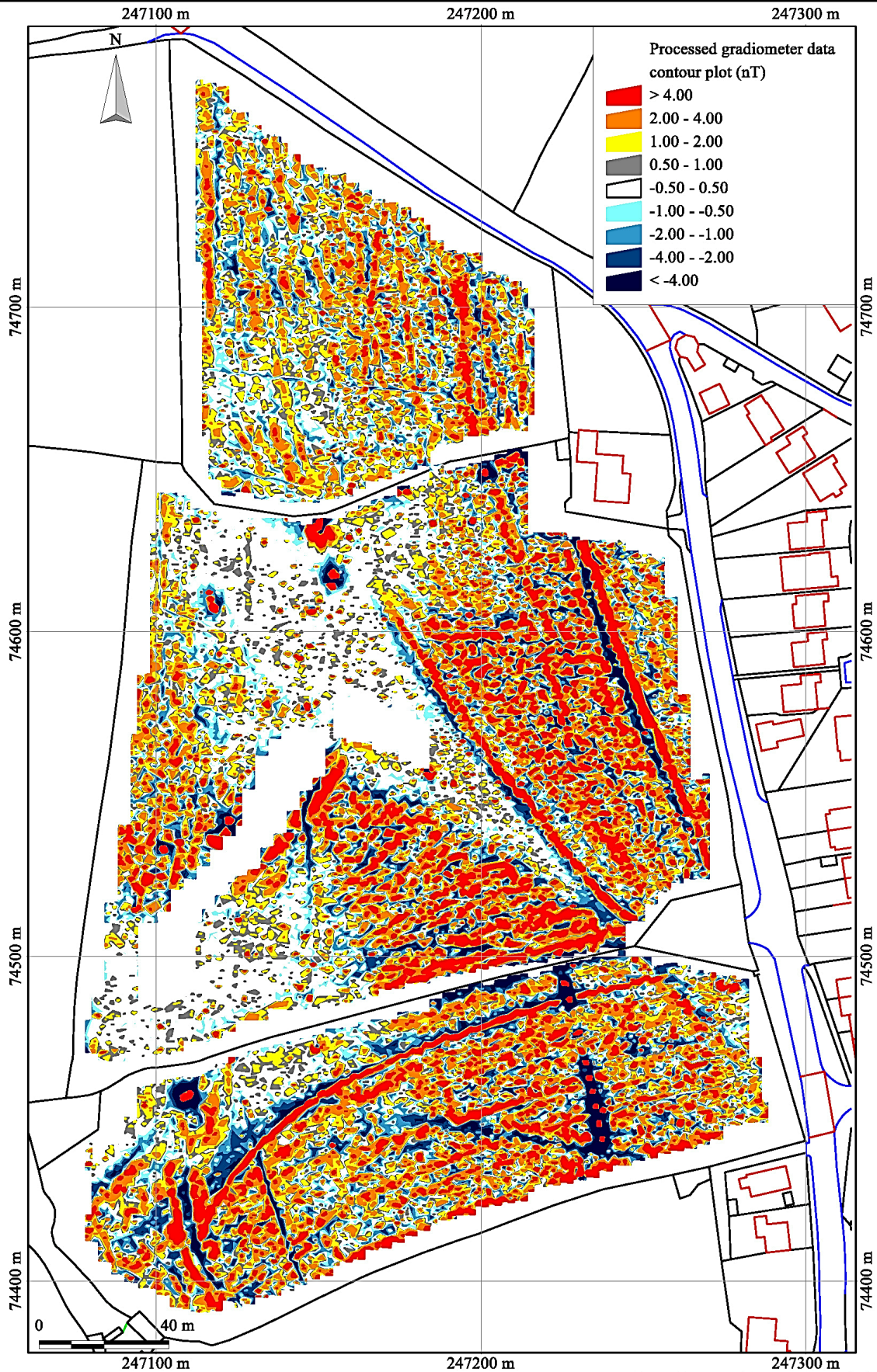
Geophysical survey: Copyright Substrata 2016.  
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Scale: 1:1300 @ A3. Spatial Units: Meter. Do not scale off this drawing

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Figure 3: shade plot of processed data

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British Grid  
centre X: 247188.03 m, centre Y: 74582.19 m

Geophysical survey: Copyright Substrata 2016.  
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An archaeological gradiometer survey  
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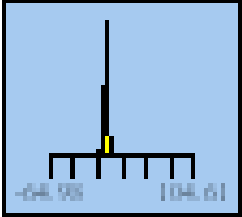
Figure 4: contour plot of processed data

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## Appendix 2 Methodology Summary

Table 2: methodology summary	
<p><b>Documents</b> Survey methodology statement: Dean (2016)</p>	
<p><b>Methodology</b></p> <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>	
<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 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><b>SITE</b>            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><b>PROGRAM</b>            Name: TerraSurveyor            Version: 3.0.28.1</p>	
<p>Stats            Max: 104.61            Min: -64.98            Std Dev: 4.34            Mean: 0.09            Median: 0.01</p>	<p>Processes: 5            1 Base Layer            2 Clip at 1.00 SD            3 De Stagger: Grids: All Mode: Both By: -1 intervals            4 DeStripe Median Sensors: All            5 Interpolate: Match X &amp; Y Doubled.</p>
	



Appendix 4 Unprocessed data plot

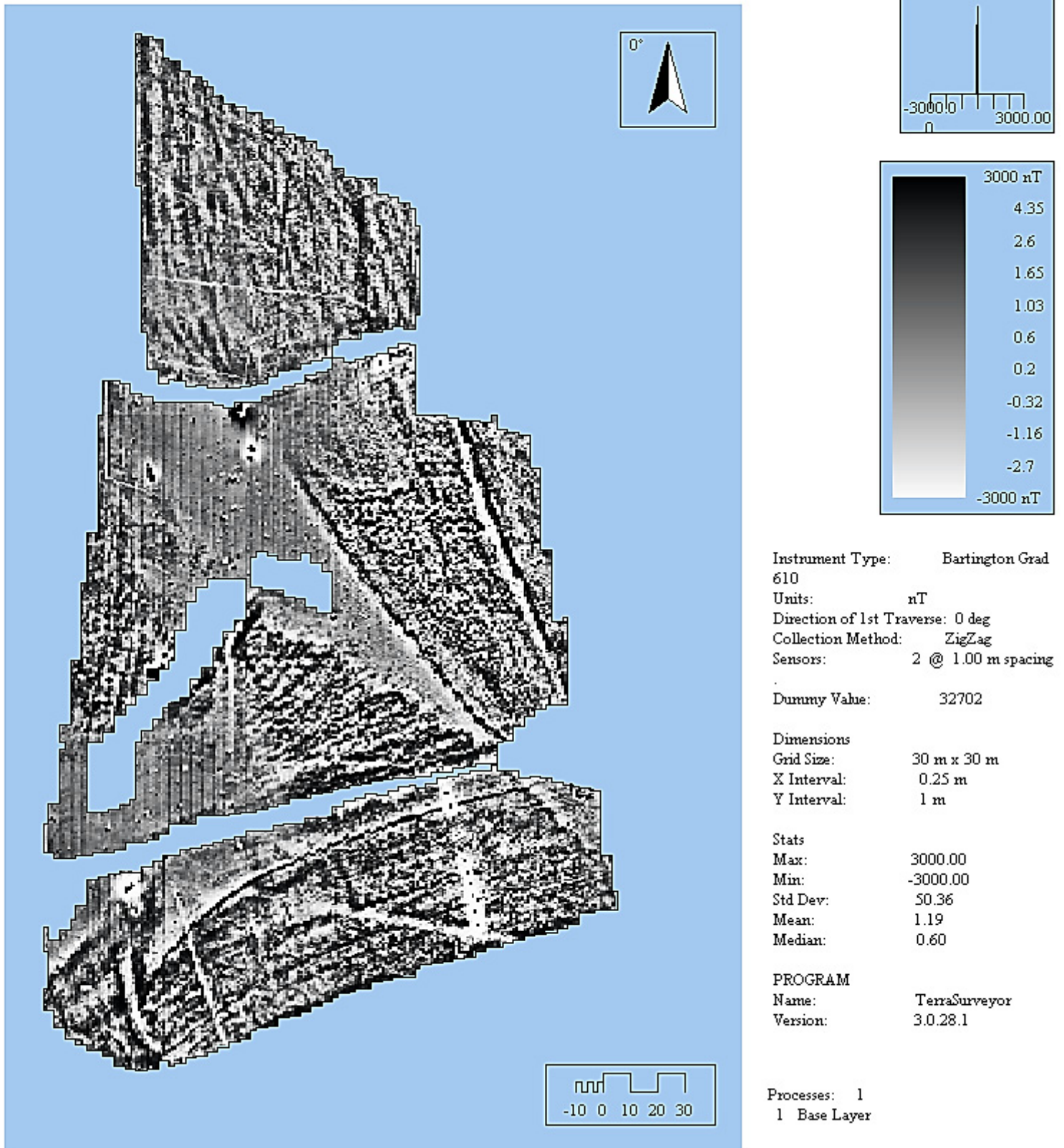


Figure 5: shade plot of unprocessed data