Substrata

Archaeological Geophysical Surveyors

An archaeological magnetometer survey

Land to the north of Little Toms Cullompton, Devon

Centred on NGR (E/N): 300961,107764 (point)

Report: 1611LIT-R-1

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05 December 2016

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Project archive

Report ..... Adobe PDF format
Copies of report figures ..... Adobe PDF format
Raw and processed grid & composite files ..... DW Consulting TerraSurveyor 3 formats
Minimal processing data plots and metadata ..... DW Consulting TerraSurveyor 3 formats
Final data processing data plots and metadata ..... DW Consulting TerraSurveyor 3 formats
GIS project, shape files and classification schema
- GIS project ..... Manifold 8 '.map' file
- GIS shape files ..... ESRI standard
- GIS classification schema ..... Adobe PDF format

AutoCAD version of the survey interpretation ..... AutoCAD DXF

Website: substrata.co.uk

For an overview of Substrata, our archaeological geophysical surveying techniques and the results we obtain.

1 Survey description and summary

1.1 Survey

Type:	twin-sensor fluxgate gradiometer
Date:	between 9 and 14 November 2016
Area:	7.5ha
Lead surveyor:	Mark Edwards BA
Author:	Ross Dean BSc MSc MA MIfA

1.2 Clients

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

1.3 Location

Site:	Land to the north of Little Toms
Civil Parish & Town:	Cullompton
District:	Mid Devon
County:	Devon
Nearest Postcode:	TA19 9DA
NGR:	ST 00961 07764 (point)
NGR (E/N):	300961,107764 (point)

1.4 Archive

OASIS number:	substrat1-270399
Archive:	At the time of writing, the archive of this survey will be held by Substrata. Depending on local authority policy, an archive of the unprocessed data may be deposited with the Archaeological Data Service

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 Ltd 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.

Fourteen magnetic anomaly groups were mapped as representing possible archaeological deposits or features. All were in the southern-most of the two fields comprising the survey area. Eight of these anomaly groups represent former field boundaries recorded on historic maps. Three of the groups are most likely to represent linear and disrupted linear deposits, such as former ditches or banks, of unknown period and probably from more than one phase of past land management. Two groups may represent two curvilinear features with an apparent partial linking linear on their northern ends which could be an archaeological deposit or relatively recent ploughing disturbance. These groups need further archaeological investigation to resolve whether or not an enclosure exists. One group represents a magnetically enhanced deposit which may have archaeological or recent origins.

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.

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 (undated).

4 Site description

4.1 Landscape and land use

The survey area comprises two agricultural fields on undulating land to the west of the town of Cullompton, immediately to the north of a minor road known as Little Toms. The land varies between 75-83m AOD as shown in Figure 1.

At the time of the survey both fields were under corn stubble; up to knee height in the southern field and up to waist height in the northern field.

4.2 Geology

1:50 000 scale bedrock geology description: Permian Cadbury Breccia Formation comprising brown to reddish-brown unbedded to very roughly bedded breccia, consisting of angular to subrounded pebbles and cobbles of Culm Sandstone in very poorly sorted gritty, clayey, sandy, silt. The clasts are mainly locally derived Culm Sandstone generally not exceeding 0.3m diameter; other clasts include vein quartz, chert and fossiliferous sandstone of Pilton Beds type (British Geological Survey, undated).

1:50 000 scale superficial deposits description: Quaternary diamicton (ibid).

5 Archaeological background

5.1 Sources

AC Archaeology Ltd completed a heritage desk-based assessment of the site (AC Archaeology, 2016) for a 1000m study area around the survey area which provides a comprehensive assessment of the historical and archaeological background of the survey area. This document is the source used below.

5.2 Historic landscape characterisation

Modern enclosures.

Modern enclosures that have been created by adapting earlier fields of probable post-medieval date (AC Archaeology, 2016 after Devon County Council, undated).

5.3 Historical and archaeological background

One non-designated heritage asset is located within the application area; a Romano-British findspot comprising a broken half of a late 1st-early 2nd century denarius (Devon HER reference MDV62791).

The designated heritage assets within the study area comprise the two Scheduled Monument Roman forts on St Andrews Hill and eleven Grade II Listed Buildings. Other non-designated

heritage assets within the study area include two possible prehistoric enclosures and a ring ditch from a former barrow.

Based on the present evidence, the recovery of surface artefacts, findings nearby and aerial photograph transcription, the part of the application area with topographic potential (away from sloping ground) may indicate the possible presence of currently unknown in-situ localised buried archaeological remains within the application area. In addition former field boundaries depicted on historic mapping within the site are likely to survive as now infilled ditches.

7.

6 Results, discussion and conclusions

6.1 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 variations in the magnetism of 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 terms ‘archaeological deposit’, ‘structure’ and ‘feature’ refer to any artefacts, material deposits or disturbance of natural deposits thought to be the result of human activity, excluding recent land maintenance and farming.

Magnetic anomalies cannot be regarded as physical archaeological deposits, structures or features and the dimensions of the anomalies shown do not represent the dimensions of any associated archaeology.

The analysis presented below identifies and characterises anomalies and anomaly groups that may relate to archaeological deposits, structures and features.

The reader is referred to section 7.

6.2 Results

Figures 2 and 3 show the interpretation of the survey data. They 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.

Figures 2 and 3 along with Table 1 comprise the analysis of the survey data.

Figures 4 and 5 are plots of processed data as specified in Table 3. Figure 6 is a plot of minimally processed data.

6.3 Discussion

6.3.1 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 the figures 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 Figures 2 and 3 and Table 1.

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.

Anomalies thought to relate to natural features and 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.

Numerous dipole magnetic anomalies are scattered across the data set. 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

The faint northwest to southeast linear trends visible in the data (Figures 4 and 5) are likely to represent relatively recent ploughing disturbance. The north-south trend is the result of minor variations in the gradiometer sensors balance highlighted when displayed using a low-range scale.

6.3.2 Data relating to historic maps and other records

Magnetic anomaly groups **3**, **5**, **6**, **7**, **8**, **10**, **11** and **14** coincide with former field boundaries recorded on historic maps published during or later than AD 1841 as shown in Table 1.

6.3.3 Data with no previous archaeological provenance

Anomaly group **1** represents a magnetically enhanced area of deposits that may have archaeological significance although a modern origin cannot be ruled out.

Groups **2** and **9** are most likely to represent disrupted linear deposits, such as former ditches or banks, of unknown period and phase of past land management. The curvilinear group 4 is likely to have a similar origin.

Groups **12** and **13** may represent curvilinear archaeological deposits such as filled ditches. There is a hint in the data that they may have a linear anomaly group linking their northern points but this may be relatively recent ground disturbance caused by ploughing.

6.4 Conclusions

Fourteen magnetic anomaly groups were mapped as representing possible archaeological deposits or features. All were in the southern-most of the two fields comprising the survey area. Eight of these anomaly groups (3, 5 to 8, 10, 11 and 14) represent former field boundaries recorded on historic maps. Three of the groups (2, 4 and 9) are most likely to represent linear and disrupted linear deposits, such as former ditches or banks, of unknown period and probably from more than one phase of past land management. Two groups (12 and 13) may represent two curvilinear features with an apparent partial linking linear on their northern ends which could be an archaeological deposit or relatively recent ploughing disturbance. These groups need further archaeological investigation to resolve whether or not an enclosure exists. One group (1) represents a magnetically enhanced deposit which may have archaeological or recent origins.

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.

8 Acknowledgements

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

9 Bibliography

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

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 (see Section 6.1).

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: 300927.79 m, centre Y: 107747.16 m

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

An archaeological magnetometer survey
Land to the north of Little Toms, Cullompton, Devon
Centred on NGR (E/N): 300961,107764 (point)
Report:1611LIT-R-1

Figure 1: location map

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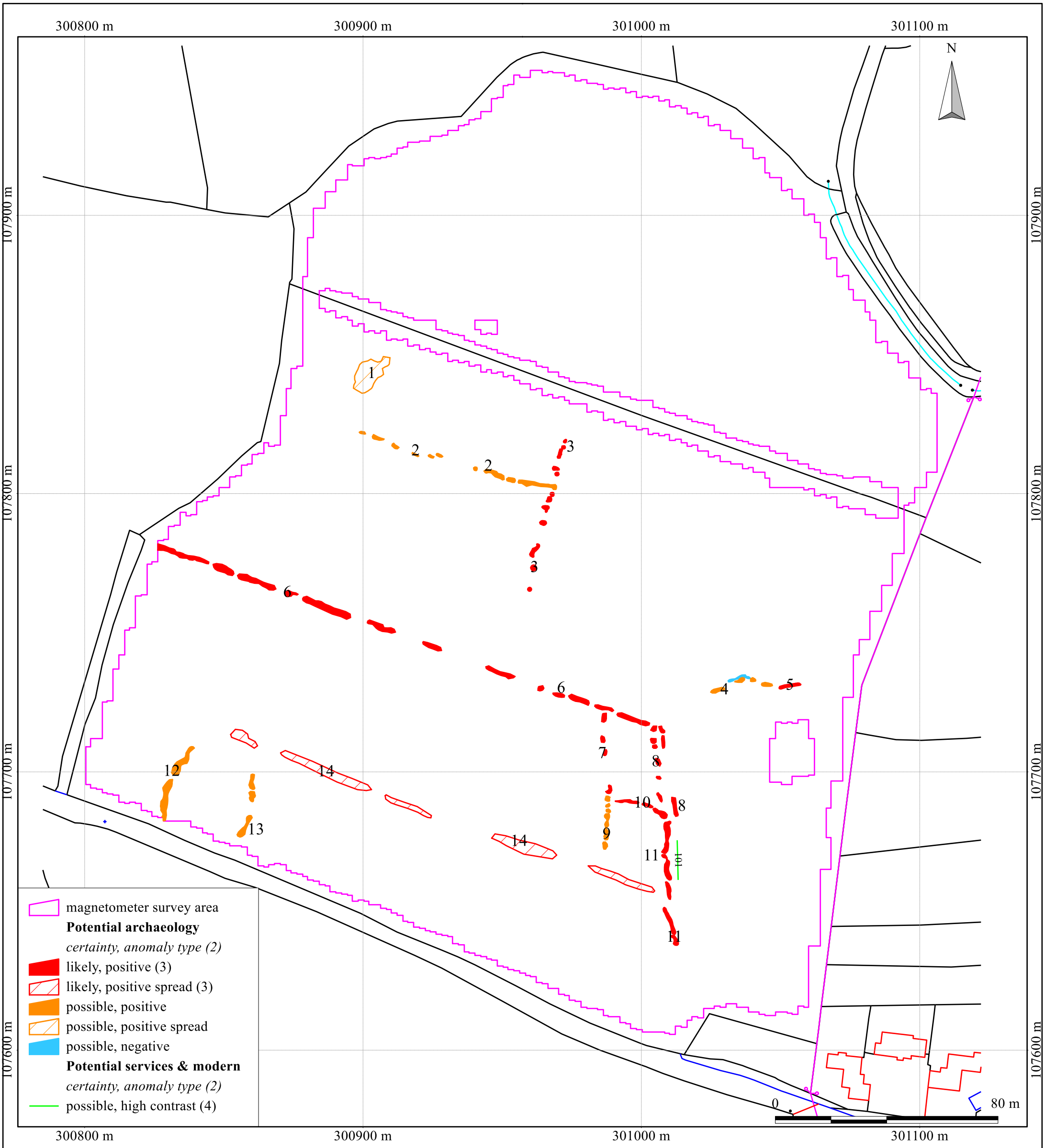

British Grid
centre X: 300957.29 m, centre Y: 107768.31 m

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. '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. Representative; not all instances are mapped.
5. Anomalies likely to represent geological or other natural deposits are not mapped unless relevant to potential archaeological events or deposits.

An archaeological magnetometer survey
Land to the north of Little Toms, Cullompton, Devon
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Figure 2: survey interpretation, entire area

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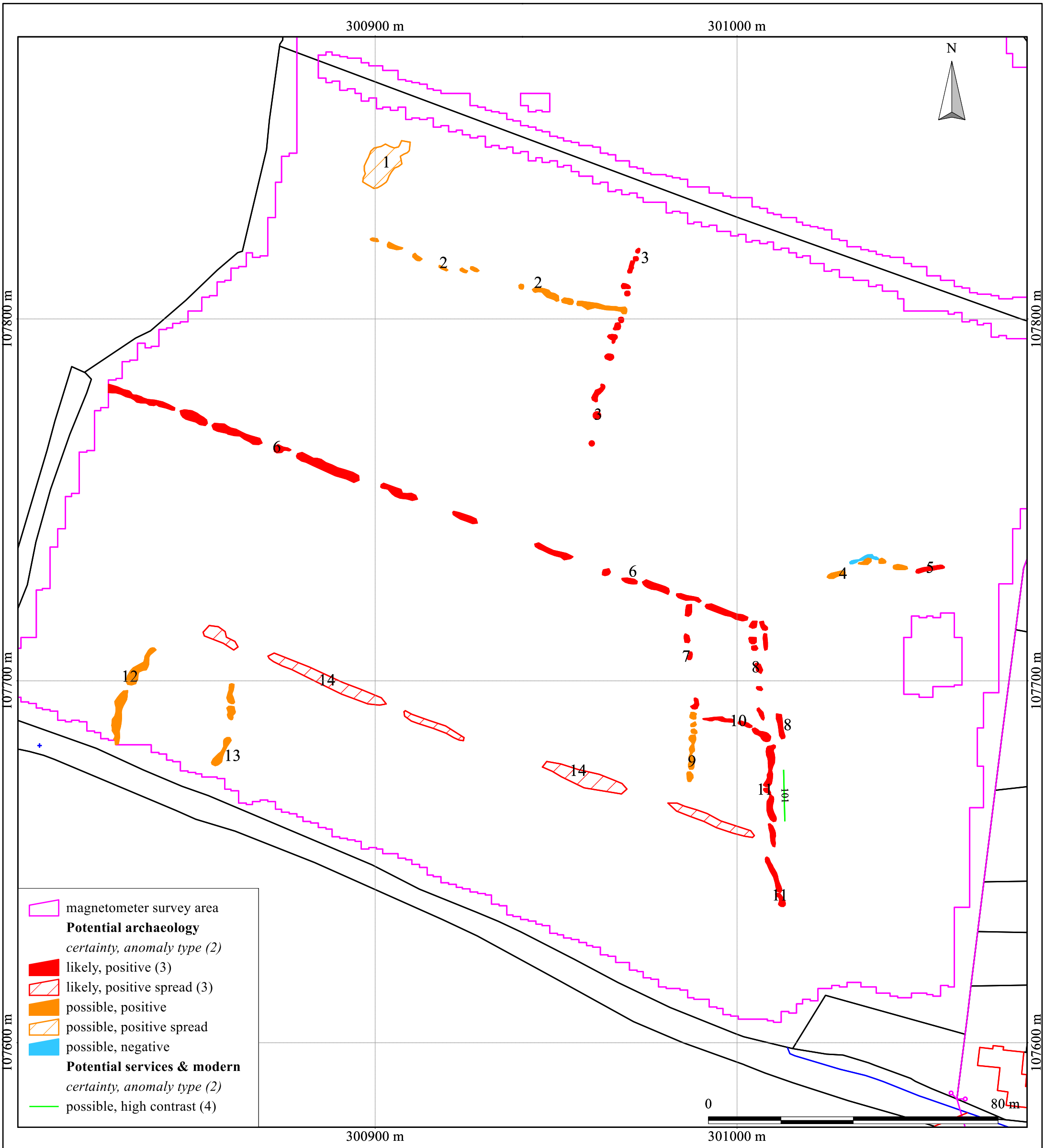

British Grid
centre X: 300940.71 m, centre Y: 107727.30 m

Scale: 1:1000 @ 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. Representative; not all instances are mapped.
5. Anomalies likely to represent geological or other natural deposits are not mapped unless relevant to potential archaeological events or deposits.

An archaeological magnetometer survey
Land to the north of Little Toms, Cullompton, Devon
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Figure 3: survey interpretation, southern field

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British Grid
centre X: 300957.29 m, centre Y: 107768.31 m

Scale: 1:1300 @ A3. Spatial Units: Meter. Do not scale off this drawing

An archaeological magnetometer survey
Land to the north of Little Toms, Cullompton, Devon
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Figure 4: shade plot of processed data, entire area

Substrata Limited
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300900 m

301000 m

107800 m

107700 m

107600 m

N

Processed magnetometer data (nT)

1

-1

0

80 m

British Grid
centre X: 300940.71 m, centre Y: 107727.30 m

Scale: 1:1000 @ A3. Spatial Units: Meter. Do not scale off this drawing

An archaeological magnetometer survey
Land to the north of Little Toms, Cullompton, Devon
Centred on NGR (E/N): 300961,107764 (point)
Report:1611LIT-R-1

Figure 5: shade plot of processed data, southern field

Substrata Limited
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Tel: 01273 273599
Email: geophysics@substrata.co.uk
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Instrument Type: Bartington Grad 601
Direction of 1st Traverse: 0 deg
Collection Method: ZigZag
Sensors: 2 @ 0.00 m spacing.
Dummy Value: 32702
Grid Size: 30 m x 30 m
X Interval: 0.25 m
Y Interval: 1 m

Stats
Max: 3006.90
Min: -3003.00
Std Dev: 55.08
Mean: -0.40
Median: 0.00
PROGRAM
Name: TerraSurveyor
Version: 3.0.31.0r
Version: 3.0.29.3

Processes: 2
1 Base Layer
2 DeStripe Median Sensors: Grids: All

Figure 6: shade plot of minimally processed data

Appendix 2 Tables

Site: An archaeological magnetometer survey
Land to the north of Little Toms, Cullompton, Devon
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anomaly group	associated anomalies	anomaly characterisation certainty & class	anomaly form	additional archaeological characterisation	comments	supporting evidence
1		possible, positive spread	irregular	area of archaeological activity or recent disturbance	anomaly group may represent disturbed archaeological deposits although a recent origin such as ground disturbed by vehicles is equally likely	
2		possible, positive	disrupted linear			
3		likely, positive	disrupted linear	field boundary	anomaly groups coincide with a former field boundary recorded on historic maps	1841 Cullompton tithe map, Ordnance Survey 1889 1:1250 & 1890-91 1:10560
4		possible, positive & negative	disrupted curvilinear			
5		likely, positive		field boundary	anomaly groups coincide with a former field boundary recorded on historic maps	1841 Cullompton tithe map, Ordnance Survey 1889 1:1250 & 1890-91 1:10560
6		likely, positive	disrupted linear	field boundary	anomaly groups coincide with a former field boundary recorded on historic maps	1841 Cullompton tithe map, Ordnance Survey 1889 1:1250 to 1962 1:10560
7	9	likely, positive	disrupted linear	field boundary	anomaly groups coincide with a former field boundary recorded on historic maps	1841 Cullompton tithe map
8	11	likely, positive	disrupted double linear	field boundary - possible Devon bank	an extension of the boundary north of the anomalies is recorded by the OS between 1904 and 1962 but is not represented by anomaly patterns in the data	Ordnance Survey 1889 1:1250 to 1962 1:10560
9	7	possible, positive	disrupted linear			
10		likely, positive	disrupted linear	field boundary	anomaly groups coincide with a former field boundary recorded on historic maps	1841 Cullompton tithe map
11	8	likely, positive	disrupted linear	field boundary	anomaly groups coincide with a former field boundary recorded on historic maps	1841 Cullompton tithe map Ordnance Survey 1889 1:1250 to 1962 1:10560
12		possible, positive	disrupted curvilinear			
13		possible, positive	disrupted curvilinear			
14		likely, positive spread	disrupted linears	field boundary	anomaly groups are disrupted by recent ploughing and coincide with a former field boundary recorded on historic maps	1841 Cullompton tithe map
101		possible, high contrast	linear	iron or steel wire, pipe, cable or service		

Table 1: data analysis

Documents
Survey methodology statement: Dean (2016)

Methodology

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 (undated).
2. The survey grid location information and grid plan was recorded as part of the project in a suitable GIS system.
3. Data processing was undertaken using appropriate software, with all anomalies being digitised and geo-referenced. The final report included a graphical and textual account of the techniques undertaken, the data obtained and an archaeological interpretation of that data and conclusions about any likely archaeology.

Grid
Method of Fixing: DGPS set-out using pre-planned survey grids and Ordnance Survey coordinates.
Composition: 30m by 30m grids
Recording: Geo-referenced and recorded using digital map tiles.
DGPS used: Spectra Precision PM5V2 GPS with external antenna and survey pole and DigiTerra Explorer 7 as the survey control program.

Equipment
Instrument: Bartington Instruments grad601-2
Firmware: version 6.1

Data Capture
Sample Interval: 0.25m
Traverse Interval: 1 metre
Traverse Method: zigzag
Traverse Orientation: GN

Data Processing, Analysis and Presentation Software
IntelliCAD Technology Consortium IntelliCAD 8.0
DW Consulting TerraSurveyor3
Manifold System 8 GIS
Microsoft Corp. Office Excel 2013
Microsoft Corp. Office Publisher 2013
Adobe Systems Inc Adobe Acrobat 9 Pro Extended

Table 2: methodology summary

SITE
Instrument Type: Bartington Grad-601 gradiometer
Units: nT
Direction of 1st Traverse: see below
Collection Method: ZigZag
Sensors: 2 @ 1.00 m spacing.
Dummy Value: 32702

PROGRAM
Name: TerraSurveyor
Version: 3.0.31.0

Stats	
Max:	144.49
Min:	-99.51
Std Dev:	3.84
Mean:	-0.18
Median:	0.01

Processes: 21
1 Base Layer
2 Clip at 1.00 SD
3 DeStripe Median Sensors: Grids: All
4 Edge Match (Area: Top 270, Left 480, Bottom 299, Right 599) to Top edge
5 Edge Match (Area: Top 270, Left 480, Bottom 299, Right 599) to Top edge
6 Edge Match (Area: Top 270, Left 360, Bottom 299, Right 479) to Top edge
7 Edge Match (Area: Top 270, Left 240, Bottom 299, Right 359) to Top edge
8 Edge Match (Area: Top 270, Left 120, Bottom 299, Right 239) to Right edge
9 Edge Match (Area: Top 270, Left 1200, Bottom 299, Right 1319) to Left edge
10 Edge Match (Area: Top 210, Left 0, Bottom 239, Right 119) to Right edge
11 Edge Match (Area: Top 180, Left 0, Bottom 209, Right 119) to Right edge
12 Edge Match (Area: Top 270, Left 0, Bottom 299, Right 119) to Right edge
13 Edge Match (Area: Top 240, Left 840, Bottom 269, Right 959) to Bottom edge
14 DeStripe Median Traverse: Grids: d23.xgd
15 Edge Match (Area: Top 210, Left 1320, Bottom 239, Right 1439) to Left edge
16 Edge Match (Area: Top 240, Left 1320, Bottom 269, Right 1439) to Top edge
17 DeStripe Median Traverse: Grids: d9+b6.xgd
18 De Stagger: Grids: All Mode: Both By: -1 intervals
19 De Stagger: Grids: b14.xgd a20.xgd b13.xgd b15.xgd a6.xgd a19.xgd a21.xgd b12.xgd b16.xgd a1.xgd a2.xgd a7.xgd a18.xgd a22.xgd b11.xgd b17.xgd a3.xgd a8.xgd a17.xgd b1.xgd b10.xgd b18.xgd a4.xgd a9.xgd a16.xgd b2.xgd b9.xgd b19.xgd a5.xgd a10.xgd a15.xgd b3.xgd b8.xgd b20.xgd a11.xgd a14.xgd b4.xgd b7.xgd b21.xgd Mode: Both By: -1 intervals
20 De Stagger: Grids: a13.xgd b5.xgd d9+b6.xgd Mode: Both By: -1 intervals
21 Interpolate: Match X & Y Doubled.

Table 3: processed data metadata