

Substrata

Archaeological Geophysical Surveyors

An archaeological gradiometer survey

Land at Bissoe Road, Carnon Downs Feock, near Truro, Cornwall

Centred on NGR 179660,40590

Report: 150627

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30 May 2015

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Contents

1. Survey description and summary.....	1
2. Survey aims and objectives.....	1
3. Standards.....	2
4. Site description	2
5. Archaeological background	2
6. Results, discussion and conclusions.....	4
7. Disclaimer and copyright	6
8. Acknowledgements.....	6
9. Bibliography	6
Appendix 1 Analysis table and supporting plots	7
Appendix 2 Methodology	13
Appendix 3 Data processing	14

Figures

Figure 1: location map	8
Figure 2: survey interpretation.....	9
Figure 3: shade plot of processed data.....	11
Figure 4: contour plot of processed data.....	12

Tables

Table 1: data analysis	10
Table 2: methodology summary	13
Table 2: data processing	14

Accompanying CD-ROM

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: 18 May 2015
Area: 2 ha
Lead surveyor: Ross Dean BSc MSc MA MifA

1.2 Client

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

1.3 Location

Site: Land at Bissoe Road
Town: Carnon Downs
Civil Parish: Feock
County & Unitary Authority: Cornwall
Nearest Postcode: TR3 6LL
NGR: SW 796 405
Ordnance Survey NGR (E/N): 179660,40590 (point)

1.4 Archive

OASIS number: substrat1-216167
Archive: At the time of writing, the archive of this survey will be held by Substrata and will be deposited with the ADS in due course.

1.5 Introduction

This report was commissioned by AC Archaeology Ltd on behalf of clients in order to help establish the cultural heritage and archaeological implications of a proposal for a development at the above site. The location of the site is shown in Figure 1.

1.6 Summary

The magnetic contrast across the area was sufficient to be able to differentiate between anomalies representing possible archaeological features and background magnetic responses. Ten magnetic anomaly groups were identified as possibly representing archaeological deposits or features. Of these two very likely represent former field boundaries mapped by the Ordnance Survey between 1888 and 1907. One and possibly two may represent former tracks or routeways although one of these may be an expression of historical ploughing recorded as parallel trends in the survey dataset. One anomaly group displays characteristics that can represent a scatter of heated material. Given the proximity of three Bronze Age barrows to the application area, this deposit is considered to be of potential archaeological interest. Two groups are most likely to relate to past field boundaries or other enclosures of unknown date. A further two groups represent either stony deposits or rubble and are most likely to have a relatively recent origin.

2 Survey aims and objectives

2.1 Aims

The main aim of the geophysical survey was 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 subsequent mitigation.

The site specific aims are to:

- Establish the presence/absence of archaeological remains;
- Determine the extent, condition, nature, character, date and significance of any archaeological remains encountered;
- Establish the nature of activity on the site;
- Identify any deposits or structures that may relate to the occupation or use of the site;

- Provide further information on the archaeology of the site from any archaeological remains encountered.

2.2 Survey objectives

1. Complete a gradiometer survey across agreed parts of the application 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 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 English Heritage (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). The document text was written using the house style of the Chartered Institute for Archaeologists (Chartered Institute for Archaeologists, undated).

4 Site description

4.1 Landscape and land use

The site occupies an area of just over 2 hectares and is situated to the west of Carnon Downs, abutting the western extent of the urban edge. It lies at approximately 70m AOD.

4.2 Geology

The application area has a solid geology of slate and siltstone of the Devonian Mylor Slate Formation. Permian Felsite dykes intrude through the Mylor Slate to the west of the application area. The superficial geology is not recorded in the source used (British Geological Survey, undated).

5 Archaeological background

The following is a short summary of information obtained from the Cornwall and Scilly Historical Environment Record (HER) as presented in the Historical England on-line resource Heritage Gateway (Historic England, undated). Designated and non-designated heritage assets within 500m of the designated centre of the application area were assessed. Those relevant to the analysis of the survey data are briefly discussed below.

The sites of three and possibly four Bronze Age (2500 BC to 801 BC) barrows lie within 500m of the application area (HER entries MCO2381 to MCO2384). MCO2381 lies to the southwest of the application area. It was plotted on the 1st and 2nd edition Ordnance Survey (OS) 1:2500 maps (1880 and 1907). It was surveyed in 1965 by the OS when it was 0.7m high. The barrow is visible on RAF vertical aerial photographs (1946 and 1951) as a mound with central hollow, suggesting that it may have been ‘opened’ and robbed. It was plotted during the Cornwall National Mapping Project (NMP). The monument was included in the Schedule on 24/10/1968 and the scheduling was affirmed on 14/3/2000. MCO2382 lies to the south of the application area. It was 1.7m high in 1965 and was excavated in 1967 by Dorothy Dudley in advance of building works on the site. It had been disturbed in the centre, though the soil had been carefully replaced, and this fill included a small Bronze Age pottery vessel. The mound was carefully built of local red clay, topsoil and peat. There was a secondary burial in the north-west quadrant. The barrow centre was surrounded by a ring of stake holes, 6.0m in diameter. One sherd of Bronze Age pottery was found in the north-west quadrant. Neither burial area revealed any evidence except burning. The monument was subsequently removed by building

development. MCO2383 also lies south of the application area. It is a well preserved Bowl Barrow, 1.3m high and 18m in diameter. There is no sign of past disturbance, except that the top of the mound is somewhat flattened. The barrow was incorporated as a traffic island in the middle of the access road to the newly-built housing estate. The monument was included in the Schedule on 19/1/1962 and the scheduling was affirmed on 14/3/2000. HER MCO55294 records an entry in the Account Books of the Carnon Downs Wesleyan Chapel, 1824-1895, in which permission was given, in 1834, "... to carry off as much earth of the old barrow at the end of the chapel as he shall think proper ..." Although this information is a somewhat oblique, and the location is rather vague, a barrow in this location, to the southeast of the application area, would fall nicely into line with a rough alignment of three barrows to the west (PRNs 9028, 9029 & 9030). A mound of higher ground just to the north of the chapel, forming a kind of turning half-circle, may be the only remaining traces of this barrow.

Trevella, now a small farmstead to the northwest of the application area, was an Early Medieval/Medieval (410 AD to 1539 AD) settlement first recorded in 1160 AD when it is spelt "Trevella". The name is Cornish and contains the element *tre* meaning 'estate, farmstead' (which implies a settlement of early medieval origin) and an unknown personal name, perhaps Old Welsh 'Elli' (MCO17871).

There are four entries concerned with Post-medieval (1540 AD to 1900 AD) and Modern (1901 AD to present) buildings of historic interest; a Corn Mill (MCO29065) to the northeast of the application area, a Nonconformist Chapel (MCO32169) to the southeast, a Blacksmiths Workshop (MCO9008) also southeast of the application area and a Clay Pit (MCO34818) to the southwest.

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.

The terms ‘archaeological features’ and ‘archaeological 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 which is provided in the attribute tables of the GIS project on the accompanying CD-ROM and in the project archive.

Figure 2 and Table 1 comprise the analysis of the survey data. Plots of the processed data are provided in Figures 3 and 4.

6.2 Discussion

6.2.1 General points

Not all anomalies or anomaly groups identified in Table 1 are necessarily discussed below. All identified anomaly groups are recorded in the GIS project on the accompanying CD-ROM.

Anomalies thought to relate to natural features were not mapped.

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.

Data collection along the survey area edges was restricted as shown in Figures 3 and 4 due to the presence of magnetic materials in and adjacent to field and roadside boundaries. Strong magnetic responses mapped close to the field and roadside boundaries are likely to relate to these materials except where otherwise indicated in Figure 2.

The survey area to the southeast of the site had strong magnetic responses as shown in Figures 3 and 4. These are due to relatively high concentrations of iron, steel and other modern materials.

There are numerous 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.

6.2.2 Data relating to historical maps and other records

Magnetic anomaly group **8** coincides with and is likely to represent a former field boundary mapped by the Ordnance Survey between 1888 and 1907. Group **7** approximately coincides with a separate field boundary also mapped at this time.

6.2.3 Data with no previous archaeological provenance

Group **1** may represent a former track or routeway. Group **5** may also represent a similar track although the anomaly group is less well defined and has the same trend as other sub-soil disturbance recorded in the dataset (group **10**) and so could represent historical ploughing.

Group **3** is an area of enhanced magnetic response which may represent natural deposits but which could relate to an area disturbed deposits including scattered heated deposits. The proximity of three and possibly four Bronze Age barrows within 500m of the survey area means that group 3 should be considered as of potential archaeological interest.

Groups **2** and **9** are most likely to relate to past field boundaries or other enclosures of unknown date.

Groups **4** and **6** represent either stony deposits or rubble and are most likely to have a relatively recent origin.

6.3 Conclusions

The magnetic contrast across the area was sufficient to be able to differentiate between anomalies representing possible archaeological features and background magnetic responses.

Ten magnetic anomaly groups were identified as possibly representing archaeological deposits or features. Of these two very likely represent former field boundaries mapped by the Ordnance Survey between 1888 and 1907. One and possibly two may represent former tracks or routeways although one of these may be an expression of historical ploughing recorded as parallel trends in the survey dataset. One anomaly group displays characteristics that can represent a scatter of heated material. Given the proximity of three Bronze Age barrows to the application area, this deposit is considered to be of potential archaeological interest. Two groups are most likely to relate to past field boundaries or other enclosures of unknown date. A further two groups represent either stony deposits or rubble and are most likely to have a relatively recent origin.

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).

8 Acknowledgements

Substrata would like to thank John Valentin of AC Archaeology Ltd for commissioning us to complete this survey and Mr Daniel Busk for arranging access to the site.

9 Bibliography

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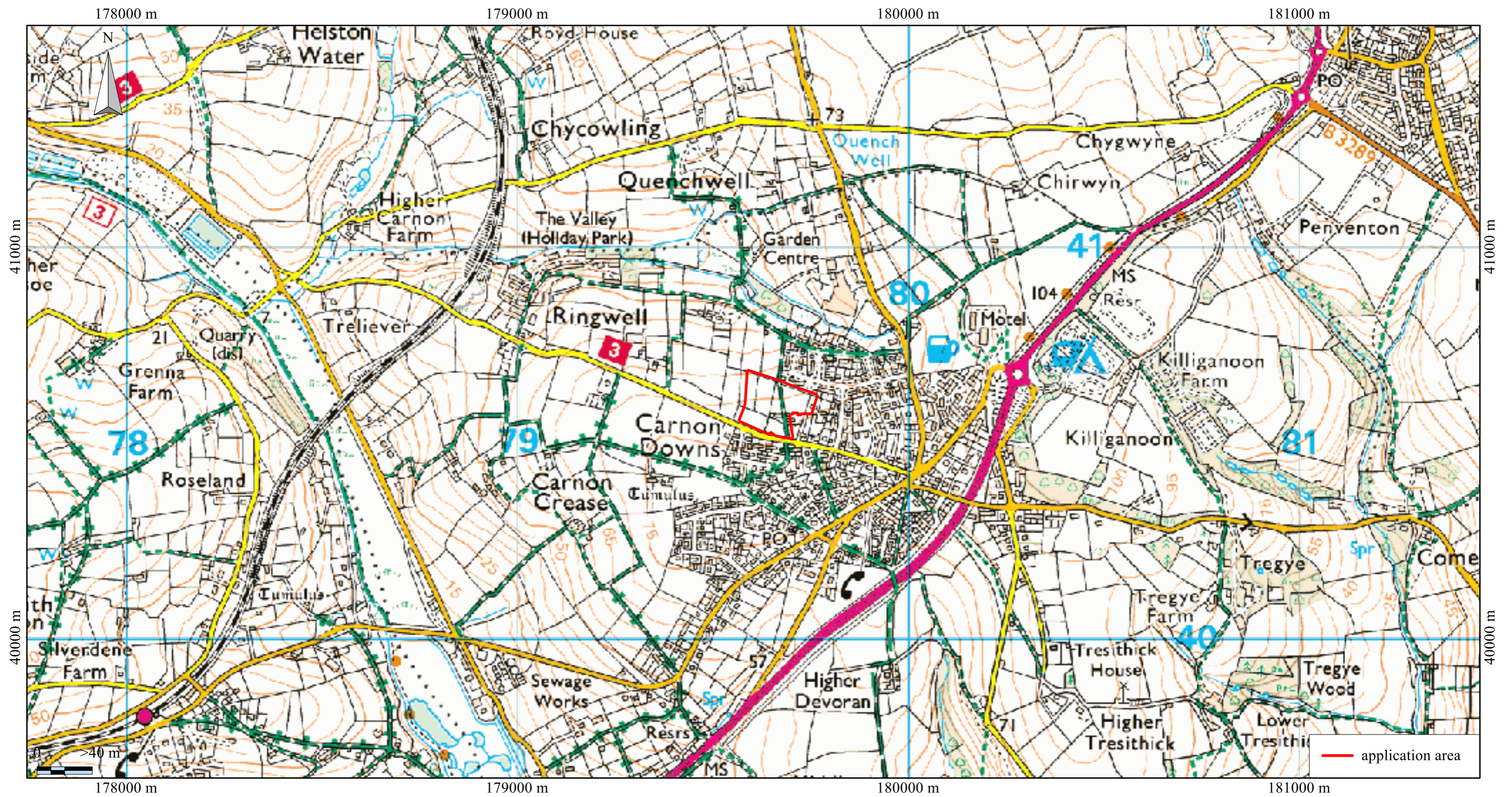
Historic England (2010) *Geophysical Survey in Archaeological Field Evaluation*, [Online], Available: <https://content.historicengland.org.uk/images-books/publications/geophysical-survey-in-archaeological-field-evaluation/geophysics-guidelines.pdf/> [June 2015]

Appendix 1 Analysis table and 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: 179604.40 m, centre Y: 40602.66 m

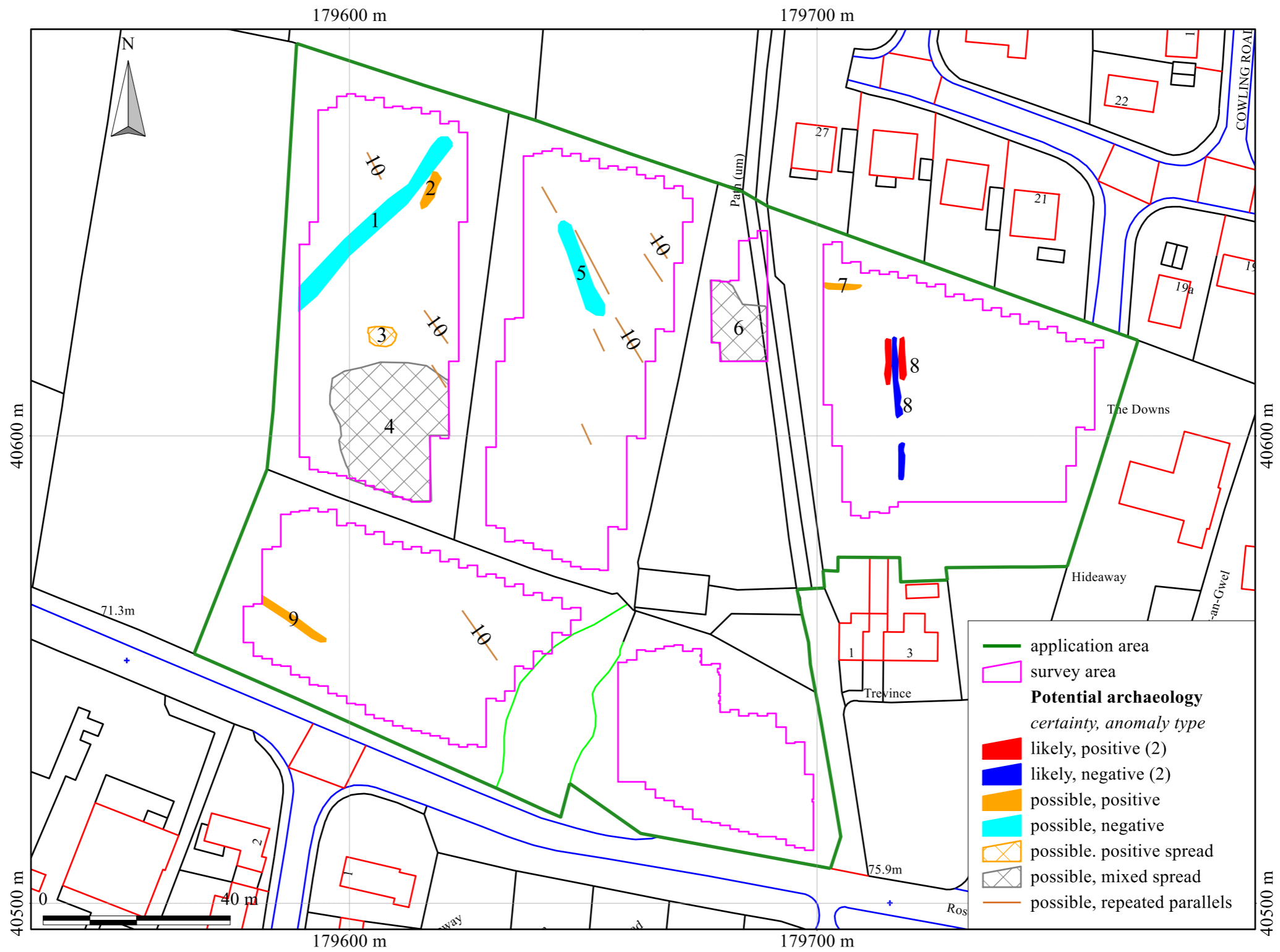
Scale: 1:10000 @ A3. Spatial Units: Meter. Do not scale off this drawing

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Figure 1: location map

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British Grid
centre X: 179662.80 m, centre Y: 40590.72 m

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

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Base map: Ordnance Survey (c) Crown Copyright 2015.
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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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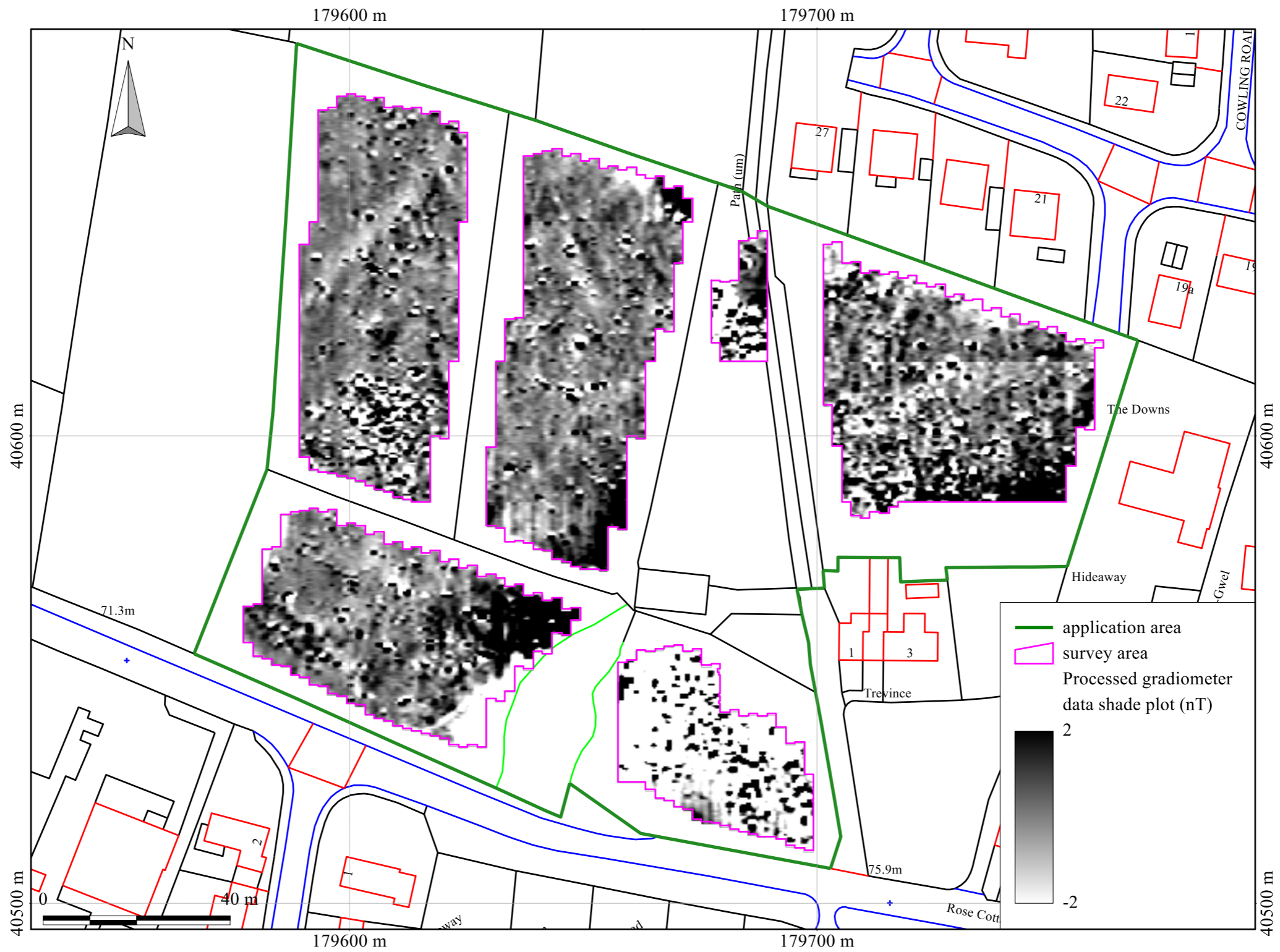
Figure 2: survey interpretation

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Site: An archaeological gradiometer survey
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anomaly group	anomaly characterisation certainty & class	anomaly form	additional archaeological characterisation	comments	supporting evidence
1	possible, negative	linear		anomaly group may represent a linear stony deposit such as a track or former road	
2	possible, positive	linear			
3	possible, positive spread	sub-circular	area of potential archaeological deposits	anomaly group may represent an area of archaeological activity and, given the existence of nearby barrows, this anomaly group may be significant, possibly representing a spread of magnetically enhanced debris which can result from the localised scattering of heated deposits	HER entries MCO2381 to MCO2384
4	possible, mixed spread	irregular	stony deposit or rubble	anomaly group represents a deposit of rubble or stony material of unknown provenance; such groups often represent demolition deposits or recently made-up ground	
5	possible, negative	linear		anomaly group may represent a linear stony deposit such as a track or former road but it on the same alignment as anomaly trends considered to relate to historical ploughing and may be a consequence of that sub-soil disturbance	
6	possible, mixed spread	irregular	stony deposit or rubble	anomaly group represents a deposit of rubble or stony material of unknown provenance; such groups often represent demolition deposits or recently made-up ground	
7	possible, positive	linear		anomaly group approximately coincides with a boundary mapped by the Ordnance Survey between 1888 and 1907 and may be related to that feature	OS maps 1888 1:10560 to 1907 1:2500
8	likely, positive/negative/positive	disrupted linear	field boundary	anomaly group coincides and reprints a former field boundary mapped by the Ordnance Survey between 1888 and 1907	OS maps 1888 1:10560 to 1907 1:2500
9	possible, positive	linear			
10	possible, repeated parallels			anomaly trends may relate to historical ploughing on a different orientation to current field boundaries	

Table 1: data analysis



British Grid
centre X: 179662.80 m, centre Y: 40590.72 m

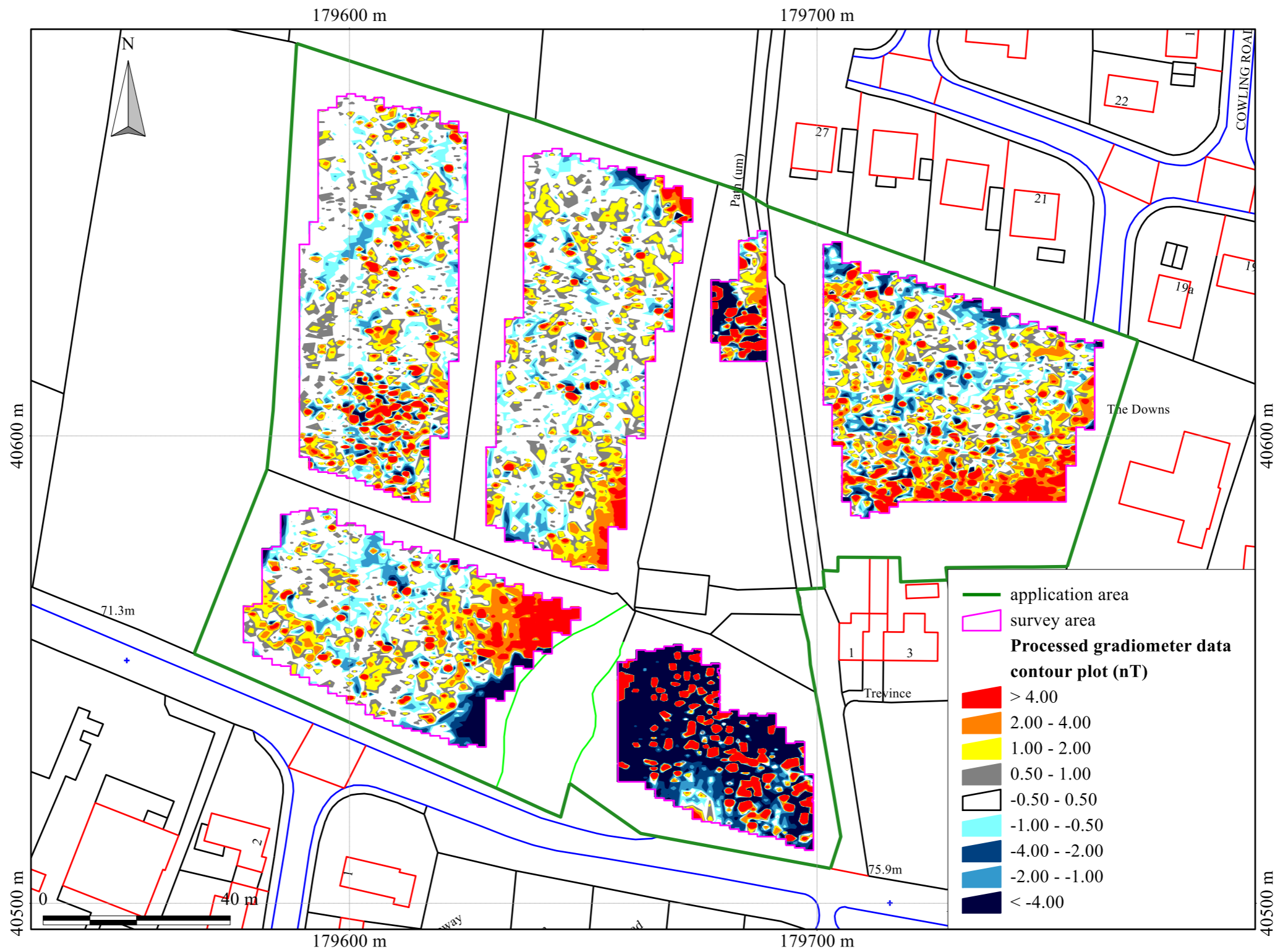
Scale: 1:1000 @ A3. Spatial Units: Meter. Do not scale off this drawing

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Figure 3: shade plot of processed data

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British Grid
centre X: 179662.80 m, centre Y: 40590.72 m

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

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Figure 4: contour plot of processed data

Appendix 2 Methodology Summary

Table 2: methodology summary	
<p>Documents Survey methodology statement: Dean (2015)</p>	
<p>Methodology</p> <ol style="list-style-type: none"> 1. The work was undertaken in accordance with the survey methodology statement. The geophysical (gradiometer) survey was undertaken with reference to standard guidance provided by the Chartered Institute for Archaeologists (2014) and Archaeology Data Service/Digital Antiquity Guides (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. 	
<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> 0.25-metres <i>Traverse Interval:</i> 1 metre <i>Traverse Method:</i> zigzag <i>Traverse Orientation:</i> GN</p>
<p>Data Processing, Analysis and Presentation Software IntelliCAD Technology Consortium IntelliCAD 7.2 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: gradiometer survey - processed data metadata	
SITE	
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
PROGRAM	
Name:	TerraSurveyor
Version:	3.0.25.0
Stats	
Max:	31.86
Min:	-28.14
Std Dev:	5.75
Mean:	-0.75
Median:	0.00
Processes: 8	
1	Base Layer
2	Clip at 1.00 SD
3	Clip at 1.00 SD
4	De Stagger: Grids: All Mode: Both By: -2 intervals
5	DeStripe Median Sensors: c17.xgd c7+c18.xgd c12+c21.xgd c27.xgd c1.xgd c8+c6.xgd c11.xgd c28.xgd c31.xgd c32.xgd c2.xgd c5.xgd c10.xgd c13+c15.xgd c29.xgd c30.xgd c33.xgd c3.xgd c4.xgd c9.xgd c14.xgd
6	DeStripe Median Sensors: c16.xgd c19.xgd
7	Edge Match (Area: Top 60, Left 240, Bottom 89, Right 359) to Right edge
8	Edge Match (Area: Top 150, Left 360, Bottom 209, Right 479) to Right edge
Note: converting the gradiometer data into ESRI GIS files imposed an x=y interpolation on the entire dataset	