

Substrata

Archaeological Geophysical Surveyors

An archaeological gradiometer survey

Land at Redannack Road Mullion, Cornwall

Centred on NGR (E/N): 167690,19580 (point)

Report: 1601MUL-R-1

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15 February 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: 3 February 2016
Area: gradiometer survey: 1.7ha
Lead surveyor: Joe Bampton
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 at Redannack Road
Civil Parish: Mullion
County: Cornwall
Nearest Postcode: TR12 7JH
NGR: SW 677 196
Ordnance Survey NGR (E/N): 167690,19580 (point)

1.4 Archive

OASIS number: substrat1-242596
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.

Twenty-two magnetic anomaly groups were mapped as representing possible archaeological deposits or structures. A further relatively large group of anomalies are thought to represent recent landscaping following the cutting of a service trench or the decommissioning of a temporary track for vehicles but an archaeological origin cannot be ruled out entirely. Of those representing potential archaeology, one is likely to represent a former field boundary mapped by the Ordnance Survey between 1879 and at least 1981 and two may represent either large pits or natural features. 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 gradiometer 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 on the north-eastern edge of the village of Mullion. To the north it is bound by Polhorman Lane, to the east by fields and to the south and east by residential housing and related infrastructure as shown in Figure 1. Topographically, the site lies between 55m and 60m AOD on a gentle slope descending northwest to southeast towards the head of a dry valley. At the time of the survey the land was under short grass.

4.2 Geology

The site has a solid geology of interbedded sandstone beds, up to 2m thick, and slaty mudstone of the Devonian Portscatho Formation. The superficial geology is unrecorded (British Geological Survey, undated).

5 Archaeological background

5.1 Historic landscape characterisation

Farmland: Medieval.

The agricultural heartland, with farming settlements documented before the 17th century AD and whose field patterns are morphologically distinct from the generally straight-sided fields of later enclosure. Either Medieval (1066 AD to 1539 AD) or Prehistoric (pre 43 AD) origins (Cornwall Council, undated).

5.2 Historical and archaeological background

The following is a short summary of information obtained from the Cornwall Historic Environment Record (HER) via the Heritage Gateway (Historic England, undated). The heritage assets discussed below are within approximately 1000m of the site and relevant to the understanding of the geophysical survey.

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

The site of a Medieval (1066 AD to 1539 AD) well in Park Venton on Tremennee Farm, on the southeast edge of the site, is traditionally known as a holy well. The place is now occupied by a pond and a small brick structure, which houses a domestic water pump (HER entry 10544 at NGR SW 6784 1948).

5.2.2 Heritage assets within 1000m of the site

The area is one of small hamlets surrounding the village of Mullion which lies to the south of the survey area (Figure 1). Many of the settlements within the study area have Medieval or earlier origins. Of these, Voundr (HER 10538 at NGR SW 6825 1904) to the southeast of the

settlement (HER 10686.02 at SW 684 187). Mullion itself has Medieval origins (HER 10527 at SW 6784 1913) with a church which may be on the site of an Early Medieval (410 AD to 1066 AD) predecessor (HER 10693.10 at SW 6787 1921).

A collection of Prehistoric (before 43 AD) flint flakes, cores, scrapers and nodules have been found in the fields near Polurrian cliff castle to the southwest of the site (HER 10549 discussed below) These artefacts have been cited as evidence for a lithic working site (HER 10548 at SW 6698).

There is some written evidence for three Bronze Age (2500 BC to 799 BC) barrows within the study area although no traces are now visible; at Gwills to the northwest of the site (HER 28087 at SW 6730 2015), Trembel to the south of the site (HER 10661 at SW 6806 1870) and Trenance to the southwest (HER 10662 at SW 6742 1868).

Evidence for Iron Age (800 BC to 42 AD) and Romano-British (43 AD to 409 AD) settlement within the study area includes a number of rounds, fogues and hill forts. A curvilinear enclosure, 60m in diameter, is visible as a poor quality crop mark on aerial photographs at Polhormon to the north of the site. The date and function of the enclosure are not certain but its appearance and size suggests it is likely to be a round (HER 51464 at SW 6747 2028). A second curvilinear enclosure 80m in diameter, also thought to be a round, is visible as a good quality soilmark on aerial photographs nearby (HER 51465, SW 6766 2026). Southeast of the site at Meaver is a similar curvilinear 48m diameter enclosure visible as a cropmark on aerial photographs. A section of curvilinear field boundary to the south of a low summit may represent part of the enclosure wall (HER 69925 at SW 6862 1889). Close by and possibly associated with 66925 is a curvilinear or C-shaped enclosure with a 10m diameter and visible as a cropmark on aerial photographs (HER 51412 at SW 6859 1903). At Trembel, to the south of the site, a curvilinear enclosure of, approximately 80m diameter, is visible as a cropmark on aerial photographs. A removed curvilinear boundary shown on the Tithe Map appears to be a possible section of the enclosure wall. The round forms an oval enclosure either side of the modern track leading to Trembel. A series of three intersecting curvilinear cropmarks appear to represent internal divisions within the round and at least one of these is visible as a large break of slope. Two smaller circular cropmarks may represent house sites within the round (HER 169924 at SW 6808 1870). There is also a possible internal enclosure within the round (HER 51417), which also appears as a crop mark. Close by another curvilinear enclosure, 16m in diameter, is visible as a cropmark on aerial photographs may be associated with 169924 (HER 15415 at SW 6810 1867). At Polurrian Cove to the southwest of the site, the field-names 'Park Kistall' and 'Crigger' on the Tithe Map might possibly indicate the site of a round (HER 10547 at SW 6720 1873). Earthworks of a cliff castle, thought to be Iron Age, on nearby Polurrian Head were visible around 1900 AD although there is some doubt as to this interpretation (HER 10549, SW 6698 1870). Traditional accounts indicate the presence of two Iron Age/Romano-British fogou in the study area although no physical evidence has been recorded. One is thought to be at Polphue Cove to the northwest of the site (HER 10539 at SW 6675 1990) and the other relatively close to the site at Tremenhee Farm (HER 10545 at SW 6798 1930).

Some mining was undertaken in the area in Post-Medieval times (1540 AD to 1900 AD) and the Wheal Fenwick mine lies within the study area to the southwest of the site. It produced copper, tin and arsenic and was recorded as disused by the time of the Ordnance Survey 1880 1:2500 map (HER 178237 at SW 6694 1866).

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.

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

The relatively large magnetic responses in the southeast of the survey area (Figures 3 and 4) denote areas of rubble and disturbed ground consistent with material dumping and ground clearance.

6.2.2 Data relating to historic maps and other records

Magnetic anomaly group **21** coincides and likely represents a field boundary mapped by the Ordnance Survey between 1879 and at least 1981-2.

6.2.3 Data with no previous archaeological provenance

Anomaly groups **11** and **19** may represent archaeological deposits in the form of former large pits but could equally represent natural deposits.

Anomaly groups **12** and **15** may represent the same set of archaeological deposits and, as such, may represent an oval enclosure rather than a typical field boundary.

While anomaly group **101** may represent an archaeological feature such as a broad ditch, it is more likely to represent recent landscaping after ground disturbance from the cutting of a service trench or the laying and use of a temporary track for heavy vehicles.

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.

Twenty-two magnetic anomaly groups were mapped as representing possible archaeological deposits or structures. A further relatively large group of anomalies are thought to represent recent landscaping following the cutting of a service trench or the decommissioning of a temporary track for vehicles but an archaeological origin cannot be ruled out entirely. Of those representing potential archaeology, one is likely to represent a former field boundary mapped by the Ordnance Survey between 1879 and at least 1981 and two may represent either large pits or natural features. 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 John Valentin of AC Archaeology Ltd for commissioning us to complete this survey.

9 Bibliography

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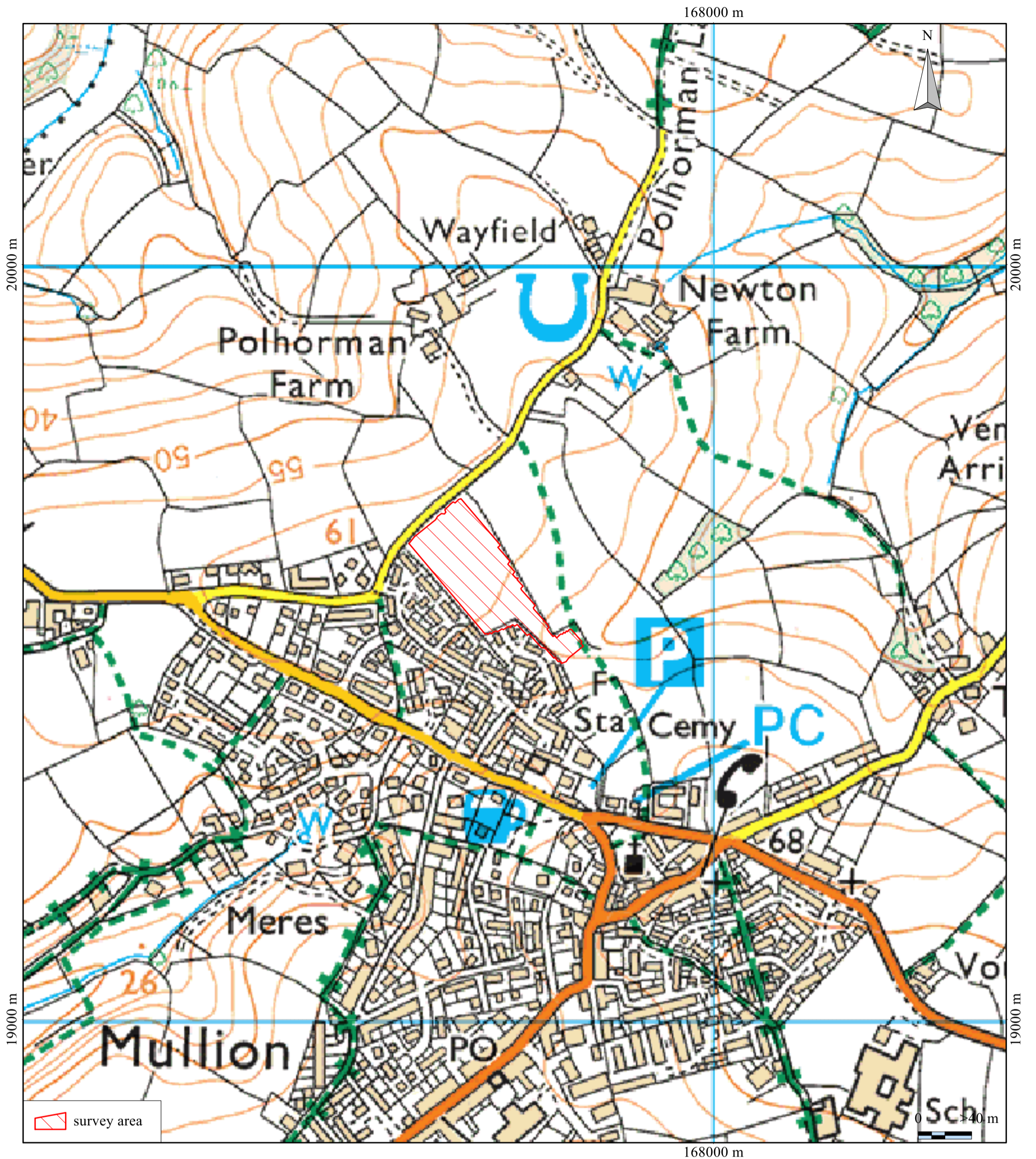
Historic England (2010) *Geophysical Survey in Archaeological Field Evaluation*, [Online], Available: <https://content.historicengland.org.uk/images-books/publications/geophysical-survey-in-archaeological-field-evaluation/geophysics-guidelines.pdf/> [January 2016]

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: 167736.66 m, centre Y: 19578.02 m

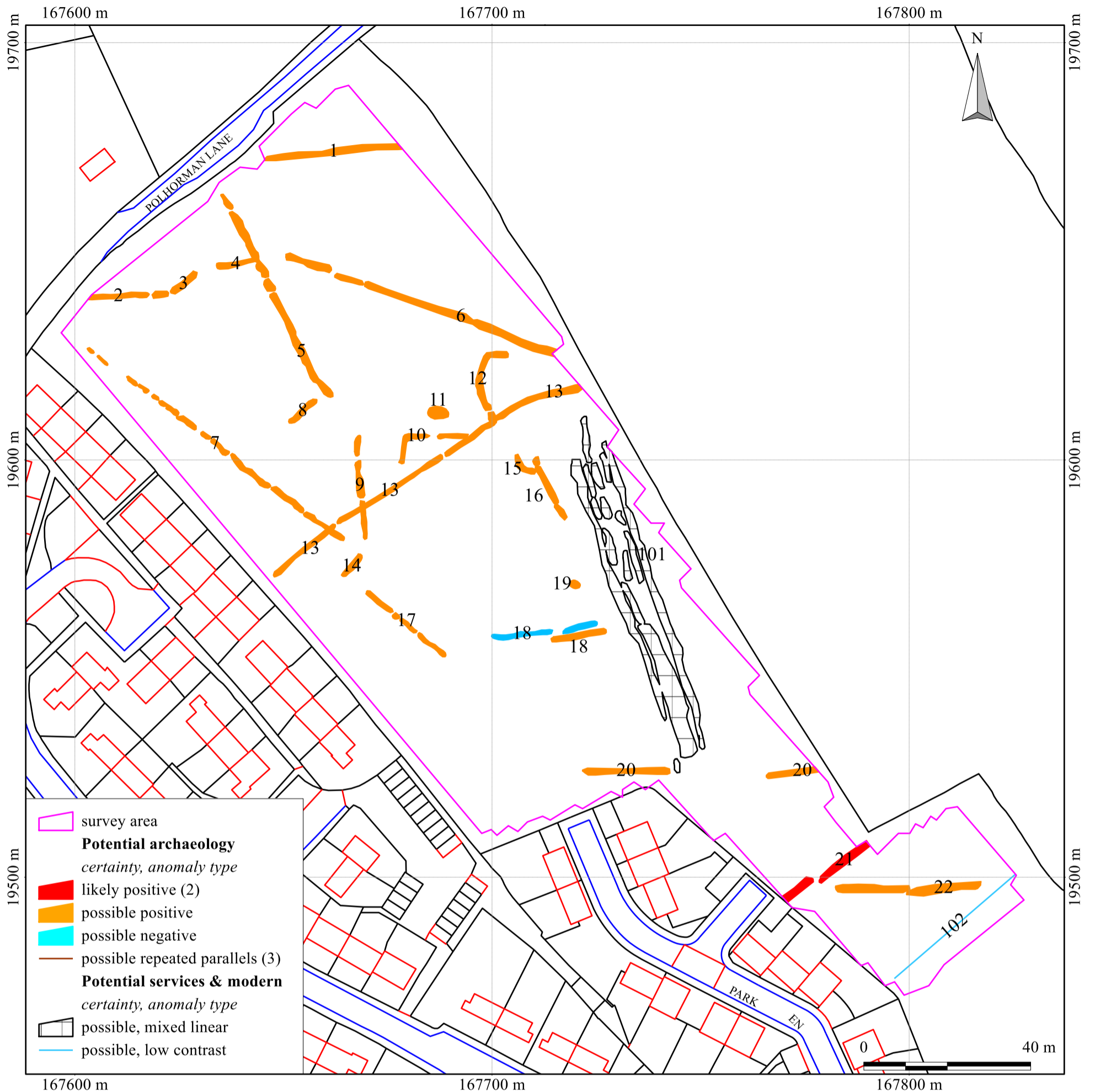
Geophysical survey: Copyright Substrata 2016.
Base map: Ordnance Survey (c) Crown Copyright 2016,
Licence number 100022432. All rights reserved.

Scale: 1:5000 @ A3. Spatial Units: Meter. Do not scale off this drawing

An archaeological gradiometer survey
Land at Redannack Road, Mullion, Cornwall
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Figure 1: survey location

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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. Anomalies designated "likely archaeology" have supporting evidence e.g. historical maps and or visible earthworks.
3. Representative; not all instances are mapped.
4. Anomalies likely to represent geological or other natural deposits are not mapped unless relevant to potential archaeological events or deposits.

An archaeological gradiometer survey
Land at Redannack Road, Mullion, Cornwall
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Figure 2: survey interpretation

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Site: An archaeological gradiometer survey
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anomaly group	associated anomalies	anomaly characterisation certainty & class	anomaly form	additional archaeological characterisation	comments	supporting evidence
1		possible, positive	linear			
2		possible, positive	disrupted linear			
3		possible, positive	linear			
4		possible, positive	linear			
5		possible, positive	disrupted linear			
6		possible, positive	disrupted linear			
7		possible, positive	disrupted linear			
8		possible, positive	linear			
9		possible, positive	disrupted linear			
10		possible, positive	disrupted return			
11		possible, positive	oval	large pit or natural deposit		
12	15	possible, positive	disrupted curvilinear			
13		possible, positive	disrupted linear			
14		possible, positive	linear			
15	12	possible, positive	curvilinear			
16		possible, positive	linear			
17		possible, positive	linear			
18		possible, positive & negative	linear			
18		possible, negative	disrupted linear			
19		possible, positive	oval	large pit or natural deposit		
20		possible, positive	disrupted linear			
21		likely, positive	disrupted linear	field boundary	anomaly group coincides with a field boundary mapped in 1879 until at least 1981-2	Ordnance Survey maps 1879 1:2500 to 1981-2 1:10000
22		possible, positive	disrupted linear			
101		possible, mixed linear	parallel linears	landscaped ground after service laying or temporary road	although an archaeological origin cannot be ruled out, the anomaly group is most likely to reflect relatively recent landscaping	
102		possible, low contrast	linear	service trench		

Table 1: data analysis



British Grid
 centre X: 167712.71 m, centre Y: 19578.50 m

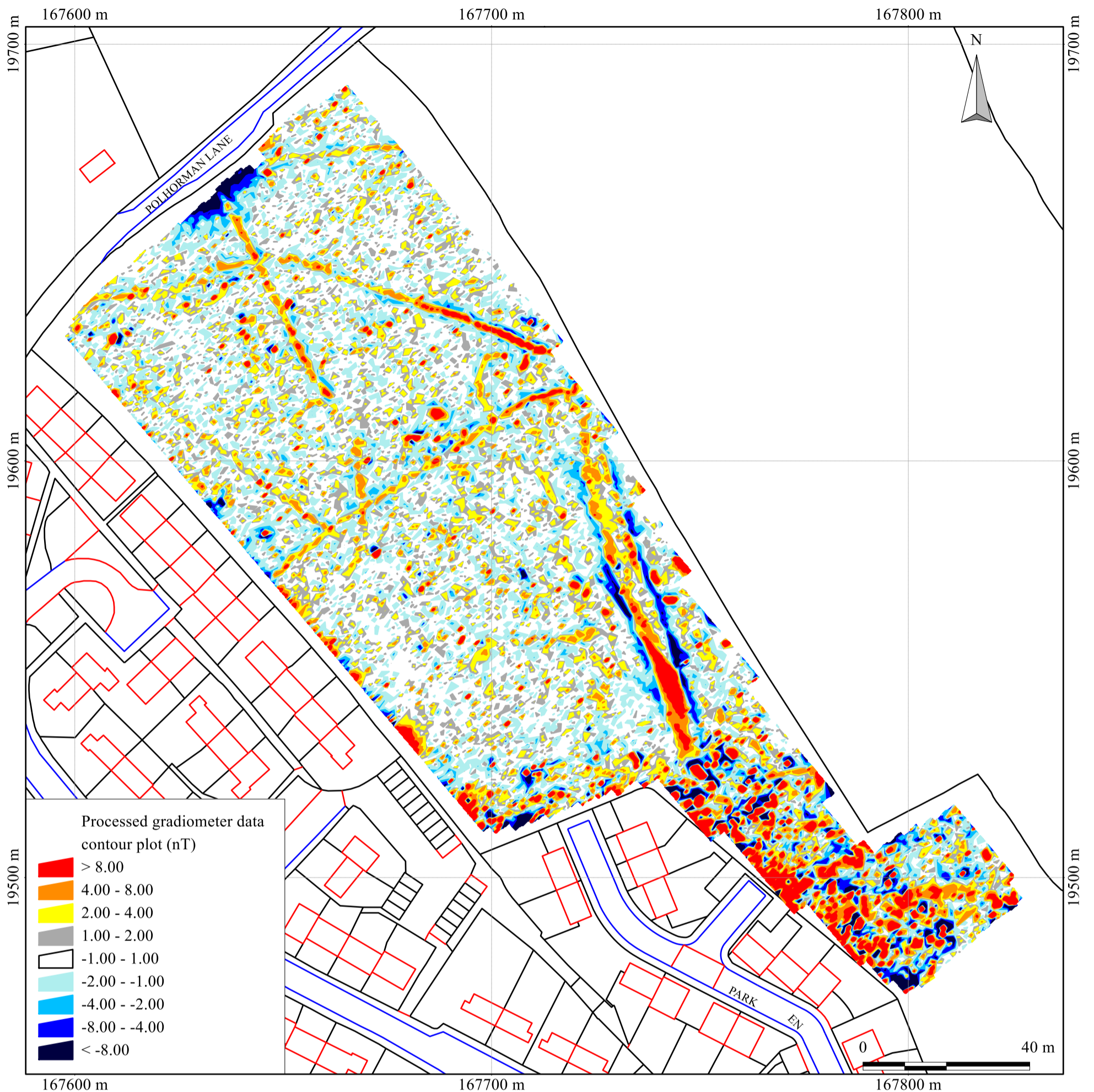
Geophysical survey: Copyright Substrata 2016.
 Base map: Ordnance Survey (c) Crown Copyright 2016,
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Scale: 1:1000 @ A3. Spatial Units: Meter. Do not scale off this drawing

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Figure 3: shade plot of processed data

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British Grid
centre X: 167712.71 m, centre Y: 19578.50 m

Geophysical survey: Copyright Substrata 2016.
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Scale: 1:1000 @ A3. Spatial Units: Meter. Do not scale off this drawing

An archaeological gradiometer survey
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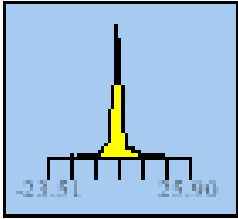
Figure 4: contour plot of processed data

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Appendix 2 Methodology Summary

Table 2: methodology summary	
<p>Documents Survey methodology statement: Dean (2016)</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> 0.25m <i>Traverse Interval:</i> 1 metre <i>Traverse Method:</i> zigzag <i>Traverse Orientation:</i> GN220</p>
<p>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</p>	

Appendix 3 Data processing

Table 3: gradiometer survey - processed data metadata	
<p>SITE Instrument Type: Bartington Grad 610 Units: nT Direction of 1st Traverse: see below Collection Method: ZigZag Sensors: 2 @ 1.00 m spacing. Dummy Value: 32702</p> <p>PROGRAM Name: TerraSurveyor Version: 3.0.28.1</p>	
<p>Stats Max: 25.90 Min: -23.51 Std Dev: 3.94 Mean: 0.17 Median: 0.00</p> 	<p>Processes: 7</p> <ol style="list-style-type: none"> 1 Base Layer 2 Clip at 2.00 SD 3 De Stagger: Grids: All Mode: Both By: 1 intervals 4 DeStripe Median Traverse: Grids: a_a26.xgd a_a9.xgd a_a6.xgd a_a25.xgd a_a10.xgd a_a5.xgd a_a24.xgd a_a11.xgd a_a4.xgd a_a23.xgd a_a12.xgd a_a3.xgd a_a22.xgd a_a13.xgd a_a2.xgd a_a21.xgd a_a14.xgd a_a1.xgd a_a20.xgd a_a15.xgd a_a19.xgd a_a16.xgd a_a18.xgd a_a17.xgd Threshold: 2.5 SDs 5 DeStripe Median Traverse: Grids: a_a27.xgd Threshold: 2.5 SDs 6 DeStripe Median Traverse: Grids: a_a7.xgd Threshold: 2.5 SDs 7 De Stagger: Grids: a_a11.xgd Mode: Both By: 2 intervals

Appendix 4 Minimally processed processed data plot

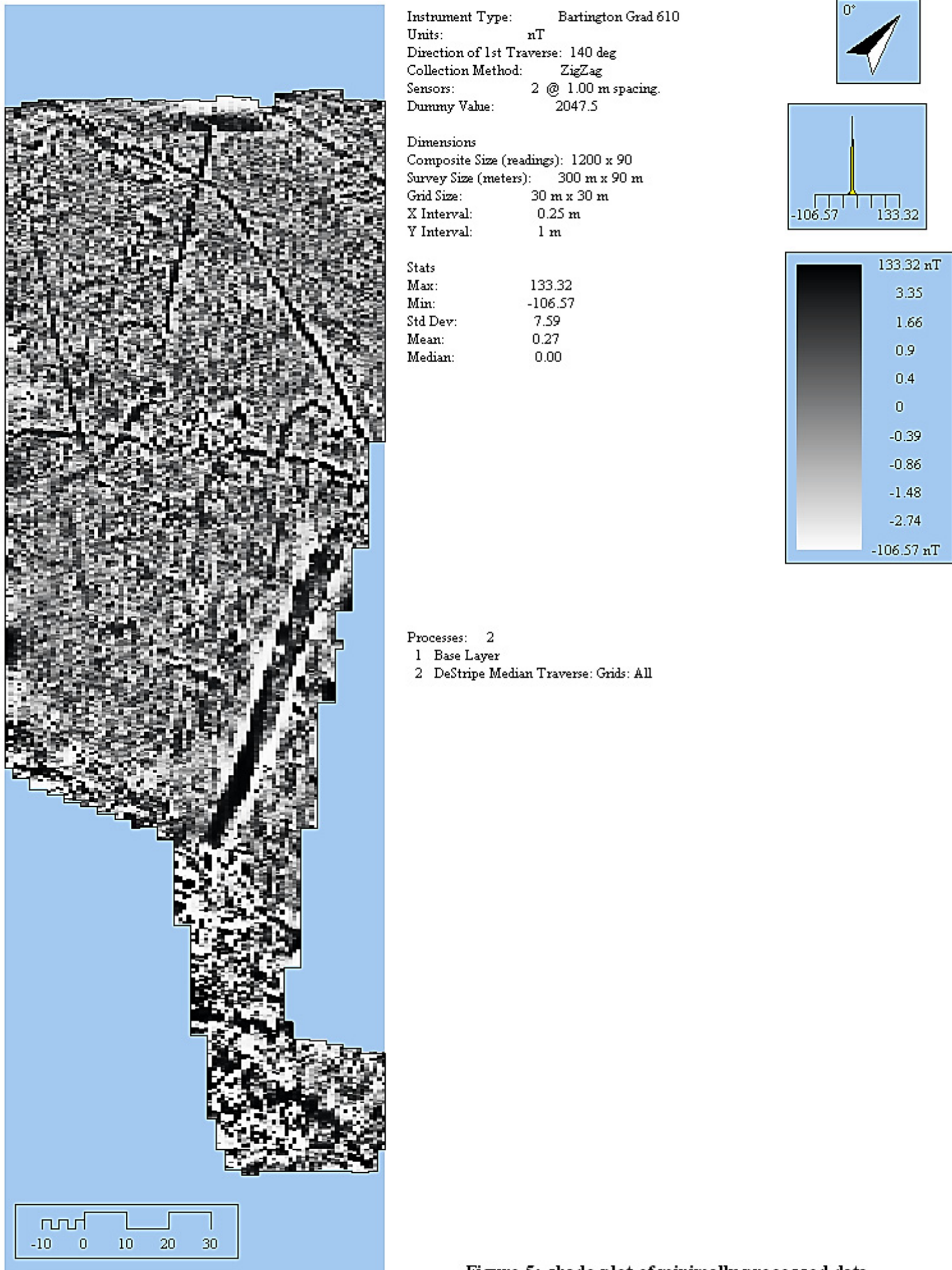


Figure 5: shade plot of minimally processed data