

An archaeological gradiometer survey

Land at Sanctuary, Goldsithney Perranuthnoe, Cornwall

Centred on NGR (E/N) 154443,30355 (point)

Report: 1508SAN-R-2

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28 August 2015

Substrata

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Website: substrata.co.uk

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

Substrata contents

1 Survey description and summary

1.1 Survey

Type: twin-sensor fluxgate gradiometer

Date: 18 and 26 August 2015

Area: 0.4ha

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:

Town & Civil Parish:

County & Unitary Authority:

Nearest Postcode:

NGR:

Land at Sanctuary

Perranuthnoe

Cornwall

TR20 9LY

SW 544 303

Ordnance Survey NGR (E/N): 154443,30355 (point)

1.4 Archive

OASIS number: substrat1-222127

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. The survey was designed to search for the location of hidden mine shafts and record other potential archaeological deposits. The location of the site is shown in Figure 1.

Two mine shafts were recorded within the survey area on the Ordnance Survey 1887 1:2500 (Figure 2) and 1:10560 maps. On subsequent historical maps the shafts are depicted as earthworks and not labelled. The Wheal Caroline tin and copper mine, located in an adjacent field to the west of the survey area, is recorded as disused on the 1887 maps and on subsequent historical maps. There is a further shaft recorded on the 1887 maps in an adjacent field to the east of the survey area and other shafts and mine works were recorded close by on these and later historical maps. The surveying team noted a cylindrical shaft revetted with stone within the survey area (Plate 1) but were unable to survey in the vicinity of the feature because of unsuitable terrain. It is likely that this feature is a third mine shaft not recorded on historical maps.

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 but in places the data was affected by the presence of magnetic materials at the surface and in adjacent field boundaries. Dense vegetation and some cut, piled vegetation impeded survey coverage across the western side of the survey area.

The surveyors noted one potential mine shaft at location A (Figures 3 and 4, Plate 1) but were unable to survey across the vicinity. Apart from this, no direct evidence of mineshafts was recorded. One magnetic anomaly group recorded in the vicinity of location A, however, represents a mix of materials and disturbed ground that can be indicative of former industrial deposits and demolition debris.

Following the data analysis, it was clear that one visible but unmapped likely mine shaft at location A could not be surveyed using standard shallow depth magnetometer techniques and two other historically mapped mineshafts were not detected. A subsequent site visit confirmed that the area has been landscaped since it was mapped in 1887 and that was rubble spread across and within the shafts. This has created mixed magnetic responses across the area effectively masking any magnetic readings from the shafts. A shallow, subcircular, negative

earthwork was noted at position B (Figures 3 and 4). This coincides with one of the mapped shafts (Figures 2 and 3) and is likely to be a filled shaft.

With regard to evidence for other archaeological features, magnetic anomalies indicative of ploughing disturbance, possibly from former ridge-and-furrow ploughing, was recorded across the site.

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 mine shafts and 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 mine shafts and other archaeological remains;
- Determine the extent, condition, nature, character, date and significance of any shafts and archaeological remains encountered;
- 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 approximately 0.4ha hectares on the southern edge of Goldsithney at approximately 65 to 75m AOD. It comprises a parcel of land formally used for mining, now partially overgrown and surrounded by thick hedges (Figure 1).

4.2 Geology

The application area is located on metamorphic bedrock of hornfelsed slate and hornfelsed siltstone of the Devonian Mylor Slate Formation. The superficial geology was 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 Isles Historic Environment Record (HER) within approximately 500m of the survey area and relevant to the understanding of the geophysical survey. Except where specifically cited, this information was obtained using the Heritage Gateway (English Heritage, undated 1).

5.1 Heritage Assets within the survey area

While no heritage assets are recorded within the survey area, two mine shafts were recorded as being located on the western side of the area on the Ordnance Survey 1877 1:2,500 (Figure 2) and 1:10,560 maps of the area.

5.2 Heritage Assets within 500m of the Application Area

The Majority of Heritage assets that are of relevance to the survey are Medieval and Post-medieval although there are Prehistoric and Romano-British assets recorded in the vicinity

Directly North of the survey area is the modern settlement of Goldsithney which has Medieval (1066 AD -1539 AD origins. The settlement and fair of Goldsithney is first recorded as "Nundinis (fair) Sancti Jacobi Exta Montem" between 1227 AD and 1242 AD. The name is Cornish and contains the element gol 'feast, fair' and the Cornish saint's name of Sithney (HER 29207). Directly north of the survey area lies the site of St James' Chapel a medieval chapel (HER 29120) (SW 5454 3068) which was built in 1400 and demolished in 1549. The site of St James' Chapel at Goldsithney is recorded on recent Ordnance Survey map editions although there are no extant remains of the chapel. The Orchard Adjoining the site of St James known as the graveyard (HER 29120.01) (SW 5456 3068) is the site of a medieval cemetery 1066 AD 1539 AD. The supposed site of St Petry's chapel was marked on OS maps until 1963 at SW 5440 3074.

The Tithe Award for Perranuthnoe records the field-name of 'Agar Gar' at SW 5478 2991. This name may include the Cornish element ker which suggests the site of a round, perhaps Early Iron Age to Romano-British in age (800 BC to 409 AD) (HER 29130). Either a second round exists close by or this asset is also recorded as HER 29195.

A possible Medieval field system has been recorded at SW 5402 3069 (HER 52830).

A Number of Post-medieval mines are present at various points around the survey area. To the south west of the survey area (HER 40061) (SW 541 299) an eighteenth century mine (1787 AD to 1862 AD) Wheal Neptune (Figure 2) which was revived in the first half of the nineteenth century before closing in 1841. It reopened once. To the North West of the survey area is the site of a post medieval nineteenth century (1826 AD to 1831 AD) copper mine Wheal Caroline (HER 40067 at SW 543 305, Figure 2) which opened in 1826 and was rich for some five years as it exploited a shallow copper lode. South of the survey area lies the site of nineteenth century post medieval mine East Wheal Neptune (1838 AD to 1867 AD) (HER 40065 at SW 5440 3005, Figure 2). An engine house at (SW 54254 30125) probably associated with this mine, had vanished by the time of the 1907 edition OS map. A Postmedieval mine known as Wheal Arthur (HER 163683 at SW 5440 3005) was possibly incorporated into the sett of East Wheal Neptune but no documentary evidence can be located to substantiate this. To the North East of the site lies a Post-medieval mine known as Wheal Verrant or Verran (HER 163726 at SW 5468 3057). Wheal Verrant was at work in the late nineteenth century, it is marked as a tin mine on the 1877 Ordnance Survey maps and was still at work on a small scale in 1907.

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.

The survey area proved very difficult to survey with dense vegetation and the presence of highly magnetic materials on the surface and close to extant boundaries limiting the area that could be surveyed.

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.

Data collection along the survey area edges was restricted as shown in Figures 3 and 4 due to the presence of thick hedges and 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.

6.2.2 Data relating to historical maps and other records

No recorded anomalies related to features recorded on historical maps.

6.2.3 Data with no previous archaeological provenance

The survey area proved difficult to survey using magnetometers because of the vegetation and presence of magnetic objects across the site. The surveyors noted one potential mine shaft at location A (Figure 2) but were unable to survey across the vicinity. Apart from this, no direct evidence of mineshafts were recorded. Magnetic anomaly group 1, however, is likely to represent a mix of materials and disturbed ground in the vicinity of location A which is often indicative of industrial deposits such as demolition debris.

The linear groups 101 are persistent across the survey area and are likely to represent ground disturbed by former ploughing, some of which appears to be ridge-and-furrow.

Groups 201 to 203 are typical of recently disturbed ground containing rubble and ferrous material. These anomaly groups are also partially affected by adjacent magnetic materials in the field boundaries.

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 but in places the data was affected by the presence of magnetic materials at the surface and in adjacent field boundaries. Dense vegetation and some cut, piled vegetation impeded survey coverage across the western side of the survey area.

The surveyors noted one potential mine shaft at location A (Figures 3 and 4, Plate 1) but were unable to survey across the vicinity. Apart from this, no direct evidence of mineshafts was recorded. One magnetic anomaly group recorded in the vicinity of location A, however, represents a mix of materials and disturbed ground that can be indicative of former industrial deposits and demolition debris.

Following the data analysis, it was clear that one visible but unmapped likely mine shaft at location A could not be surveyed using standard shallow depth magnetometer techniques and two other historically mapped mineshafts were not detected. A subsequent site visit confirmed that the area has been landscaped since it was mapped in 1887 and that was rubble spread across and within the shafts. This has created mixed magnetic responses across the area effectively masking any magnetic readings from the shafts. A shallow, subcircular, negative earthwork was noted at position B (Figures 3 and 4). This coincides with one of the mapped shafts (Figures 2 and 3) and is likely to be a filled shaft.

With regard to evidence for other archaeological features, magnetic anomalies indicative of ploughing disturbance possibly from former ridge-and-furrow ploughing, was recorded across the site.

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

9 Bibliography

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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.

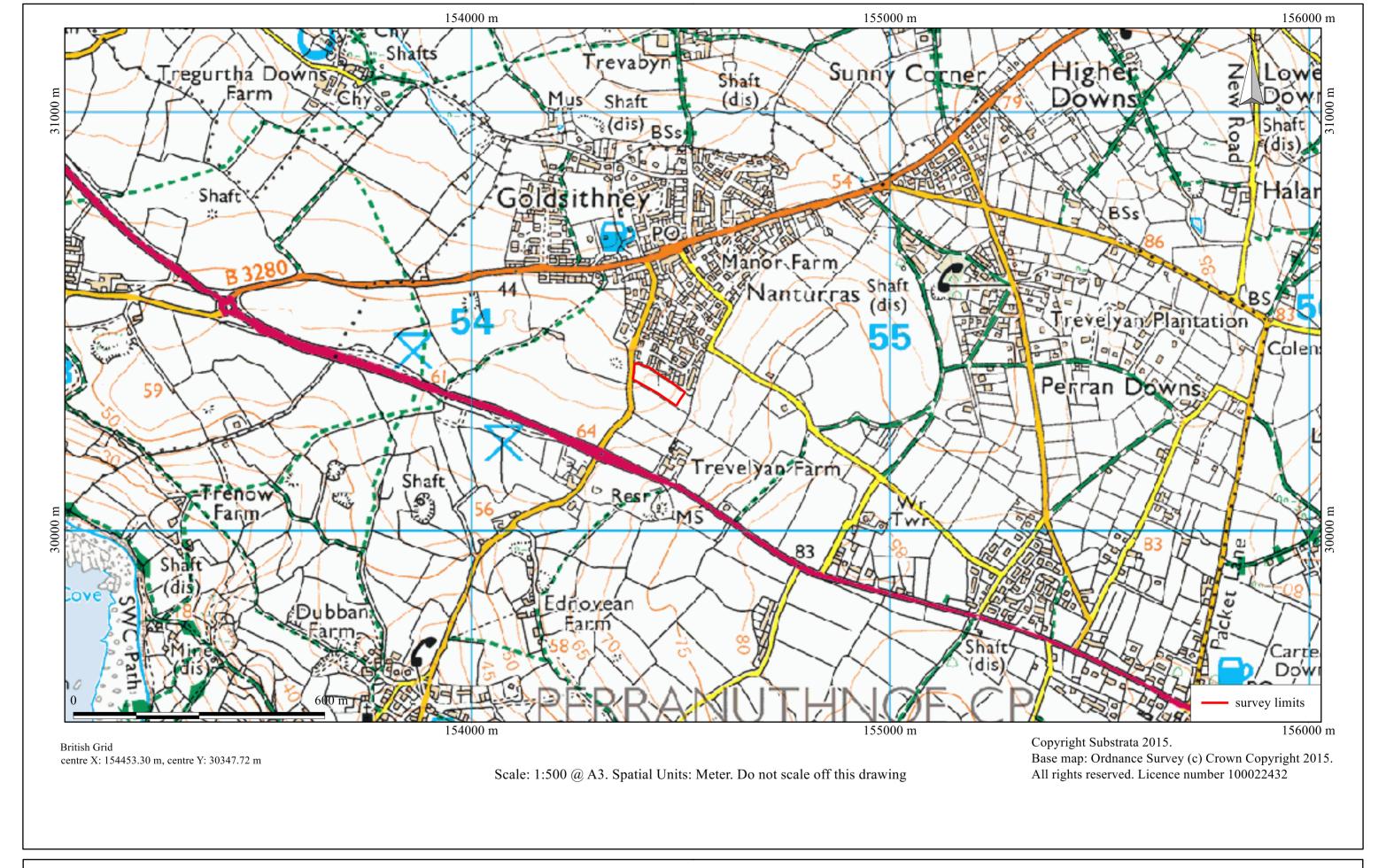
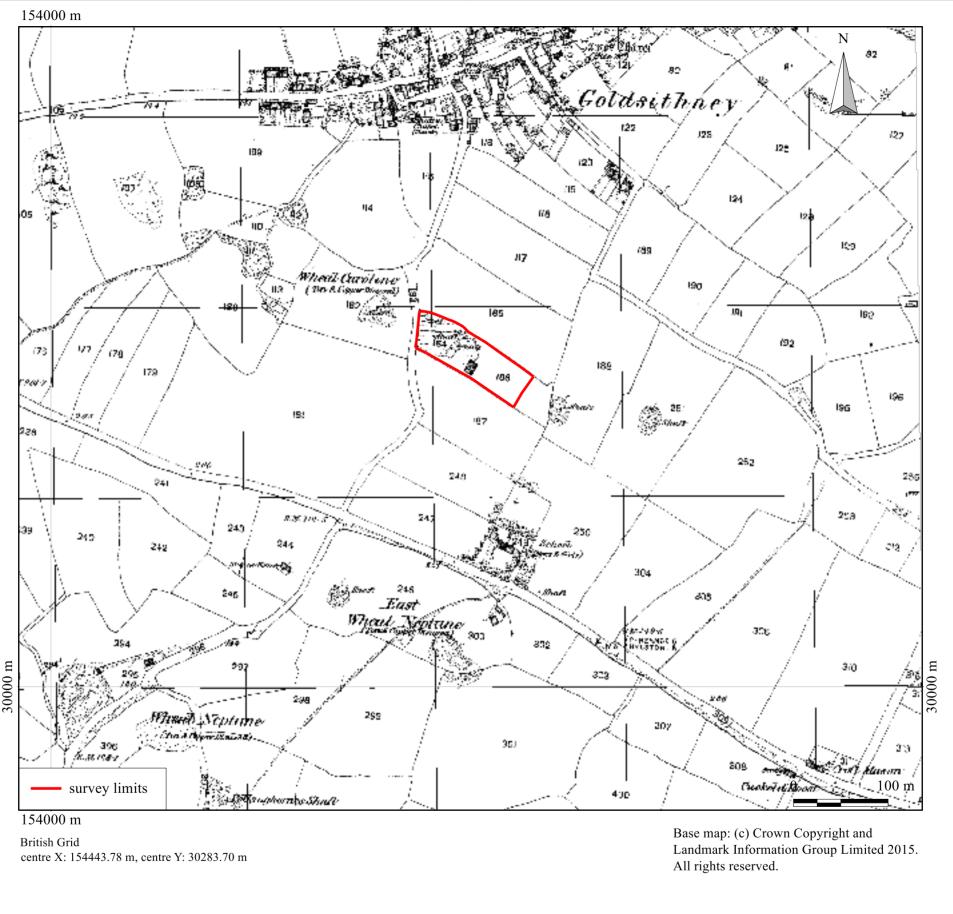


Figure 1: location map



Scale: 1:4000 @ A3. Spatial Units: Meter. Do not scale off this drawing

An archaeological gradiometer survey Land at Sanctuary, Goldsithney Perranuthnoe, Cornwall Centred on NGR (E/N) 154443,30355 (point) Report: 1508SAN-R-2

Figure 2: Ordnance Survey Cornwall & Isles of Scilly, 1877-78 1:2,500

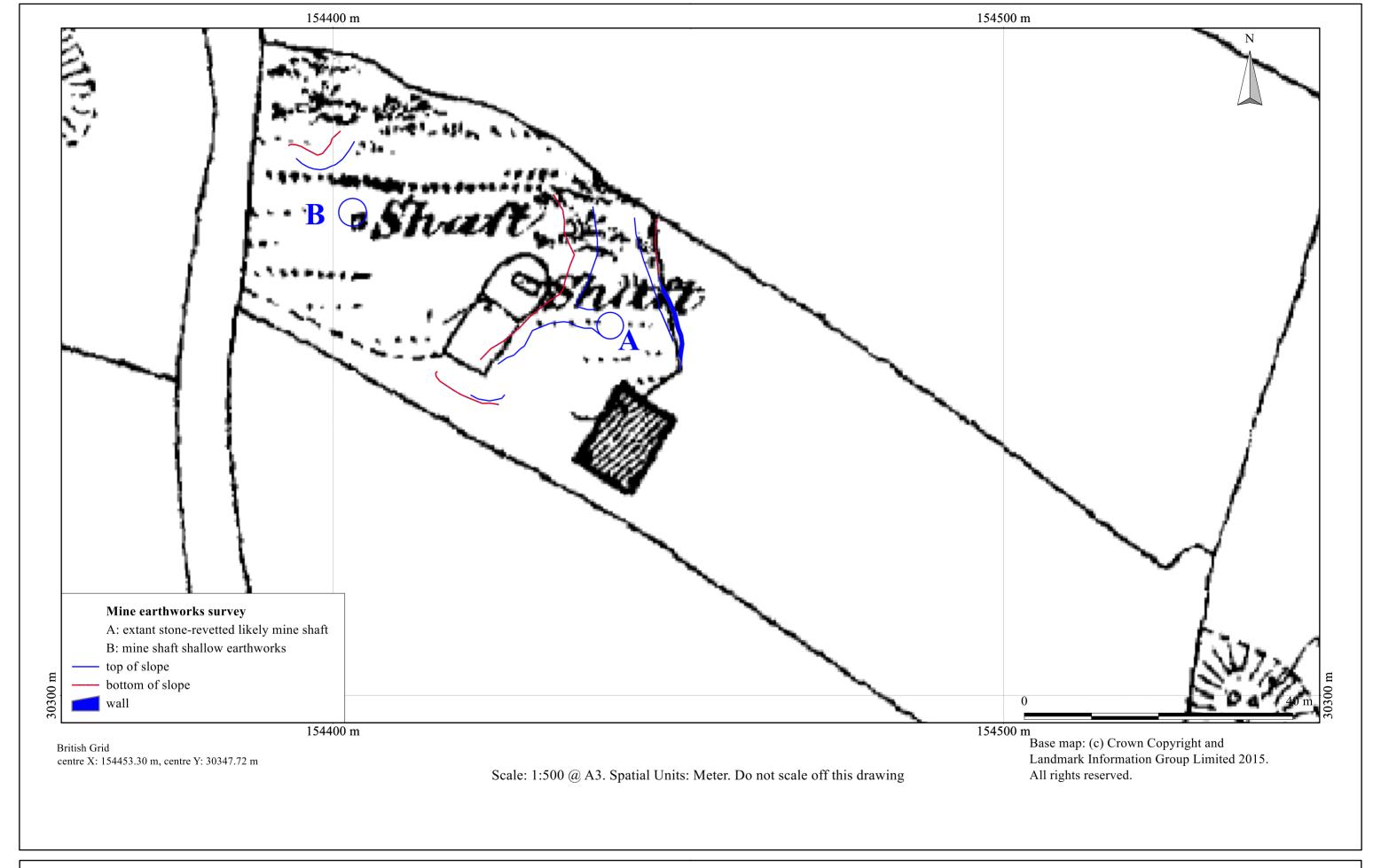


Figure 3: Mine earthworks survey over Ordnance Survey Cornwall & Isles of Scilly, 1877-78 1:2,500

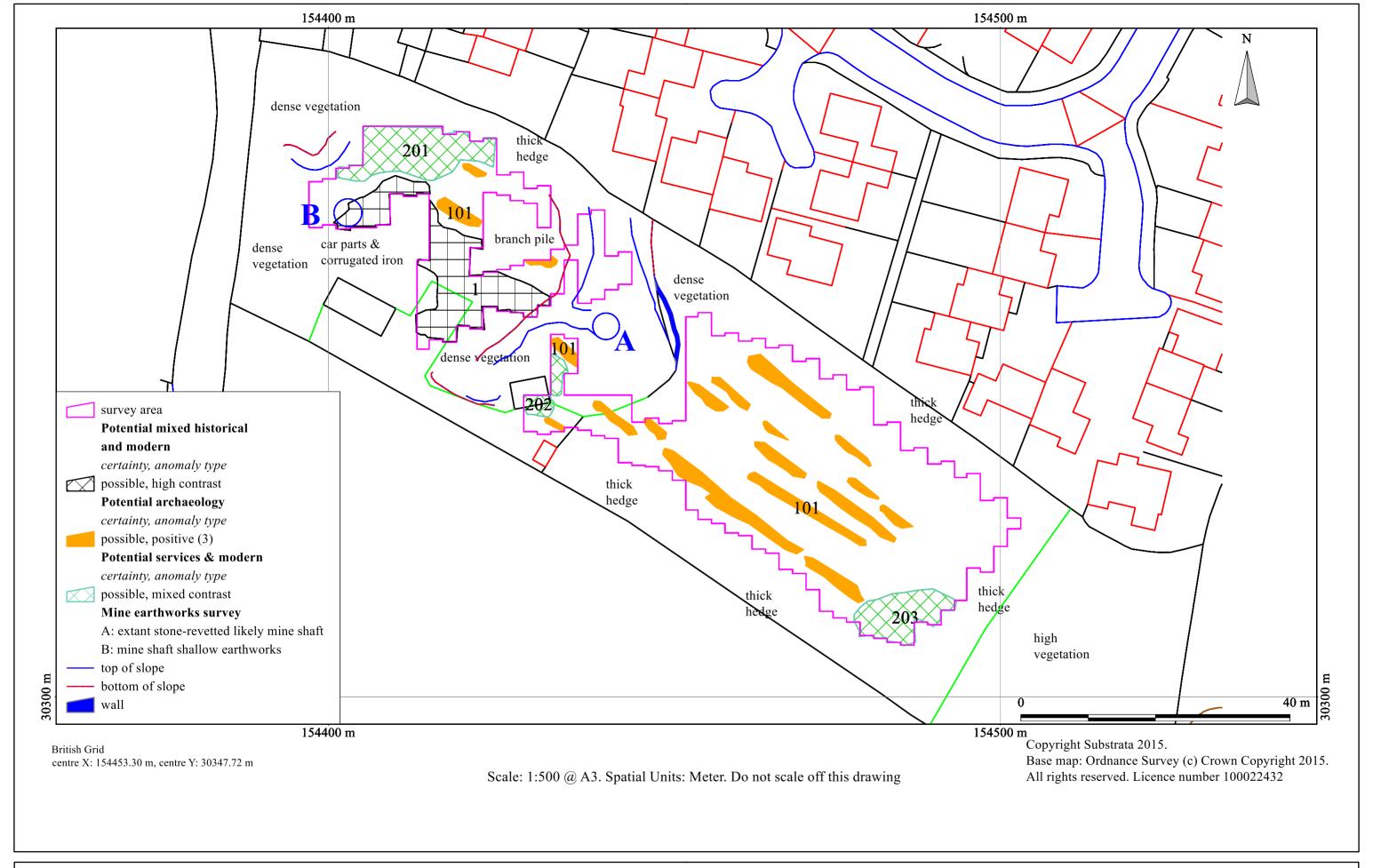


Figure 4: survey interpretation with mine earthworks survey over modern Ordnance Survey map

Site:

An archaeological gradiometer survey Land at Sanctuary, Goldsithney Perranuthnoe, Cornwall Centred on NGR (E/N) 154443,30355 (point) Report: 1508SAN-R-2

anomaly	anomaly characterisation	anomaly form	additional archaeological	comments
group	certainty & class		characterisation	
1	possible, high contrast	irregular	mixed, disturbed rubble and ferrous material	anomaly groups are most likely to represent disturbed ground and a mix of ferrous-rich materials, rubble and
				other materials resulting from both recent activities and historical mining activity
101	possible, positive	parallel linear deposits	remnant ploughing, possibly ridge-and-furrow	
201	possible, mixed contrast	irregular	modern interference	a magnetic response to nearby extant buildings, boundaries and recent materials deposited in the survey area
202	possible, mixed contrast	irregular	modern interference	a magnetic response to nearby extant buildings, boundaries and recent materials deposited in the survey area
203	possible, mixed contrast	irregular	modern interference	a magnetic response to nearby extant buildings, boundaries and recent materials deposited in the survey area

Table 1: data analysis

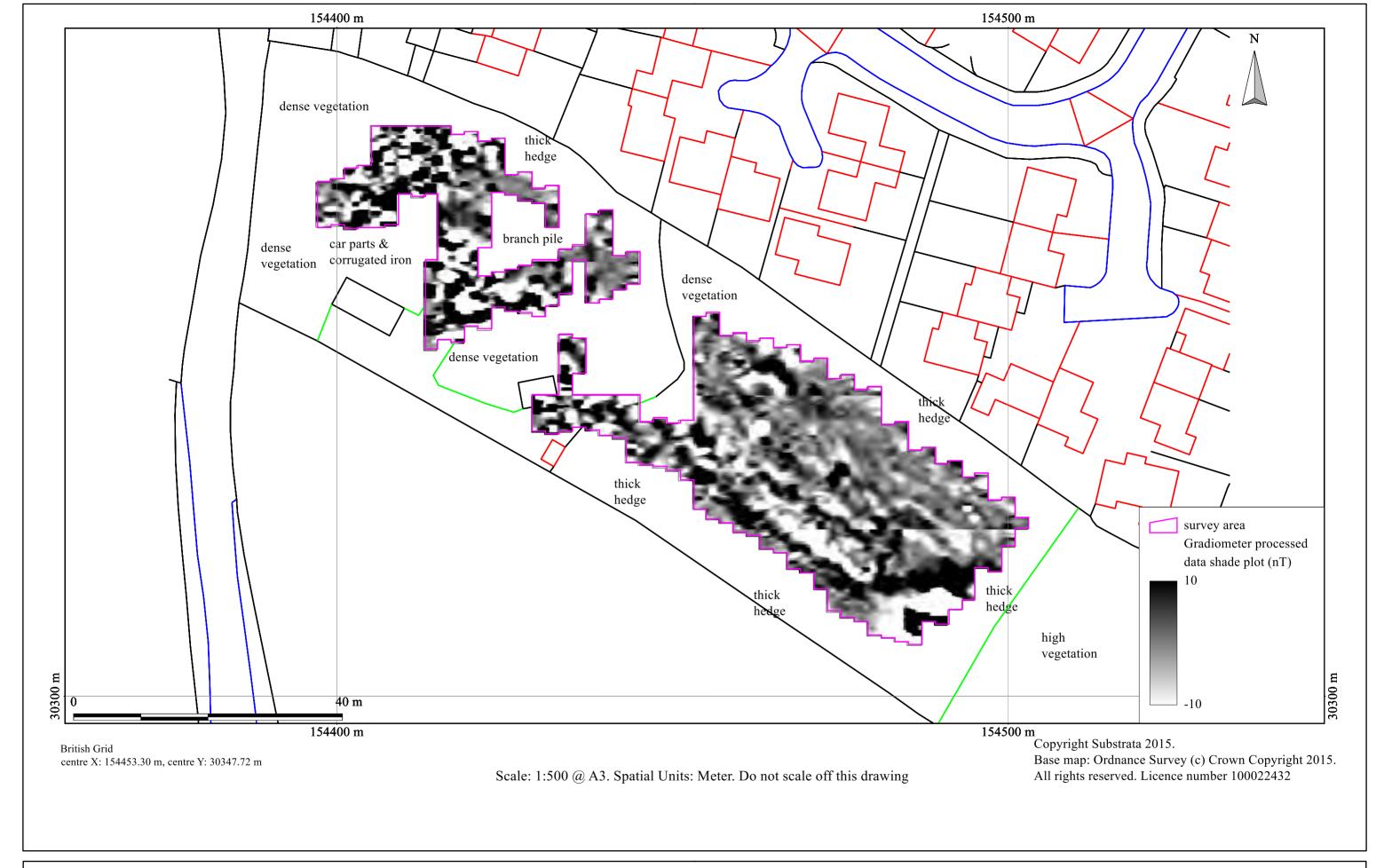


Figure 5: shade plot of processed data

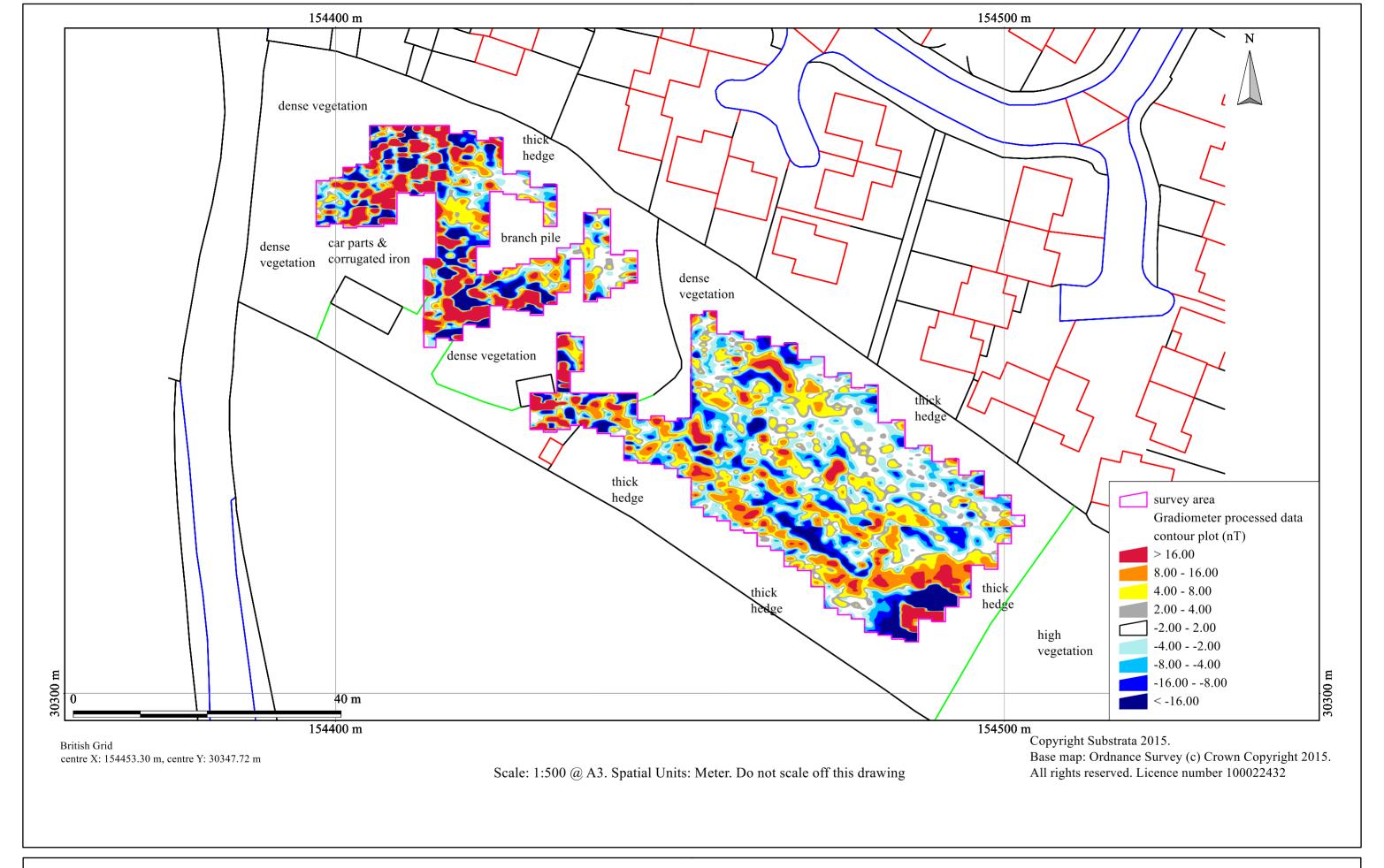


Figure 6: contour plot of processed data

Appendix 2 Plates



Plate 1: Location A, (Figures 2 and 3), a stone revetted likely mine shaft (scale: 2m GPS pole)

Appendix 3 Methodology Summary

Table 2: methodology summary

Documents

Survey methodology statement: Dean (2015)

Methodology

- 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.

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: 0.25-metres Traverse Interval: 1 metre Traverse Method: zigzag Traverse Orientation: GN

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

Appendix 4 Data processing

Table 3: gradiometer survey - processed data metadata

SITE

Instrument Type: Bartington Grad 601

Units: Direction of 1st Traverse: 0 deg Collection Method:

ZigZag 2 @ 1.00 m spacing. 32702 Sensors:

Dummy Value:

PROGRAM

TerraSurveyor Name: 3.0.25.0 Version:

Stats

Max: 115.36 Min: -61.52 Std Dev: 14.61 Mean: 0.46 Median: 0.00

Processes: 6

- 1 Base Layer
- Clip at 1.00 SD
- 3 Clip at 1.00 SD
- 4 Clip at 1.00 SD
 5 De Stagger: Grids: All Mode: Both By: -2 intervals
 6 DeStripe Median Traverse: Grids: All

Note: converting the gradiometer data into ESRI GIS files imposed an x=y interpolation on the entire dataset