Substrata
Archaeological Geophysical Surveyors

An archaeological gradiometer survey,
earth resistance survey and archaeological appraisal

Land at Portledge House, Fairy Cross, Bideford, Devon

Ordnance Survey (E/N): 239424,124779 (point)

Report: 140227

Ross Dean BSc MSc MA MIfA
27 January 2014

Substrata
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Accompanying CD-ROM

1 Description and summary

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

Location

Site:	Land at Portledge House, Fairy Cross
Civil Parish:	Alwington
District:	Torridge
County:	Devon
Nearest Postcode:	EX39 5BX
NGR:	SS 394 247 (point)
Ordnance Survey E/N:	239424,124779 (point)
Planning references:	Torridge District Council 1/0069/2014/FUL & 1/0070/2014/LBC
OASIS number:	substrat1-172829
Archive:	At the time of writing, the archive of this survey will be held by Substrata.

Programme of work
Archaeological appraisal by AC Archaeology Ltd (section 5 of this report)
Archaeological geophysical surveys by Substrata:
Type of survey: twin-sensor fluxgate gradiometer & twin probe earth resistance
Date of survey: 21 February 2014
Area surveyed: 0.12ha plus a second area not the subject of the planning application below of 0.06ha
Lead surveyor: Ross Dean BSc MSc MA MIfA

Introduction
This report was prepared during February 2014 by Substrata and AC archaeology. It represents the results of a geophysical survey and archaeological appraisal, produced in support of a planning application for a proposed development at the above site. The development is proposed within the grounds of a Grade II* Listed Building and the locality of two others of Grade II status.

The results of the archaeological appraisal are presented in section 5.

Magnetic (gradiometer) and earth resistance surveys were completed across two areas in the grounds of Portledge House as shown in Figure 1. Area 1 is the subject of the planning application and the archaeological appraisal presented in section 5. Area 2 was of interest to the client. In environments where building remains are likely and the ground is likely to have been disturbed, a combination of magnetic and earth resistance surveys provides a better understanding of potential archaeological deposits and structures.

Summary
The archaeological appraisal has established the potential for medieval archaeology on the site.

The magnetic and resistance contrasts across the survey areas were sufficient to be able to differentiate between anomalies representing possible archaeological features and background responses.

Area 1:
A total of six anomaly groups were identified as relating to potential archaeology. Of these, two coinciding magnetic and resistance groups may represent a former ditch or drainage channel. The remaining anomalies are thought to relate to relatively recent activities.

Area 2:
A total of five anomaly groups were identified as relating to potential archaeology. Of these, two coinciding magnetic and resistance groups and one resistance group may represent linear

deposits such as former ditches, drainage channels or track edges. One anomaly group may represent a stone or stone-filled pit. One anomaly group coincides exactly with an area of gravel.

2 Aims and objectives

The scope of the study followed the guidance of Anne Dick, archaeology officer for Devon County Council, and included a geophysical survey and archaeological appraisal of the site.

Survey aims

1. Define and characterise and detectable archaeological remains on the site.
2. Inform any future archaeological investigation of the area.

Survey Objectives

1. Complete a gradiometer 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 site about the location and possible archaeological character of the recorded anomalies.

3 Standards

The standards used to complete the survey are defined by the Institute for Archaeologists (2011). The codes of approved practice that were followed are those of the Institute for Archaeologists (2008 and 2009) and Archaeology Data Service/Digital Antiquity Guides (undated). The document text was written using the house style of the Institute for Archaeologists (Institute for Archaeologists, undated).

4 Site description

Land use

The geophysical survey areas were situated on two plots within the grounds of Portledge House (figures 1 and 6). Area 1, a wooded plot with mature trees, is the subject of the planning application and the archaeological assessment provided in section 5 below. Area 2, a lawn at the rear of Portledge House and adjacent to the former front house entrance, was of interest to the client.

Geology

The site is located on an unconformable solid geology boundary between rocks of the Permian Exeter Group to the south and rocks of the Carboniferous Bude Formation to the north.

The component formations of the Exeter Group are predominantly breccia, with subordinate sandstone. All formations are alluvial fan deposits. The Bude Formation comprises Grey thick-bedded, somewhat argillaceous and silty sandstones, in laterally discontinuous internally massive beds 1-5m thick and commonly amalgamated into units up to 10m thick. When weathered the sandstones become buff and friable. Very thick beds of slumped and destratified strata are also present. Grey mudstones occur as interbeds up to 1m thick but locally packets of darker mudstone up to 20m thick with thin ironstone beds and bundles of thin sandstones are present, especially in the upper part of the Formation. Five named beds of black sulphurous "shales" with goniatite-bearing calcareous nodules occur within the Formation. Thin units of thin- to medium-bedded siltstones with Xithosurid trails are also present (British Geological Survey, undated).

The superficial geology is not recorded in the source used (British Geological Survey, undated).

5 Archaeological assessment; historical and archaeological background

5.1 The development site and associated buildings have been subject to several recent detailed heritage planning and significance assessments (DMA Heritage 2014a, b, c). These have confirmed the significance of Portledge which is a substantial stone-built country house of double courtyard with the remnants of a medieval hall, of relatively modest proportions in the central part of the building.

5.2 There are four designated heritage assets in proximity to the proposed development site. As well as the country house there is a Grade II listed stone granary to the northwest of the house, of probable early 19th century date, and to the west of this a Grade II listed stone and cob former cartshed and stable of possible mid to late 16th century date. To the northeast of the house is a Grade II listed sundial.

5.3 Non-designated heritage assets in proximity to the study area as revealed by data from the Devon HER for the most part relate to aspects of the standing estate buildings and furniture. Archaeological features noted are a field boundary of possible medieval date to the south of the house (Devon HER reference no. MDV102308), a ditch of unknown date to the east of the house (MDV102311), linear earthworks of former field boundaries which may date back to the medieval period to the northeast of the house (MDV102312) and two oval-shaped earthworks of unknown date or function in Kennel Copse to the northwest of the house (MDV102312, MDV102313).

5.4 The historic map evidence (see DMA Heritage 2014b) shows that the site of the swimming pool was not developed in the 1769 Estate Plan, or the 1840 Tithe Map the apportionment for which lists the area as part of the mansion and barton farm. The Tithe Map does show a building attached running at right angles to the northwest wing, and a smaller building, though detached is shown in the OS map 1st edition 1885, and no longer exists. All later OS mapping is consistent in that the site of the swimming pool is not developed.

5.5 Two watercolours by Edmund Prideaux dated to 1716 show that the formal gardens are to the east of the house (Gray 2013). This is confirmed by the 1840 Tithe Map whose apportionment marks the eastern garden the ‘Flower Garden’, and the area to the east of the wall adjacent and east of the proposed development site as the walled garden. It appears from Prideaux’s paintings that the house faced south at that time.

6 Results, discussion and conclusions

This survey was designed to record magnetic and earth resistance 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 attempts to identify and characterise anomalies and anomaly groups that may pertain to archaeological deposits and structures.

The reader is referred to section 7.

6.1 Results

Figure 1 (this section) shows the interpretation of the survey across all survey areas including the anomaly groups identified as pertaining to archaeological deposits along with their numbers. Table 1 is an extract from a detailed analysis of the survey data provided in the attribute tables of the GIS project on the accompanying CD-ROM.

Only those anomaly groups considered to be associated with archaeological deposits or features are recorded in figure 1 and table 1.

Figure 1 and table 1 comprise the analysis of the survey data.

Plots of the processed data are provided in figures 2 to 5 (appendix 1).

Site: An archaeological gradiometer survey
Land at Portledge House, Fairy Cross, Bideford, Devon
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area	anomaly group	associated anomalies	anomaly characterisation certainty & class	anomaly form	additional archaeological characterisation	comments
1	1		possible mixed spread	irregular	archaeological deposit, recent rubble or near-surface bedrock	a group of mixed anomalies of medium contrast with a scatter of extreme contrast anomalies indicative of relatively recent ferrous material: probably a relatively recent fill or rubble dump
	2	101	possible positive	linear		anomaly group coincides with resistance anomaly group 101
	101	1	possible low	linear		anomaly group coincides with magnetic anomaly group 1
	102		possible high	linear		
	103	104	possible low	linear		anomaly group alignment may coincide with a drain noted by the survey team as emerging at the base of a slope in the southeast corner of the survey area
	104	103	possible high	linear		anomaly group alignment may coincide with a drain noted by the survey team as emerging at the base of a slope in the southeast corner of the survey area
2	3	107	possible positive	linear		anomaly group coincides with resistance anomaly group 107
	105		possible low	multilinear		
	106		possible high	oval	stone or stone-filled pit	
	107	3	possible low	linear		anomaly group coincides with magnetic anomaly 3
	108		possible low			anomaly group coincides with an area of gravel

Table 1: data analysis

239400 m

124800 m

N

1

area 1

103

102

101

2

104

Swimming Pool

Issue

area 2

105

3

108

106

107

SD

0

20 m

Potential archaeology: gradiometer survey

certainty, anomaly type

possible positive

possible mixed spread

gradiometer survey area

Potential archaeology: resistance survey

certainty, anomaly type

possible high

possible low

resistance survey area

239400 m

British Grid
centre X: 239430.16 m, centre Y: 124766.77 m

Scale: 1:300 @ A3. Spatial Units: Meter. Do not scale off this drawing

Notes:

1. All interpretations are provisional and represent potential archaeological deposits.
2. Anomalies designated "likely archaeology" have supporting evidence e.g. historical maps and or visible earthworks.
3. Anomalies likely to represent geological or other natural deposits are not mapped unless relevant to potential archaeological events or deposit

An archaeological gradiometer survey
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Figure 1: survey interpretation

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6.2 Discussion

Refer to figures 1 (this section) and 2 to 5 (appendix 1).

Not all anomalies or anomaly groups identified in the survey dataset are necessarily discussed below. All identified anomaly groups are recorded in the GIS project on the accompanying CD-ROM. Those anomaly groups possibly representing archaeological deposits are included in data analysis table 1.

General points
Any anomaly trends visible in the data not discussed below are likely to relate to relatively recent activities or natural deposits.

Data relating to historical maps and other records
No data relating to historical maps and other records was recorded in the dataset.

Data with no previous provenance
Area 1
Magnetic anomaly group **1** most probably relates to disturbed ground and relatively recent deposits of rubble and other material. The group includes anomalies relating to ferrous materials such as iron and steel which occur most frequently on the eastern side of the anomaly group. Resistance anomaly groups **102 to 104** coincide with this area of ferrous materials and it is reasonable to conclude that this pattern of anomalies relates to the construction of a drain or similar structure. The end of a working drain was noted by the surveying team to the south of anomaly group 104 at the base of sloping ground.

Magnetic anomaly group **2** and resistance anomaly group **101** coincide. Typically such anomalies represent deposits associated with former ditches or drainage channels.

Area 2
Magnetic group **3** and resistance group **107** coincide. Typically such anomalies represent deposits associated with former ditches, drainage channels or track edges. Group **105** has similar characteristics.

Group **106** may represent a stone or a stone or gravel-filled pit.

Group **107** corresponds exactly to an area of gravel and is likely to represent this but the possibility of an archaeological deposit cannot be entirely ruled out.

6.3 Conclusions

The magnetic and resistance contrasts across the survey areas were sufficient to be able to differentiate between anomalies representing possible archaeological features and background responses.

Area 1
A total of six anomaly groups were identified as relating to potential archaeology. Of these, two coinciding magnetic and resistance groups may represent a former ditch or drainage channel. The remaining anomalies are thought to relate to relatively recent activities.

Area 2
A total of five anomaly groups were identified as relating to potential archaeology. Of these, two coinciding magnetic and resistance groups and one resistance group may represent linear deposits such as former ditches, drainage channels or track edges. One anomaly group may represent a stone or stone-filled pit. One anomaly group coincides exactly with an area of gravel.

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

9 Bibliography

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Appendix 1 Supporting plots

General Guidance

The anomalies represented in the survey plots provided in this appendix are magnetic anomalies. The apparent size of such anomalies and anomaly patterns are unlikely to correspond exactly with the dimensions of any associated archaeological features.

A rough rule for interpreting magnetic anomalies is that the width of an anomaly at half its maximum reading is equal to the width of the buried feature, or its depth if this is greater (Clark, 2000: 83). Caution must be applied when using this rule as it depends on the anomalies being clearly identifiable and distinct from adjacent anomalies. In northern latitudes the position of the maximum of a magnetic anomaly will be displaced slightly to the south of any associated physical feature.

A rough rule for interpreting resistance anomalies is that if an x-y trace is drawn of the resistance over an anomaly, then the width of an anomaly at half its maximum height is equal to the width of the buried feature. Caution must be applied when using this rule as it depends on the anomalies being clearly identifiable and distinct from adjacent anomalies and it should be noted that the relationship between change in resistance response and depth is not linear (Gaffney and Gater, 2003: 112).

239400 m

124800 m

124800 m

N

area 1

Swimming Pool

Issue

area 2

SD

0

20 m

Gradiometer processed data contour plot

nT

- > 16.00
- 2.00 - 4.00
- 4.00 - 8.00
- 8.00 - 16.00
- -2.00 - 2.00
- -4.00 - -2.00
- -8.00 - -4.00
- -16.00 - -8.00
- < -16.00

239400 m

British Grid
centre X: 239430.16 m, centre Y: 124766.77 m

Scale: 1:300 @ A3. Spatial Units: Meter. Do not scale off this drawing

An archaeological gradiometer survey
Land at Portledge House, Fairy Cross, Bideford, Devon
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Figure 2: contour plot of processed gradiometer data

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239400 m

124800 m

124800 m

N

area 1

Swimming Pool

Issue

area 2

SD

0

20 m

Gradiometer processed data shade: area 1
nT
55
-55

Gradiometer processed data shade: area 2
nT
20
-15

239400 m

British Grid
centre X: 239430.16 m, centre Y: 124766.77 m

Scale: 1:300 @ A3. Spatial Units: Meter. Do not scale off this drawing

An archaeological gradiometer survey
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Figure 3: shade plot of processed gradiometer data

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239400 m

124800 m

124800 m

N

area 1

Swimming Pool

Issue

area 2

SD

Resistance processed data contour
Resistance data (ohms) normalised to a near-zero mean

- > 8.00
- 4.00 - 8.00
- 2.00 - 4.00
- 1.00 - 2.00
- -1.00 - 1.00
- -2.00 - -1.00
- -4.00 - -2.00
- -8.00 - -4.00
- < -8.00

0 20 m

239400 m

British Grid
centre X: 239430.16 m, centre Y: 124766.77 m

Scale: 1:300 @ A3. Spatial Units: Meter. Do not scale off this drawing

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

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239400 m

124800 m

124800 m

N

area 1

Swimming Pool

Issue

area 2

SD

0

20 m

Resistance processed data shade: area 1
resistance data (ohms) normalised
to a near-zero mean
1

-3

Resistance processed data shade: area 2
resistance data (ohms) normalised
to a near-zero mean
15

-15

239400 m

British Grid
centre X: 239430.16 m, centre Y: 124766.77 m

Scale: 1:300 @ A3. Spatial Units: Meter. Do not scale off this drawing

An archaeological gradiometer survey
Land at Portledge House, Fairy Cross, Bideford, Devon
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Figure 5: shade plot of processed resistance data

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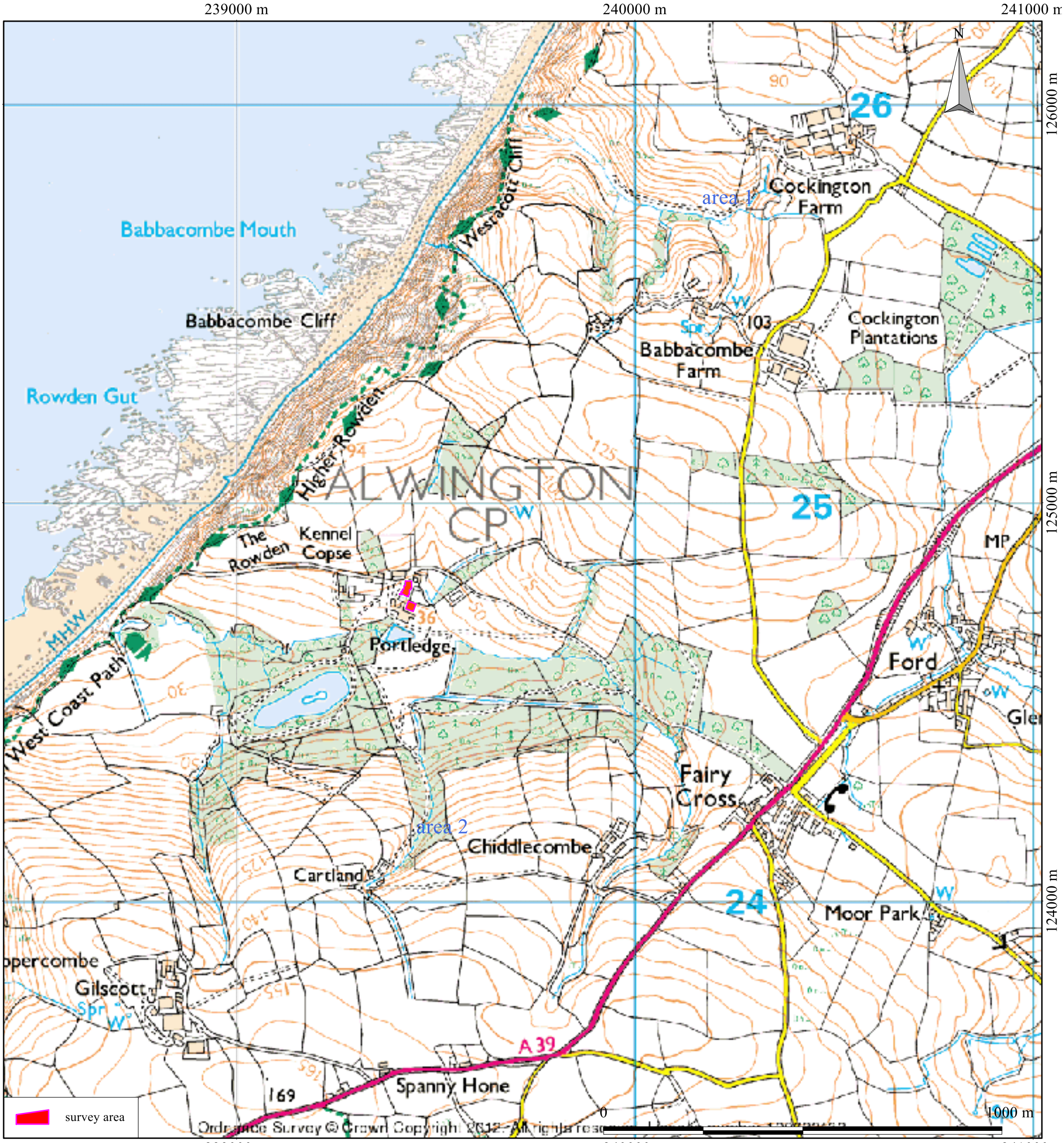

British Grid
centre X: 239718.53 m, centre Y: 124806.78 m

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

An archaeological gradiometer survey
Land at Portledge House, Fairy Cross, Bideford, Devon
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Figure 6: location map

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Appendix 2 Methodology Summary

<table>
<tr><th colspan="2">Table 2: methodology summary</th></tr>
<tr><td colspan="2">Documents
DMA Heritage, 2014a, 2014b and 2014c
Survey methodology statement: Dean (2014)</td></tr>
<tr><td colspan="2">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 Institute for Archaeologists (2011) 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.</td></tr>
<tr><td colspan="2">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.</td></tr>
<tr><td>Equipment
Instrument: Bartington Instruments grad601-2
Firmware: version 6.1

Instrument: Geoscan Research RM15/MPX15 twin probes
Firmware: RM15 Adv. 30000 Version 2.00</td><td>Data Capture
Sample Interval: 0.25-metres
Traverse Interval: 1 metre
Traverse Method: zigzag
Traverse Orientation: GN

Sample Interval: 1 metre
Traverse Interval: 1 metre
Traverse Method: zig-zag
Traverse Orientation: north</td></tr>
<tr><td colspan="2">Data Processing, Analysis and Presentation Software
DW Consulting TerraSurveyor3
Manifold System 8
Microsoft Corp. Office Publisher 2013.</td></tr>
</table>

Appendix 3 Data processing

Table 3: gradiometer survey - processed data metadata

SITE
Instrument Type: Bartington Grad 610
Units: nT
Direction of 1st Traverse: 0 deg
Collection Method: ZigZag
Sensors: 2 @ 1.00 m spacing.
Dummy Value: 32702

PROGRAM
Name: TerraSurveyor
Version: 3.0.22.1

Area 1 Stats Max: 56.10 Min: -55.71 Std Dev: 35.75 Mean: -0.34 Median: 0.00	Processes: 7 1 Base Layer 2 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 Sensors: All 7 Clip at 1.00 SD Note: exporting the processed data from TerraSurveyor into Manifold GIS for analysis imposes an 'x matches y' interpolation on the data which is reflected in the processed data figures.
Area 2 Stats Max: 20.56 Min: -31.75 Std Dev: 11.97 Mean: 1.65 Median: 0.00	Processes: 5 1 Base Layer 2 Clip at 1.00 SD 3 Clip from -22.00 to 28.41 nT 4 De Stagger: Grids: All Mode: Both By: -2 intervals 5 DeStripe Median Sensors: All Note: exporting the processed data from TerraSurveyor into Manifold GIS for analysis imposes an 'x matches y' interpolation on the data which is reflected in the processed data figures.

Table 4: earth resistance survey - processed data metadata

SITE
Instrument Type: Research Machines RM15
Units: ohms
Direction of 1st Traverse: 0 deg
Collection Method: ZigZag
Sensors: 2 @ 0.50 m spacing.
Dummy Value: 32702

PROGRAM
Name: TerraSurveyor
Version: 3.0.22.1

Area 1 Stats Max: 10.96 Min: -12.70 Std Dev: 2.56 Mean: 0.04 Median: -0.03	Processes: 6 1 Base Layer 2 Move (Area: Top 17, Left 32, Bottom 19, Right 39) to X -12, Y 0 3 Move (Area: Top 29, Left 0, Bottom 40, Right 4) to X 15, Y 0 4 Despike Threshold: 1 Window size: 3x3 5 High pass Gaussian filter: Window: 21 x 21 6 Interpolate: X & Y Doubled. Note: exporting the processed data from TerraSurveyor into Manifold GIS for analysis imposes an 'x matches y' interpolation on the data which is reflected in the processed data figures.
Area 2 Stats Max: 28.08 Min: -20.98 Std Dev: 7.55 Mean: -1.14 Median: -1.90	Processes: 3 1 Base Layer 2 Despike Threshold: 1 Window size: 3x3 3 High pass Gaussian filter: Window: 21 x 21 Note: exporting the processed data from TerraSurveyor into Manifold GIS for analysis imposes an 'x matches y' interpolation on the data which is reflected in the processed data figures.

Appendix 4 Geophysical surveying techniques

1 Introduction

Substrata offers magnetometer and earth resistance surveying. We also provide other archaeology-specific geophysical surveys such as ground penetrating radar and resistivity. The particular method or combination of methods used depends on local soil conditions and the survey requirements. These methods are capable of delivering fast and accurate assessments of the archaeology of both large and small sites.

Further details can be found on our website at www.substrata.co.uk.

2 Magnetometer surveying

Standard magnetometer surveys are the workhorse of archaeological surveying when speed and cost-effectiveness are important. Identifiable archaeological features include areas of occupation, hearths, kilns, furnaces, ditches, pits, post-holes, ridge-and-furrow, timber structures, wall footings, roads, tracks and similar buried features.

Magnetometer surveying is used to detect and map small changes in the earth's magnetic field caused by concentrations of ferrous-based minerals within the soil and subsoil, and by materials buried beneath the surface. While most of these changes are too small to affect a compass needle, they can be detected and mapped by sensitive field equipment. During surveys the different magnetic properties of top-soils, sub-soils, rock formations and archaeological features are recorded as variations against a background value. Subsequently magnetic anomalies resulting from potential archaeology can be identified and interpreted.

Bartington grad601-2 gradiometers

A gradiometer is a type of magnetometer and is sensitive to relatively small changes in the earth's magnetic field. Our primary surveying instruments are Bartington Grad601-2 (dual sensor) fluxgate gradiometers with automatic data loggers. They are specifically designed for field use by archaeologists. The Bartington gradiometers provide proven technology in archaeological magnetic surveying and offer fast, accurate set-up and survey rates. They are sensitive to depths of between 0 and 1.5m below ground level, with optimum sensitivity at depths of 1m or less.

Multiple sensor arrays

A technique relatively new to commercial archaeological surveying but well understood in academic circles involves the use of multiple magnetometer sensors towed behind a quad bike or similar vehicle. With multiple sensors and the use of on-board GPS units, it is possible to achieve faster survey rates at competitive commercial rates when compared to the use of multiple instruments and the techniques discussed above provided the ground is suitable for the vehicle and array. Substrata is pleased to announce that we now offer this service on suitable larger sites

3 Earth resistance surveying

Earth resistance surveying is an excellent tool for detecting buried archaeology. Its relatively slow rate of survey compared to magnetometer surveys means that it usually employed in commercial surveys when a detailed understanding of buried building remains is required. This technique measures changes in the electrical resistance of the ground being surveyed. In practice, the recording of differences in the electrical resistance of near-surface deposits and structures allows the detection and interpretation of masonry and brick foundations, paving and floors, drains and other cavities, large pits, building platforms, robber trenches, ditches, graves and similar buried features.

Resistance to electrical current flow in the ground depends on the moisture content and structure of the soil and other materials buried beneath the surface. For example, the higher the moisture content of a soil, the less resistant it is to electrical current flow. A ditch completely buried beneath the present ground surface is likely to have an infill soil different to that surrounding the ditch in terms of compactness and composition. As a result, the soil filling the buried ditch will retain moisture in a different way to the surrounding soil which means it will

have an electrical resistance at variance with the surrounding environment. By passing a small current through the ground it is possible to detect, record, plot and interpret such changes in electrical resistance.

For earth resistance surveying Substrata uses the Geoscan Research RM15 series multi-probe resistance meters and purpose-built automatic data-loggers. The Geoscan MPX15 multiplexer is an integral part to the instrument configuration and facilitates multi-probe arrays which speed up survey area coverage rates and, if required, facilitate simultaneous multiple-depth data collection.