Substrata
Archaeological Geophysical Surveyors

An archaeological gradiometer survey

Land at Blackhorse, Clyst Honiton East Devon

Ordnance Survey (E/N): 298120,93500 (point)

Report: 141211

Ross Dean BSc MSc MA MIfA

8 January 2015

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

1 Survey description and summary

1.1 Survey

Type:	twin-sensor fluxgate gradiometer
Date:	26 November2014
Area:	1ha
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 Blackhorse
Village & Civil Parish:	Clyst Honiton
District:	East Devon
County:	Devon
Nearest Postcode:	EX5 2AP
NGR:	SX 98120 93500
Ordnance Survey E/N:	298120,93500 (point)

1.4 Archive

OASIS number:	substrat1-199435
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 as part of a forthcoming planning application. The location of the proposed development area 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. Only one magnetic anomaly group was identified as possibly representing an archaeological deposit but it is more likely to represent a service trench or relatively recent ground disturbance. Although there was a great deal of interference to the data from surrounding buildings and recent ground disturbance, it was clear from the recorded data that the area is unlikely to contain other archaeological deposits.

2 Survey aims and objectives

2.1 Aims

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

2.2 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 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

4.1 Landscape and land use

The application area is situated within the village of Clyst Honiton on flat ground bounded by Blackhorse Lane to the north, a housing estate to the west, Honiton Road to the south and open ground to the east. Two houses and a Public House lie to the south of the application area on the eastern side as shown in Figure 1.

4.2 Geology

The application area is located on a solid geology of the Permian Dawlish Sandstone Formation. The rocks are reddish brown sands and sandstones, cross-bedded, with intercalated thin lenses and beds of breccia and mudstone. The superficial geology is not recorded in the source used (British Geological Survey, undated).

5 Archaeological background

5.1 Historical Landscape Characterisation

'Modern settlement': this is an area of modern settlement that was developed during the twentieth century (Devon County Council, undated).

5.2 Heritage Assets within the Application Area

There are no heritage assets within the application area.

5.3 Heritage Assets within 250m of the Application Area (English Heritage, undated)

A number of heritage assets were uncovered during the A30 Honiton to Exeter road improvement to the south of the application area. Within 250m of the site two Prehistoric (698000 BC to 42 AD) struck flints (Devon County Council Historic Environment Record (DCCHER) MDV60914) and one Medieval to Post Medieval (11th century to 1750 AD) stoneware pottery sherd (MDV60915) were recorded.

An ovate Prehistoric hand axe with the lower part broken off and probably Acheulian or Mousterian in age was found on the ground surface during ploughing at Jackets to the south of the application area. It is thought to have originated from nearby river gravels.

A Prehistoric enclosure was identified as a cropmark in 1987 to the south of the application area. It was tested by trial excavation during the excavations carried out in 1996-8 but not successfully elucidated and was destroyed by road construction.

Jackets Farmstead, a holding of approximately 16 acres, was in existence by 1620 with the date of origin is not known. The buildings were still in existence in 1839 (Sowton Tithe Map) but had disappeared by 1888.

During World War 2 a searchlight canopy was sited to the southeast of the application area.

Some foundations, remnants and out houses of the Black Horse Inn, recorded in 1650 AD, remain to the east of the application area.

5.4 Previous Fieldwork within 250m of the Application Area

EDV4246 - Land at Redhayes, Sowton, Exeter
EDV4774 - Historic Airport Survey, Exeter Airport
EDV4887 - Assessment Two Areas of Highway to the East of Exeter

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 reader is referred to section 7.

6.1 Results

Figure 1 shows the interpretation of the survey data. It includes the anomaly group identified as relating to archaeological deposits along with its number. A detailed analysis of the survey data is provided in the attribute tables of the GIS project on the accompanying CD-ROM.

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

6.2 Discussion

General points

Anomalies though 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 field edges was restricted as shown in Figures 1 to 3 due to the presence of magnetic materials in and adjacent to the field boundaries. Strong magnetic responses mapped close to the field boundaries are likely to relate to these materials except where indicated otherwise in Figure 1.

Data relating to historical maps and other records

No magnetic anomaly groups coincided with features recorded on historical maps.

Data with no previous archaeological provenance

Only one magnetic anomaly group (group 1, Figure 2) was identified as possibly representing an archaeological deposit but it is more likely to represent a service trench or possibly ground disturbed by relatively recent cultivation.

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. Only one magnetic anomaly group was identified as possibly representing an archaeological deposit but it is more likely to represent a service trench or relatively recent ground disturbance. Although there was a great deal of interference to the data from surrounding buildings and recent ground disturbance, it was clear from the recorded data that the area is unlikely to contain other archaeological deposits.

7 Disclaimer and copyright

The description and discussion of the results presented in this report are the authors, based on his interpretation of the survey data. Every effort has been made to provide accurate descriptions and interpretations of the geophysical data set. The nature of archaeological geophysical surveying is such that interpretations based on geophysical data, while informative, can only be provisional. Geophysical surveys are a cost-effective early step in the multi-phase process that is archaeology. The evaluation programme of which this survey is part may also be informed by other archaeological assessment work and analysis. It must be presumed that more archaeological features will be evaluated than those specified in this report.

8 Acknowledgements

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

9 Bibliography

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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: 298089.64 m, centre Y: 93482.59 m

Scale: 1:2000 @ A3. Spatial Units: Meter. Do not scale off this drawing

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Figure 1: location map

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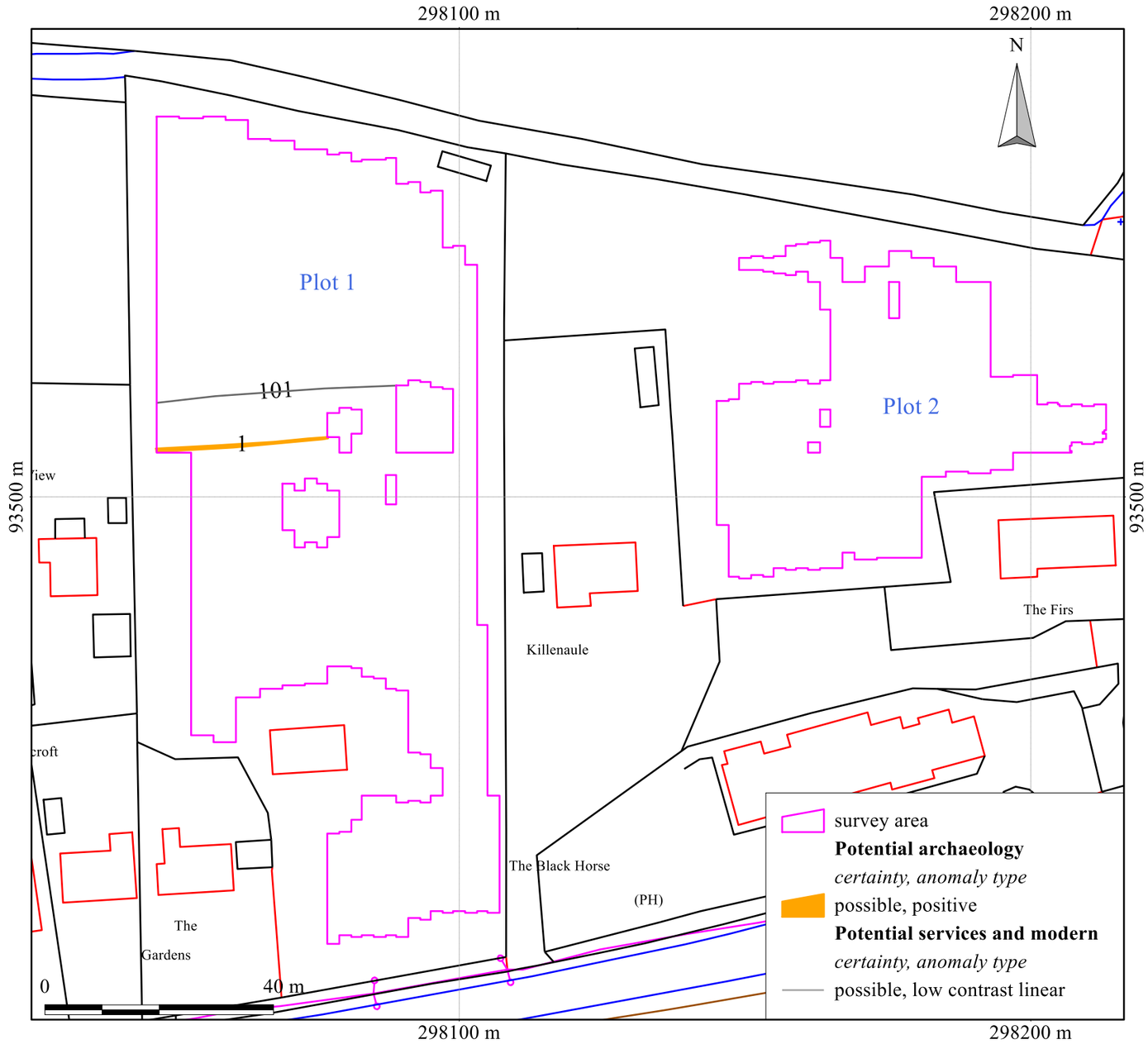

British Grid
centre X: 298120.73 m, centre Y: 93495.19 m

Scale: 1:900 @ 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 deposits.

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Figure 2: survey interpretation

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British Grid
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Figure 3: shade plot of processed data

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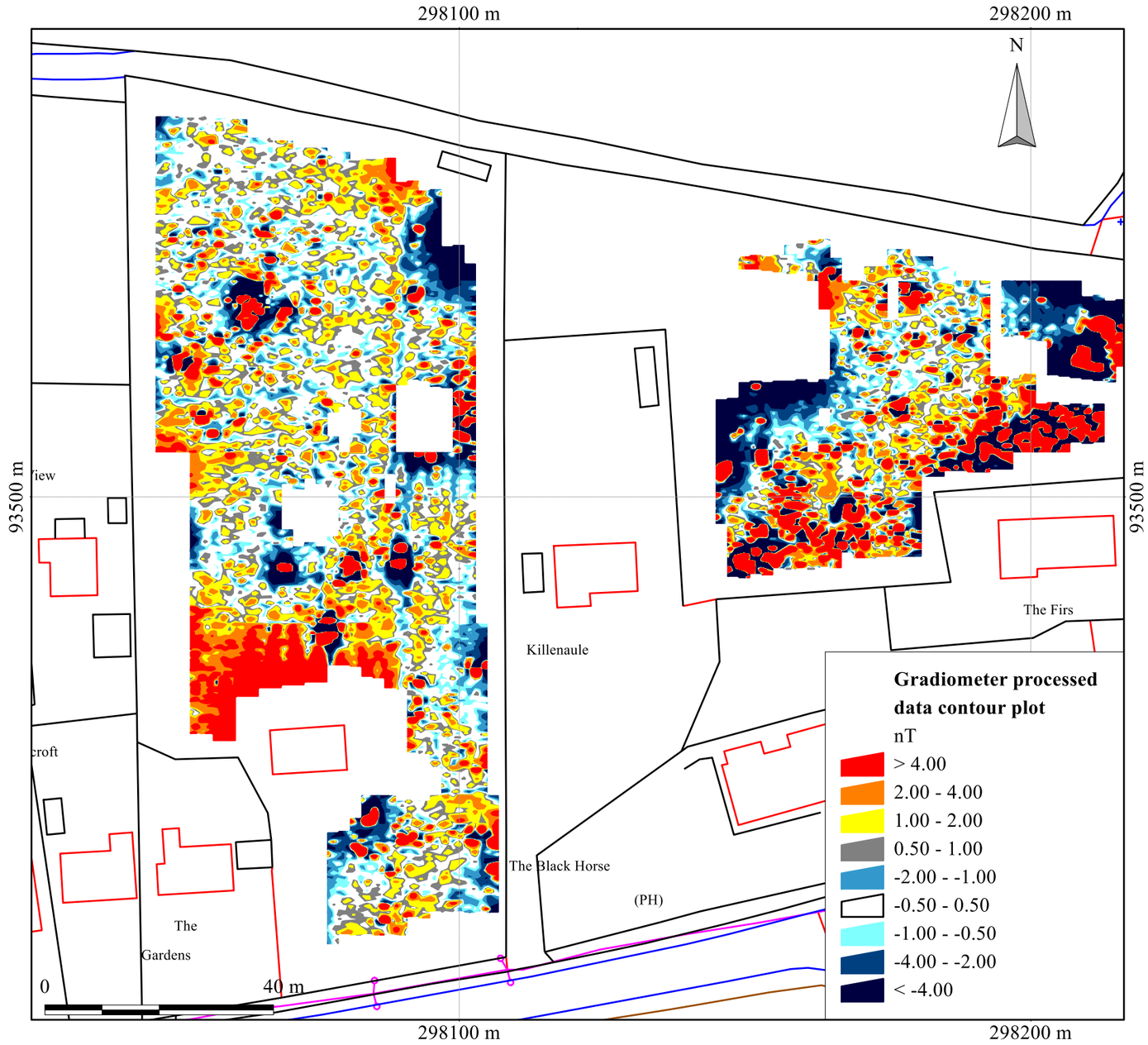

British Grid
centre X: 298120.73 m, centre Y: 93495.19 m

Scale: 1:900 @ A3. Spatial Units: Meter. Do not scale off this drawing

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Figure 4: contour plot of processed data

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Appendix 2 Methodology Summary

<table>
<tr><th colspan="2">Table 1: methodology summary</th></tr>
<tr><td colspan="2">Documents
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</td><td>Data Capture
Sample Interval: 0.25-metres
Traverse Interval: 1 metre
Traverse Method: zigzag
Traverse Orientation: GN</td></tr>
<tr><td colspan="2">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</td></tr>
</table>

Appendix 3 Data processing

Table 2: 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: 3.0.25.0
Stats Max: 69.60 Min: -61.73 Std Dev: 12.02 Mean: -0.49 Median: 0.00 Processes: 8 1 Base Layer 2 Clip at 1.00 SD 3 Clip at 2.00 SD 4 De Stagger: Grids: ha1.xgd ha2.xgd ha3.xgd ha6.xgd ha4.xgd ha7.xgd ha5.xgd ha8.xgd Mode: Both By: -1 intervals 5 De Stagger: Grids: ha9+ha10.xgd Mode: Both By: -1 intervals 6 DeStripe Median Sensors: hb2.xgd ha3.xgd ha6.xgd hb5.xgd hb3.xgd ha4.xgd ha7.xgd hb6.xgd hb4.xgd ha5.xgd ha8.xgd hb7.xgd 7 DeStripe Median Sensors: ha1.xgd ha2.xgd 8 Edge Match (Area: Top 90, Left 360, Bottom 119, Right 479) to Bottom edge Note: converting the gradiometer data into ESRI GIS files imposed an x=y interpolation on the entire dataset

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.