Substrata

Archaeological Geophysical Surveyors

An archaeological gradiometer survey

Land south of West Farm, Faulkland Hemington, Mendip, Somerset

Ordnance Survey E/N: 373800, 154379 (point)

Report: 130723
Ross Dean BSc MSc MA MIfA
25July 2013

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1 Survey description and summary

Type of survey: twin-sensor fluxgate gradiometer
Date of survey: 10 June 2013
Area surveyed: 1.7ha.
Lead surveyor: Ross Dean BSc MSc MA MIfA

Client
C.P. Clarke BA, FSA, MIFA of Arrowhead Archaeology.

Location

Site:	Land south of West Farm, Faulkland
Civil Parish:	Hemington
District:	Mendip
County:	Somerset
NGR:	ST 738 543 (point)
Ordnance Survey E/N:	373800, 154379 (point)
OASIS entry:	substrat1-155742
Archive:	The archive of this survey will be held by Substrata.

Summary
This report was commissioned by Phil Clarke of Arrowhead Archaeology on behalf of clients in preparation of a forthcoming application at the above site. A Historic Environment Desk-based Assessment was carried out by Arrowhead Archaeology in May 2013 (Clarke, 2013).

The survey area comprised the Area of Proposed Development (APD) and an extension to the south as requested by the client (figure 4).

The magnetic contrast across the survey area was sufficient to be able to differentiate between anomalies representing possible archaeological features and background magnetic responses. A total of 53 magnetic anomaly groups were identified as pertaining to potential archaeology.

Numerous pits or similar deposits were recorded within the APD, much more so than is usually found in such a relatively small area and this may be significant given the proximity of two possible Romano-British burials adjacent to the survey area. These anomalies will be the result of either archaeological or natural processes and the nature of these deposits can only be assessed by further archaeological evaluation. Of the anomaly groups within the APD, two may indicate the presence of a ditched track or routeway which may coincide to similar anomalies recorded outside the APD. Eleven groups are linear and curvilinear anomalies that typically pertain to archaeological deposits such as enclosures and/or field boundaries. In this case, their number and proximity suggest a relatively complex set of deposits perhaps indicating more than one phase of archaeological activity.

Outwith the APD, three anomaly groups coincide with low earthworks observed by the survey team. They appear to form three sides of a possible rectilinear enclosure or similar archaeological feature. In the southern-most part of the survey area, an area of enhanced magnetic responses was recorded which may indicate an area of archaeological activity or an area subjected to a different cultivation regime.

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.

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).

2 Site description

Site location and description

The Area of Proposed Development (APD) comprises part of a field to the south of West Farm that was under pasture at the time of the survey. The area lies in the northeast of the Mendip District, and is characterised under the Mendip District Land Characterisation programme as comprising broad ridges with arable farmland.

The field slopes downwards to the south and east (figure 4). The area shown in figure 4 map b is the area under consideration but, at the owner's request, the survey area was extended to that shown in figure 4 map c.

Geology and soils

The solid geology comprises upper Forest Marble Formation mudstone overlain sharply and non-sequentially by ooidal shelly wackestone/packstone of the Cornbrash Formation British Geological Survey, undated 1).

The topsoil is generally shallow and is underlain by loose sandy rubble at approximately 0.2m (pers. comm. Bryan Weaver after Clarke, 2013).

Archaeological summary

The APD lies within an area of anciently enclosed land modified in the seventeenth to nineteenth centuries. There are two non-designated heritage assets comprising Roman burials and pottery to the immediate north of the survey area. The area has been in use as pasture since at least 1840 and has remained unenclosed except for the creation of an eastern boundary as a result of the establishment of two fields to the east.

An assessment of the impact of the proposed development has concluded that if Roman settlement and/or burials do extend into the survey area, then damage to the site is likely to be severe, particularly as preservation is likely to be very good (Clarke, 2013: 3, 8).

Historic Landscape Characterisation

Anciently enclosed land modified in the seventeenth to nineteenth centuries (source: Somerset HER).

Known archaeological sites near the survey area

There are two Historical Environment Record (HER) entries adjacent to the survey area (figure 4 map b):

PRN23653:	Casual finds. At least two Roman burials, one or both in stone coffins and a pottery scatter.. Hearsay evidence. 1921.
PRN12264:	Archaeological Evaluation. Some prehistoric & significant quantity of Romano-British material. 1991.

A comprehensive discussion of the above and other heritage assets is presented by Clarke (2013).

3. 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 attempts to identify and characterise anomalies and anomaly groups that may pertain to archaeological deposits and structures.

The reader is referred to section 4.

3.1 Results

Figure 1 shows the interpretation of the survey and 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.

The anomalies shown in table 1 as belonging to field number 1 relate to potential archaeological features within the APD. Those designated as 'field 2' are within the required survey area but outwith the current APD.

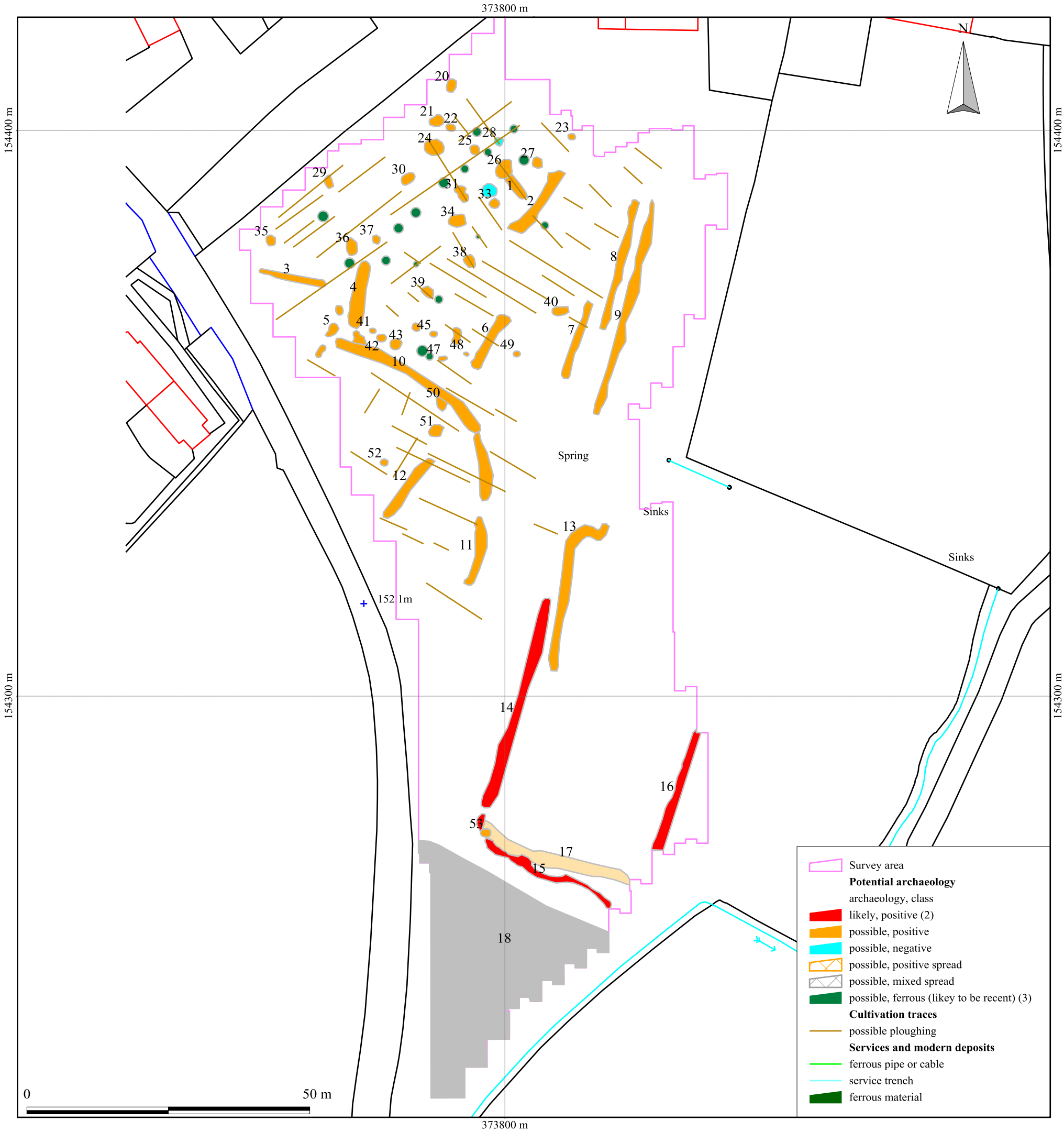
Figures 1 and table 1 comprise the analysis and interpretation of the survey data.

The processed gradiometer data and site location map are presented appendix 1.

Site: An archaeological gradiometer survey
Land south of West Farm, Faulkland, Hemington, Somerset
Ordnance Survey E/N: 285932 78878 (point)
Report: 130723

field number	anomaly group	associated anomaly group(s)	anomaly characterisation certainty & class	anomaly form	additional archaeological characterisation	comments
1	1		possible, positive	linear		
1	2		possible, positive	linear		
1	3		possible, positive	linear		
1	4		possible, positive	linear		
1	5		possible, positive	linear	disrupted linear or pits	
1	6		possible, positive	linear		
1	7		possible, positive	linear		
1	8	9 13 14	possible, positive	linear		anomalies on the same line & trend as anomaly groups 8 9 13 14
1	9	8 13 14	possible, positive	linear		anomalies on the same line & trend as anomaly groups 8 9 13 14
1	10		possible, positive	curvilinear		
1	11		possible, positive	curvilinear		
1	12		possible, positive	linear		
1	20		possible, positive	oval	pit or similar deposit	
1	21		possible, positive	oval	pit or similar deposit	
1	22		possible, positive	oval	pit or similar deposit	
1	23		possible, positive	oval	pit or similar deposit	
1	24		possible, positive	oval	pit or similar deposit	
1	25		possible, positive	oval	pit or similar deposit	
1	26		possible, positive	oval	pit or similar deposit	
1	27		possible, positive	oval	pit or similar deposit	
1	28		possible, negative	oval	pit or similar stony deposit	
1	29		possible, positive	oval	pit or similar deposit	
1	30		possible, positive	oval	pit or similar deposit	
1	31		possible, positive	oval	pit or similar deposit	
1	32		possible, negative	oval	pit or similar stony deposit	
1	33		possible, positive	oval	pit or similar deposit	
1	34		possible, positive	oval	pit or similar deposit	
1	35		possible, positive	oval	pit or similar deposit	
1	36		possible, positive	oval	pit or similar deposit	
1	37		possible, positive	oval	pit or similar deposit	
1	38		possible, positive	oval	pit of similar deposit	
1	39		possible, positive	oval	pit or similar deposit	
1	40		possible, positive	oval	pit of similar deposit	
1	41		possible, positive	oval	pit or similar deposit	
1	42		possible, positive	oval	pit or similar deposit	
1	43		possible, positive	oval	pit or similar deposit	
1	44		possible, positive	oval	pit of similar deposit	
1	45		possible, positive	oval	pit or similar deposit	
1	46		possible, positive	oval	pit of similar deposit	
1	47		possible, positive	oval	pit or similar deposit	
1	48		possible, positive	oval	pit or similar deposit	
1	49		possible, positive	oval	pit or similar deposit	
1	50		possible, positive	oval	pit or similar deposit	
1	51		possible, positive	oval	pit or similar deposit	
1	52		possible, positive	oval	pit	
1	54		possible, dipole		ferrous material	anomalies scattered across area relating to ferrous material - unlikely to be archaeology and included where anomalies affect those associated with potential archaeology
2	13	8 9 14	possible, positive	linear		
2	14	8 9 13	likely, positive	linear		part of an apparent three-sided rectilinear feature
2	15		likely, positive	curvilinear		part of an apparent three-sided rectilinear feature
2	16		likely, positive	linear		part of an apparent three-sided rectilinear feature
2	17		possible, positive spread	linear	earthen bank or former field boundary	on the line of an extant field boundary and adjacent to an apparent three-sided rectilinear feature
2	18		possible, mixed spread	irregular	archaeological deposit	anomalies contrast with those immediately north & may indicate an area of archaeological activity or different past cultivation practice
2	19		possible, negative	linear		
2	53		possible, positive	oval	pit	

Table 1: data analysis



British Grid
centre X: 373805.13 m, centre Y: 154322.79 m

Scale: 1:700 @ A3. Spatial Units: Meter. Do not scale off this drawing

Produced 25/7/2013

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.

An archaeological gradiometer survey
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Ordnance Survey E/N: 373800, 154379 (point)
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Figure 1: survey interpretation

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3.2 Discussion

Refer to figures 1, 2 and 3.

Not all anomalies or anomaly groups identified in the survey dataset are 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 tables 1 and 2.

3.2.1 General observations

1. There were three and possibly four trends in the data resulting from relatively recent ploughing as shown in figures 1 and 2. There has been no ploughing within recent memory (pers. comm. Phil Clarke, 2013). These trends may derive from grass re-seeding or from earlier episodes of cultivation which, from the patterns encountered, are likely to be post-medieval or modern in date.
2. Numerous pits or similar deposits were recorded in the data set, much more so than is usually found in a typical relatively small area survey. These anomalies will be the result of either archaeological or natural processes and that the nature of these deposits can only be assessed by further archaeological evaluation.
3. The anomalies shown in table 1 as belonging to field number 1 relate to potential archaeological features within the APD. Those designated as 'field 2' are within the required survey area but without the current APD.

3.2.2 Data related to historical maps, other records or on-site observations

Groups **14**, **15** and **16** (*outwith the APD*) coincide with low earthworks observed by the survey team. They appear to form three sides of a possible rectilinear enclosure or similar archaeological feature.

3.2.3 Data with no previous provenance

Anomaly groups **8** and **9** may relate to two linear features forming an archaeological feature such as a ditched track or routeway. The appear to be related spatially to groups 14 (see above) and possibly **13**.

Anomaly groups **1 to 7** and **10 to 12** are linear and curvilinear anomalies that typically pertain to archaeological deposits such as enclosures and/or field boundaries. In this case, their number and proximity suggest a relatively complex set of deposits perhaps indicating more than one phase of archaeological activity.

Groups **20 to 52** and **53** (which is *outwith the APD*) are anomalies often associated with pits, burials or similar archaeological deposits as discussed above in section 3.2.1 (2).

Group **18** (*outwith the APD*) is an area of enhanced magnetic responses which may indicate an area of archaeological activity or an area subjected to a different relatively recent cultivation regime. Group **19** (*outwith the APD*) is a linear anomaly lying within group 18.

3.3 Conclusions

Summary

The magnetic contrast across the survey area was sufficient to be able to differentiate between anomalies representing possible archaeological features and background magnetic responses. A total of 53 magnetic anomaly groups were identified as pertaining to potential archaeology.

Numerous pits or similar deposits were recorded within the APD, much more so than is usually found in such a relatively small area and this may be significant given the proximity of two possible Romano-British burials adjacent to the survey area. These anomalies will be the result of either archaeological or natural processes and the nature of these deposits can only be assessed by further archaeological evaluation. Of the anomaly groups within the APD, two may indicate the presence of a ditched track or routeway which may coincide to similar anomalies recorded outside the APD. Eleven groups are linear and curvilinear anomalies that typically pertain to archaeological deposits such as enclosures and/or field boundaries. In this case, their number and proximity suggest a relatively complex set of deposits perhaps indicating more than one phase of archaeological activity.

Outwith the APD, three anomaly groups coincide with low earthworks observed by the survey team. They appear to form three sides of a possible rectilinear enclosure or similar archaeological feature. In the southern-most part of the survey area, an area of enhanced magnetic responses was recorded which may indicate an area of archaeological activity or an area subjected to a different cultivation regime.

4 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.

5 Acknowledgements

Substrata would like to thank Phil Clarke for commissioning the survey on behalf of clients and for providing project management throughout.

6 References

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www.archaeologists.net/sites/default/files/node-files/ifa_code_practice.pdf [June 2013]

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: 373805.13 m, centre Y: 154322.79 m

Scale: 1:700 @ A3. Spatial Units: Meter. Do not scale off this drawing

Produced 25/7/2013

An archaeological gradiometer survey
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Figure 2: shade plot of processed data

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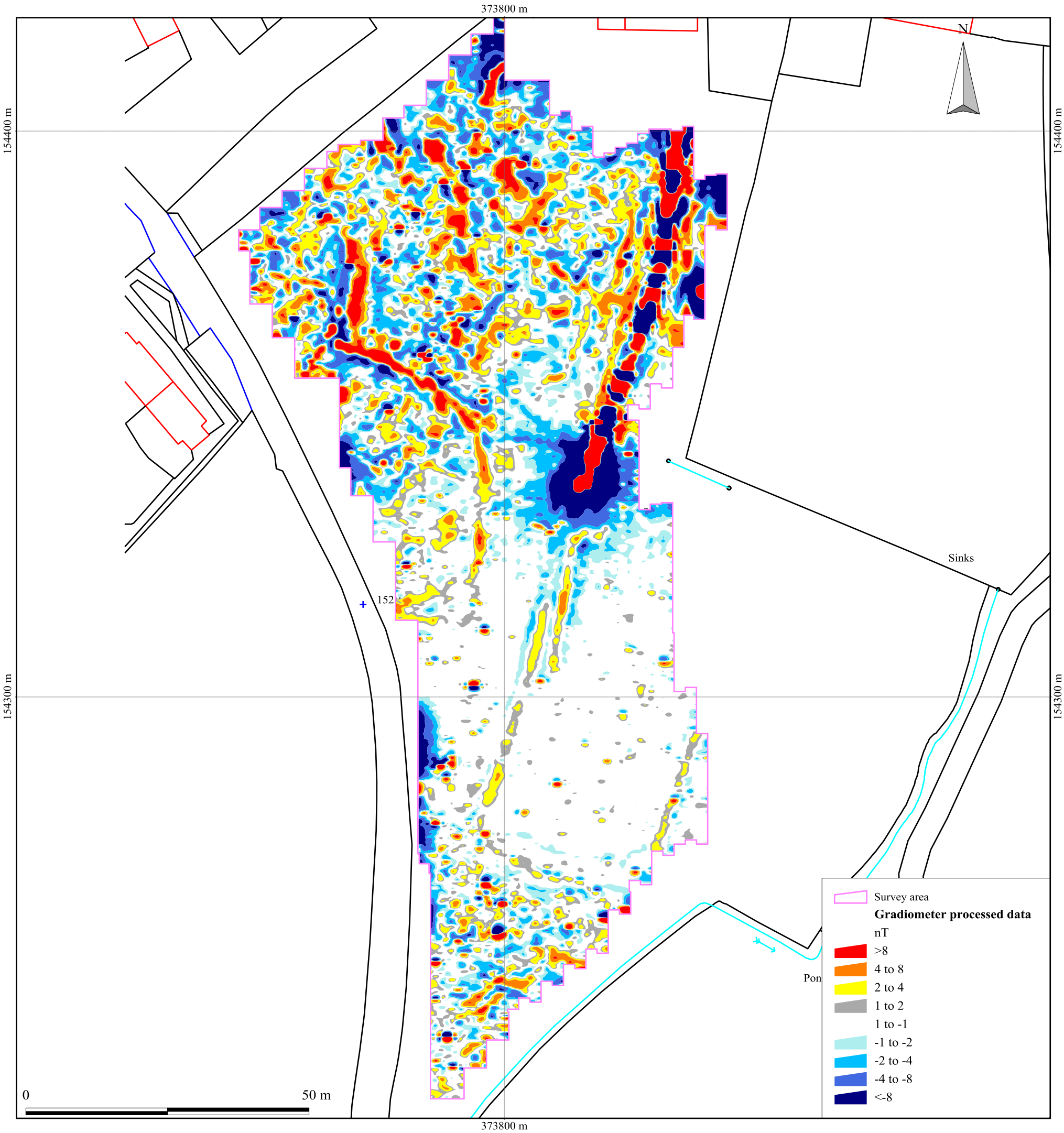

British Grid
centre X: 373805.13 m, centre Y: 154322.79 m

Scale: 1:700 @ A3. Spatial Units: Meter. Do not scale off this drawing

Produced 25/7/2013

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Figure 3: filled contour plot of processed data

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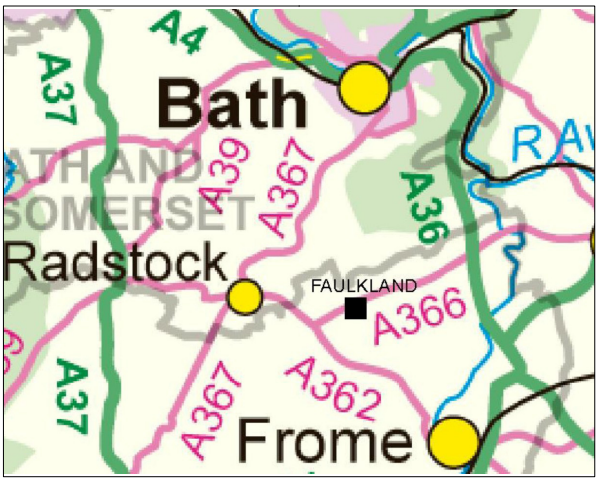
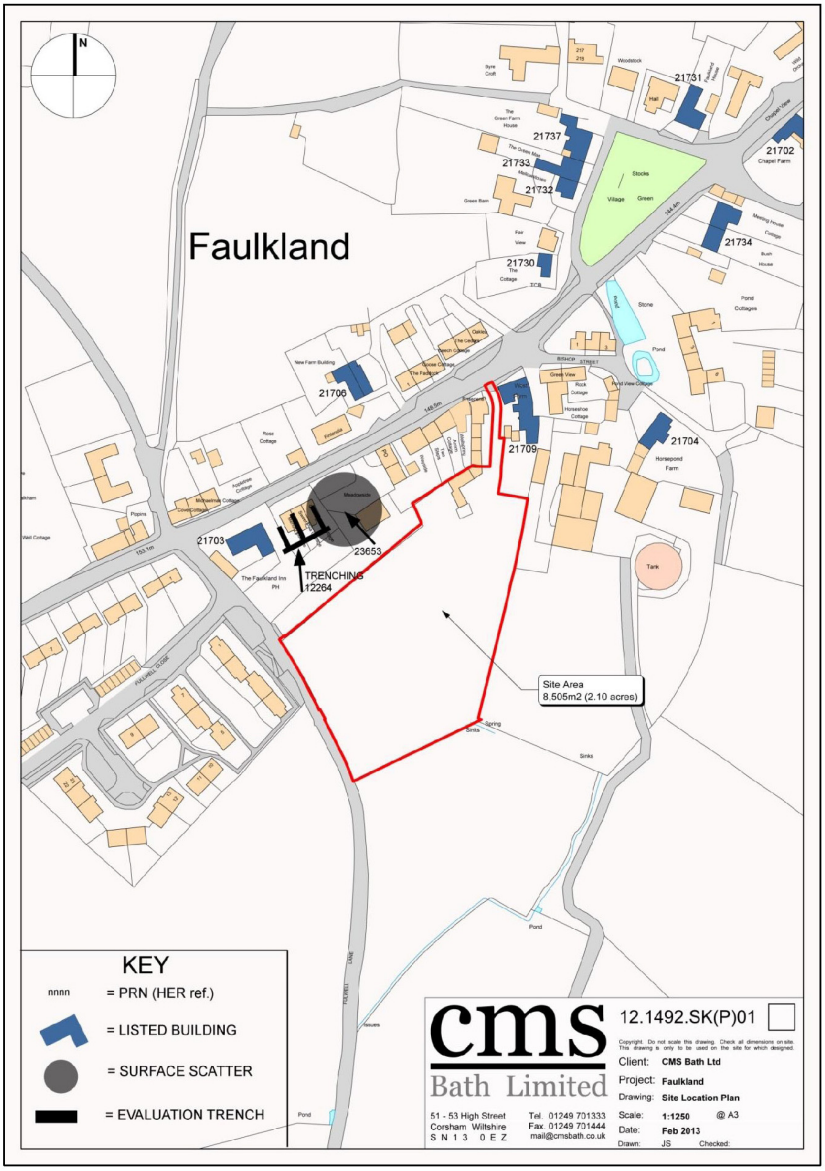
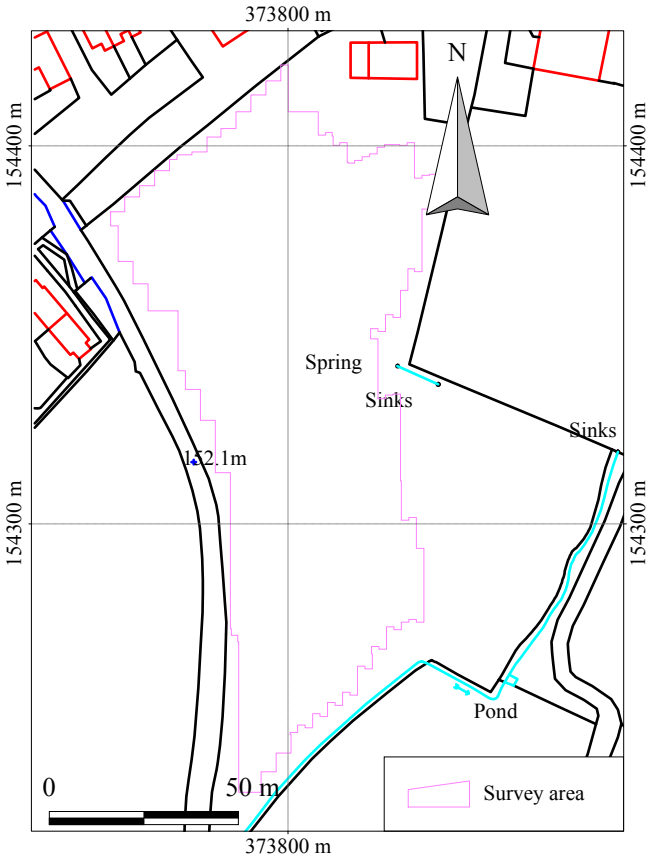


Map a: location map



Map b: survey site (red) with designated & non-designated archaeological sites (Clarke, 2013)



Map c: area surveyed

Figure 4: location map,
original survey area with archaeological assets & area surveyed

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Appendix 2 Methodology

Table 2: methodology
Documents Survey project design: Dean (2013)
Methodology 1. The work was undertaken in accordance with the survey project design. The geophysical (gradiometer) survey was undertaken with reference to standard guidance provided by the Institute for Archaeologists (2011), the Archaeology Data Service/Digital Antiquity Guides (undated). 2. The temporary 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.
Data Processing, Analysis and Presentation Software DW Consulting TerraSurveyor3 Manifold System 8.0 Universal Edition Microsoft Corp. Office Publisher 2003.

Appendix 3 Data processing

Table 3: gradiometer survey - processed data metadata
SITE Land south of West Farm, Faulkland, Hemington, Mendip, Somerset Ordnance Survey E/N: 373800, 154379 (point) Report: 130723
COMPOSITE Instrument Type: Grad 601 (Magnetometer) Units: nT Surveyed by: on 10/06/2013 Assembled by: on 10/06/2013 Direction of 1st Traverse: 0 deg Collection Method: ZigZag Sensors: 2 @ 1.00 m spacing. Dummy Value: 32702 Dimensions Composite Size (readings): 840 x 120 Survey Size (meters): 210 m x 120 m Grid Size: 30 m x 30 m X Interval: 0.25 m Y Interval: 1 m Stats Max: 223.04 Min: -215.40 Std Dev: 18.89 Mean: -0.26 Median: -0.10 Surveyed Area: 0.8884 ha
Processes: 7 1 Base Layer 2 De Stagger: Grids: wf10.xgd wf11.xgd wf12.xgd wf14.xgd wf13.xgd wf15.xgd wf16.xgd wf19.xgd wf17.xgd wf18.xgd Mode: Both By: -3 intervals 3 Clip at 1.00 SD 4 DeStripe Median Sensors: wf09.xgd wf08.xgd wf07.xgd wf06.xgd wf01.xgd wf05.xgd wf02.xgd wf04.xgd 5 DeStripe Median Sensors: wf10.xgd wf11.xgd wf12.xgd wf14.xgd wf13.xgd 6 DeStripe Median Sensors: wf16.xgd wf19.xgd wf17.xgd wf18.xgd 7 Edge Match (Area: Top 60, Left 360, Bottom 89, Right 479) to Left edge Note: interpolation match x & y doubled is completed automatically during export from TerraSurveyor to ERSI format for the GIS

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 magnetised 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.

<u>Bartington grad601-2 gradiometers</u>

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.

<u>Multiple sensor arrays</u>

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.