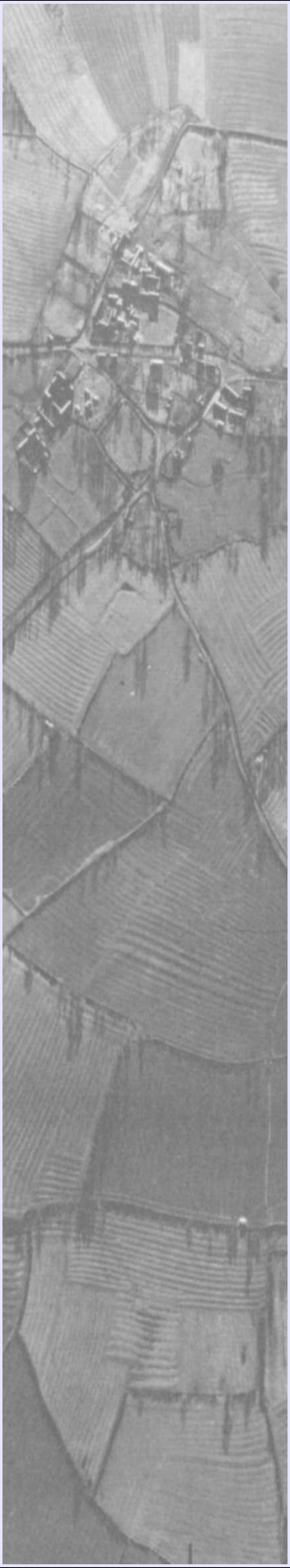
Archaeological Surveys Ltd



Badgers Field, Chipping Campden, Gloucestershire

MAGNETOMETER SURVEY REPORT

for

Longborough Developments

David Sabin and Kerry Donaldson

November 2011

Ref. no. 383

ARCHAEOLOGICAL SURVEYS LTD

Badgers Field, Chipping Campden, Gloucestershire

Magnetometer Survey

for

Longborough Developments

Fieldwork by David Sabin and Francis Sabin
Report by David Sabin BSc (Hons) MIFA and Kerry Donaldson BSc (Hons)

Survey date - **24th November 2011**
Ordnance Survey Grid Reference – **SP 15273 38949**

Archaeological Surveys Ltd
PO Box 2862, Castle Combe, Chippenham, Wiltshire, SN14 7WZ
Tel: 01249 782234 Fax: 0871 661 8804
Email: info@archaeological-surveys.co.uk
Web: www.archaeological-surveys.co.uk

CONTENTS

SUMMARY....1
1 INTRODUCTION....1
1.1 Survey background....1
1.2 Survey objectives and techniques....1
1.3 Site location, description and survey conditions....2
1.4 Site history and archaeological potential....2
1.5 Geology and soils....2
2 METHODOLOGY....3
2.1 Technical synopsis....3
2.2 Equipment configuration, data collection and survey detail....3
2.3 Data processing and presentation....4
3 RESULTS....6
3.1 General overview....6
3.2 List of anomalies....7
4 CONCLUSION....9
5 REFERENCES....10
Appendix A – basic principles of magnetic survey....11
Appendix B – data processing notes....12
Appendix C – survey and data information....13
Appendix D – digital archive....14

LIST OF FIGURES

Figure 01 Map of survey area (1:25 000)

Figure 02 Referencing information (1:2000)

Figure 03 Greyscale plot of raw magnetometer data (1:1000)

Figure 04 Greyscale plot of processed magnetometer data (1:1000)

Figure 05 Abstraction and interpretation of magnetic anomalies (1:1000)

LIST OF TABLES

Table 1: Bartington fluxgate gradiometer sensor calibration results....................................4

Table 2: List and description of interpretation categories..7

SUMMARY

Archaeological Surveys Ltd was commissioned by Archaeology & Planning Solutions, on behalf of Longborough Developments, to undertake a magnetometer survey of an area of land at Badgers Field, Chipping Campden in Gloucestershire. The site has been outlined for a proposed residential development and the survey forms part of an archaeological assessment of the site.

The results of the survey indicate the presence of linear and discrete anomalies, a number of which are considered to have archaeological potential. Several positive linear anomalies appear to have a different orientation to extant ridge and furrow, which is likely to be medieval in origin. There is also evidence for the furrows truncating small sections of some of the linear anomalies which would tend to indicate that the anomalies are earlier in origin; they may represent former ditches relating to earlier land boundaries. Parallel ditch-like anomalies in the southern part of the site may indicate an early trackway.

Linear and discrete anomalies of uncertain origin were located across the site. These may represent former ditch-like and pit-like features although they tend to be weak and fragmented preventing confident interpretation.

1 INTRODUCTION

1.1 Survey background

1.1.1 Archaeological Surveys Ltd was commissioned by Archaeology & Planning Solutions, on behalf of Longborough Developments, to undertake a magnetometer survey of an area of land at Badgers Field, Chipping Campden, Gloucestershire. The site has been outlined for a proposed residential development. The survey forms part of an archaeological assessment of the site.

1.1.2 The geophysical survey was carried out in accordance with a Written Scheme of Investigation (WSI) produced by Archaeological Surveys (2011) and approved by Charles Parry, Senior Archaeological Officer for Gloucestershire County Council, prior to commencing the survey.

1.2 Survey objectives and techniques

1.2.1 The objective of the survey was to use magnetometry to locate geophysical anomalies that may be archaeological in origin, so that they may be assessed prior to development of the site.

1.2.2 The methodology is considered an efficient and effective approach to archaeological prospection. The survey and report generally follow the recommendations set out by: English Heritage, 2008, *Geophysical survey in archaeological field evaluation;* and Institute for Archaeologists, 2002, *The use* *of Geophysical Techniques in Archaeological Evaluations*.

1.3 Site location, description and survey conditions

1.3.1 The site lies to the south of the central part of Chipping Campden in Gloucestershire and is centred OS Grid Reference SP 15270 38950, see Figures 01 and 02. The area covered by the site is approximately 1.2ha of pasture within a single field.

1.3.2 The survey area slopes down gently towards the north west and contains evidence of former ridge and furrow cultivation. A public footpath crosses the area diagonally from the south western to the north eastern corner.

1.3.3 The ground conditions across were considered to be favourable for the collection of magnetometry data. A number of sources of magnetic disturbance were visible within and surrounding the site, and these included wire mesh fencing, steel gates and a water trough. Overhead cables are linked to a wooden pole that is supported and anchored by steel guys in the northern part of the site. Weather conditions during the survey were mainly fine.

1.4 Site history and archaeological potential

1.4.1 An Archaeological Desk-Based Assessment was carried out by CgMs Consulting (2010) and identified that apart from extant ridge and furrow, there were no known heritage assets within the site. From this desk-based exercise it was concluded that there was a low potential for buried archaeological features. However, it is possible that the geophysical survey could locate cut features that underlie the ridge and furrow, should they be present.

1.5 Geology and soils

1.5.1 The underlying solid geology across the majority of the site are siltstones and mudstones of the Dyrham Formation with some ferruginous limestone of the Marlstone Rock Formation across the southern part of the site (BGS, 2011).

1.5.2 The overlying soil across the survey area is from the Oxpasture association, which is a stagnogleyic, argillic brown earth. It consists of a fine loamy over clayey soil with a slowly permeable subsoil and is subject to slight seasonal waterlogging (Soil Survey of England and Wales, 1983).

1.5.3 Although clayey and waterlogged soils can result in suppressed magnetic susceptibility, magnetometry survey carried out across similar soils has produced good results. Ferruginous marlstone rocks can result in a strong contrast between cut features and the surrounding soils. The underlying geology and soils are therefore considered acceptable for magnetic survey.

2 METHODOLOGY

2.1 Technical synopsis

2.1.1 Magnetometry survey records localised magnetic fields that can be associated with features formed by human activity. Magnetic susceptibility and magnetic thermoremnance are factors associated with the formation of localised fields. Additional details are set out below and within Appendix A.

2.1.2 Iron minerals within the soil may become altered by burning and the break down of biological material; effectively the magnetic susceptibility of the soil is increased, and the iron minerals become magnetic in the presence of the Earth's magnetic field. Accumulations of magnetically enhanced soils within features, such as pits and ditches, may produce magnetic anomalies that can be mapped by magnetic prospection.

2.1.3 Magnetic thermoremnance can occur when ferrous minerals have been heated to high temperatures such as in a kiln, hearth, oven etc. On cooling, a permanent magnetisation may be acquired due to the presence of the Earth's magnetic field. Certain natural processes associated with the formation of some igneous and metamorphic rock may also result in magnetic thermoremnance.

2.1.4 The localised variations in magnetism are measured as sub-units of the Tesla, which is a SI unit of magnetic flux density. These sub-units are nano Teslas (nT), which are equivalent to 10^{-9} Tesla (T).

2.2 Equipment configuration, data collection and survey detail

2.2.1 The detailed magnetic survey was carried out using a Bartington Grad 601-2 gradiometer. The instrument effectively measures a magnetic gradient between two fluxgate sensors mounted vertically 1m apart. Two sets of sensors are mounted on a single frame 1m apart horizontally.

2.2.2 The instrument is extremely sensitive and is able to measure magnetic variation to 0.01nanoTesla (nT), with an effective resolution of 0.03nT. The data are limited to ±100nT when surveying with the highest sensitivity. All readings are saved to an integral data logger for analysis and presentation.

2.2.3 The instrument is operated according to the manufacturer's instructions with consideration given to the local conditions. An adjustment procedure is required, prior to collection of data, in order to balance the sensors and remove the effects of the Earth's magnetic field; further adjustment is required during the survey due to instrument drift often associated with temperature change.

2.2.4 It can be very difficult to obtain optimum balance for the sensors due to localised magnetic vectors that may be associated with large ferrous objects, geological/pedological features, 'magnetic debris' within the topsoil and natural temperature fluctuations. Imperfect balance results in a heading error often visible as striping within the data; this can be effectively removed by software processing and generally has little effect on the data unless extreme.

2.2.5 The Bartington gradiometer undergoes regular servicing and calibration by the manufacturer. A current assessment of the instruments is shown in Table 1 below.

Sensor type and serial numbers	Bartington Grad - 01 – 1000 Nos. 084, 085
Date of certified calibration/service	Sensors 084 and 085 - August 2010 (due Aug 2012)
Bandwidth	12Hz (100nT range) both sensors
Noise	<100pT peak to peak
Adjustable errors	<2nT

Table 1: Bartington fluxgate gradiometer sensor calibration results

The instrument was considered to be in good working order prior to the survey, with no known faults or defects.

2.2.6 Data were collected at 0.25m centres along traverses 1m apart. The survey area was separated into 30m by 30m grids ($900m^2$) giving 3600 recorded measurements per grid. This sampling interval is very effective at locating archaeological features and is the recommended methodology for archaeological prospection (English Heritage, 2008).

2.2.7 The survey grids were set out to the Ordnance Survey OSGB36 datum using a Penmap RTK GPS and oriented parallel to the southern field boundary. The GPS is used in conjunction with Leica's SmartNet service, where positional corrections are sent via a mobile telephone link. Positional accuracy of around 10 – 20mm is possible using the system. The instrument is regularly checked against the ETRS89 reference framework using Ordnance Survey ground marker C1ST7784 (Horton).

2.3 Data processing and presentation

2.3.1 Magnetometry data downloaded from the Grad 601-2 data logger are analysed and processed in specialist software known as ArcheoSurveyor. The software allows greyscale and trace plots to be produced for presentation and display. Survey grids are assembled to form an overall composite of data (composite file) creating a dataset of the complete survey area. Appendix C contains specific information concerning the survey and data attributes and is derived directly from ArcheoSurveyor; this should be used in conjunction with information provided by Figure 02.

2.3.2 Only minimal processing is carried out in order to enhance the results of the survey for display. Raw data are always analysed, as processing can modify anomalies. The following schedule sets out the data and image processing used in this survey:

- clipping of the raw data at ±30nT to improve greyscale resolution,
- clipping of processed data at ±5nT to enhance low magnitude anomalies,
- edge match is used for grids containing magnetic disturbance in order to match adjacent grids,
- de-stagger is used to enhance linear anomalies,
- zero median/mean traverse is applied in order to balance readings along each traverse.

Reference should be made to Appendix B for further information on the specific processes carried out on the data. Appendix C metadata includes details on the processing sequence used.

2.3.3 An abstraction and interpretation is offered for all geophysical anomalies located by the survey. A brief summary of each anomaly, with an appropriate reference number, is set out in list form within the results (Section 3) to allow a rapid and objective assessment of features within the survey area.

2.3.4 The main form of data display prepared for this report is the greyscale plot. Both 'raw' and 'processed' data have been shown followed by an abstraction and interpretation plot. Anomalies are abstracted using colour coded points, lines and polygons. All plots are scaled to landscape A3 for paper printing.

2.3.5 Graphic raster images in bitmap format (.BMP) are initially prepared in ArcheoSurveyor. Regardless of survey orientation, data captured along each traverse are displayed and processed by ArcheoSurveyor from left to right. Prior to displaying against base mapping, raster graphics require a rotation of 109.864° anticlockwise to restore north to the top of the image. Greyscale images are rotated by AutoCAD.

2.3.6 The raster images are combined with base mapping using ProgeCAD Professional 2009 and AutoCAD LT 2007, creating DWG file formats. All images are externally referenced to the CAD drawing in order to maintain good graphical quality. Quality can be compromised by rotation of graphics in order to allow the data to be orientated with respect to grid north; this is considered acceptable as the survey results are effectively georeferenced allowing relocation of features using GPS, resection method etc.. A digital archive, including raster images, is produced with this report allowing separate analysis if necessary, see Appendix D below.

3 RESULTS

3.1 General overview

3.1.1 The detailed magnetic survey was carried out over approximately 1.2ha. Geophysical anomalies located can be generally classified as positive linear and discrete positive responses of archaeological potential, positive and negative linear anomalies of an uncertain origin, linear anomalies of an agricultural origin, areas of magnetic debris and disturbance, strong discrete dipolar anomalies relating to ferrous objects and strong multiple dipolar linear anomalies relating to buried services or pipelines. Anomalies have been numbered and are described below.

3.1.2 Data are considered representative of the magnetic conditions and anomalies within the site. Magnetic disturbance is associated with services and other ferrous objects within and adjacent to the site, particularly along the northern edge. In addition, ridge and furrow have formed uneven magnetic conditions across the whole survey area, albeit at quite low magnitude, and this has prevented optimum balancing of the magnetometer. However, anomalies appear to have strong contrast and this is frequently observed on sites within the vicinity of the ferruginous Marlstone Rock Formation.

3.1.3 The list of sub-headings below attempts to define a number of separate categories that reflect the range and type of features located during the survey. A basic explanation of the characteristics of the magnetic anomalies is set out for each category in order to justify interpretation, a basic key is indicated to allow cross referencing to the abstraction and interpretation plot. CAD layer names are included to aid reference to associated digital files (.dwg/.dxf). Sub-headings are then used to group anomalies with similar characteristics for each survey area.

Report sub-heading CAD layer names and plot colour	**Description and origin of anomalies**
Anomalies with archaeological potential AS-ABST MAG POS LINEAR ARCHAEOLOGY AS-ABST MAG POS DISCRETE ARCHAEOLOGY	Anomalies have the characteristics (mainly morphological) of a range of archaeological features such as pits, ring ditches, enclosures, etc..
Anomalies with an uncertain origin AS-ABST MAG POS LINEAR UNCERTAIN AS-ABST MAG NEG LINEAR UNCERTAIN AS-ABST MAG POS DISCRETE UNCERTAIN	The category applies to a range of anomalies where <u>there is not enough evidence to confidently suggest an origin</u>. Anomalies in this category <u>may well be related to archaeologically significant features, but equally relatively modern features, geological/pedological features and agricultural features should be considered</u>. Positive anomalies are indicative of magnetically enhanced soils that may form the fill of 'cut' features or may be produced by accumulation within layers or 'earthwork' features; soils subject to burning may also produce positive anomalies. Negative anomalies are produced by material of comparatively low magnetic susceptibility such as stone and subsoil.
Anomalies with an agricultural origin AS-ABST MAG RIDGE AND FURROW	The anomalies are often linear and form a series of parallel responses or are parallel to extant land boundaries. Where the response is broad, former ridge and furrow is likely; narrow response is often related to modern ploughing.

Anomalies associated with magnetic debris AS-ABST MAG STRONG DIPOLAR ●	Magnetic debris often appears as areas containing many small dipolar anomalies that may range from weak to very strong in magnitude. It often occurs where there has been dumping or ground make-up and is related to magnetically thermoremnant materials such as brick or tile or other small fragments of ferrous material. This type of response is occasionally associated with kilns, furnace structures, or hearths and <u>may therefore be archaeologically significant</u>. It is also possible that the response may be caused by natural material such as certain gravels and fragments of igneous or metamorphic rock. Strong discrete dipolar anomalies are responses to ferrous objects within the topsoil.
Anomalies with a modern origin AS-ABST MAG DISTURBANCE AS-ABST MAG SERVICE	The magnetic response is often strong and dipolar indicative of ferrous material and may be associated with extant above surface features such as wire fencing, cables, pylons etc.. Often a significant area around such features has a strong magnetic flux which may create magnetic disturbance; such disturbance can effectively obscure low magnitude anomalies if they are present. Fluxgate sensors may respond erratically and with hysteresis adjacent to strong magnetic sources. Buried services may produce characteristic multiple dipolar anomalies dependant upon their construction.

Table 2: List and description of interpretation categories

3.2 *List of anomalies*

Anomalies of archaeological potential

(1) – A positive linear anomaly extends across the western part of the survey area, with an approximate north-south orientation. It appears to have been “cut” by ridge and furrow suggesting an earlier construction. It is a response to the magnetically enhanced fill of a ditch and it is likely to be associated with anomalies (2) to (6).

(2) – A positive linear anomaly, extends towards anomaly (1) from the west, and possibly beyond it to the east as anomaly (12). It is likely to relate to a former ditch-like feature.

(3) – Two positive linear anomalies may be associated with anomaly (1). The anomalies may indicate former ditch-like features associated with a trackway.

(4) – A positive linear anomaly appears to have been crossed by anomaly (1), although it may be associated with it.

(5) - A partially fragmented positive linear anomaly extends from the south eastern corner towards the centre of the site. It appears in places to have been “cut” by the ridge and furrow, indicating that it pre-dates it. It is joined or crossed by another positive linear anomaly that is oriented orthogonally to it. It is possible that these are associated with anomalies (1) to (4).

(6) – A slightly curvilinear anomaly and discrete positive anomaly are located close to the south eastern corner of the survey area and appear to relate to cut features.

It is possible that it links to anomalies (3) beyond the southern field boundary.

Anomalies with an uncertain origin

(7) – Two weakly positive linear anomalies are located towards the eastern edge of the survey area. They appear roughly parallel to anomalies (8) and (9) and it is possible that they are associated.

(8) – A weak, fragmented, positive linear anomaly appears approximately equidistant to, and parallel with, anomalies (7) and (9).

(9) – A weakly positive linear anomaly appears to have been disturbed by ridge and furrow.

(10) – A positive linear anomaly, with parallel negative anomaly, appears to extend towards anomaly (8) from the north west. It is possible that they are associated with anomalies (7) to (9).

(11) – A weakly positive curvilinear anomaly is located close to the western edge of the site. It is possible that it relates to a cut feature, and may have some association with anomaly (2).

(12) – A short, positive linear anomaly appears to extend eastwards from anomaly (1) on the same alignment as anomaly (2). Although it may relate to an easterly extension of anomaly (2), its weak response prevents confident interpretation.

(13) – The site contains many weak, fragmented, positive linear and possible curvilinear anomalies of uncertain origin that may be related to former cut features.

(14) – Weak, discrete positive anomalies may relate to pit-like features, with some archaeological potential, although their origin is uncertain.

(15) – Close to the south eastern corner of the survey area is a weakly positive linear anomaly. It is possible that it may be associated with anomalies (7) to (10).

(16) – A negative linear anomaly extends across the entire site, from close to the north western corner to close to the eastern edge. Although of uncertain origin, it is possible that this relates to a buried service. A linear feature can be seen in a similar position on an aerial photograph from 1945 (Google Earth).

(17) – A fragmented negative linear anomaly is located close to the south eastern corner of the site. It's origin is uncertain.

Anomalies with an agricultural origin

(18) – The site contains a series of parallel linear anomalies that relate to ridge and furrow. This is still extant within the field, and in this case, the negative anomaly indicates the furrow which can be seen to have truncated several former ditch-like features.

Anomalies associated with magnetic debris

(19) – Strong discrete dipolar anomalies relate to ferrous objects on the ground surface and within the topsoil.

Anomalies with a modern origin

(20 & 21) – Two strong multiple dipolar linear anomalies relate to buried services.

(22) - Magnetic disturbance that is a response to steel guys anchoring an electricity pole located within the northern central part of the survey area.

4 CONCLUSION

4.1.1 The detailed magnetometry survey located a number of positive linear anomalies probably indicating former ditch-like features that may underlie the extant ridge and furrow. The orientation of the ridge and furrow can be seen to be aligned with the long medieval land plots within the core of Chippng Campden, beyond the modern development immediately north of the site. Although it cannot be stated with confidence that the extant ridge and furrow earthworks were formed within the medieval period, it would seem unlikely that there has been any significant realignment of field boundaries within the medieval, post medieval and modern periods. It is possible, therefore, that the anomalies relate to earlier boundary features and/or a trackway. In addition there is clear evidence for the ridge and furrow truncating some of the anomalies, which would again provide evidence for their early construction.

4.1.2 The anomalies have quite high levels of enhancement, particularly anomaly (1), which may indicate close proximity to settlement. However, soils in the region that are close to, and derived from, the ferruginous Marlstone Rock Formation produce strong enhancement and good contrast, and the level of enhancement is not necessarily a good indicator of the intensity of anthropogenic activity in the vicinity.

4.1.3 Several linear and discrete positive anomalies of uncertain origin were located across the survey area. However, it is possible that they represent former cut features and their archaeological potential should be considered.

5 REFERENCES

Archaeological Surveys, 2011. *Badgers Field, Chipping Campden, Gloucestershire, Geophysical Survey Written Scheme of Investigation. Unpublished typescript document.*

British Geological Survey, 2010. *Geology of Britain viewer, 1:50 000 scale [online]* available from http://maps.bgs.ac.uk/geologyviewer/ [accessed 22/11/2011].

CgMs, 2010. *Archaeological Desk-Based Assessment, Badgers Field, Chipping Campden, Gloucestershire.* Unpublished typescript document.

English Heritage, 2008. *Geophysical survey in archaeological field evaluation. Research and Professional Service Guideline No.1.* 2nd ed. Swindon: English Heritage.

Institute for Archaeologists, 2002. *The use of Geophysical Techniques in Archaeological Evaluations*. IFA Paper No. 6. IFA, University of Reading.

Soil Survey of England and Wales, 1983. *Soils of England and Wales, Sheet 5 South West England.*

Appendix A – basic principles of magnetic survey

Iron minerals are always present to some degree within the topsoil and enhancement associated with human activity is related to increases in the level of magnetic susceptibility and thermoremnant material.

Magnetic susceptibility is an induced magnetism within a material when it is in the presence of a magnetic field. This can be thought of as effectively permanent due to the presence of the Earth's magnetic field.

Thermoremnant magnetism occurs when ferrous material is heated beyond a specific temperature known as the Curie Point. Demagnetisation occurs at this temperature with re-magnetisation by the Earth's magnetic field upon cooling.

Enhancement of magnetic susceptibility can occur in areas subject to burning and complex fermentation processes on biological material; these are frequently associated with human settlement. Thermoremnant features include ovens, hearths, and kilns. In addition thermoremnant material such as tile and brick may also be associated with human activity and settlement.

Silting and deliberate infilling of ditches and pits with magnetically enhanced soil can create an area of enhancement compared with surrounding soils and subsoils into which the feature is cut. Mapping enhanced areas will produce linear and discrete anomalies allowing an assessment and characterisation of hidden subsurface features.

It should be noted that areas of negative enhancement can be produced from material having lower magnetic properties compared to the topsoil. This is common for many sedimentary bedrocks and subsoils which were often used in the construction of banks and walls etc. Mapping these 'negative' anomalies may also reveal archaeological features.

Magnetic survey or magnetometry can be carried out using a fluxgate gradiometer and may be referred to as gradiometry. The gradiometer is a passive instrument consisting of two fluxgate sensors mounted vertically 1m apart. The instrument is carried about 30cm above the ground surface and the upper sensor measures the Earth's magnetic field as does the lower sensor but this is influenced to a greater degree by any localised buried field. The difference between the two sensors will relate to the strength the magnetic field created by the buried feature. If no enhanced feature is present the field measured by both sensors will be similar and the difference close to zero.

There are a number of factors that may affect the magnetic survey and these include soil type, local geology and previous human activity. Situations arise where magnetic disturbance associated with modern services, metal fencing, dumped waste material etc., obscures low magnitude fields associated with archaeological features.

Appendix B – data processing notes

Clipping

Minimum and maximum values are set and replace data outside of the range with those values. Extreme values are removed improving colour or greyscale contrast associated with data values that may be archaeologically significant. It has been found that clipping data to ranges between ±5nT and ±1nT often improves the appearance of features associated with archaeology. Different ranges are applied to data in order to determine the most suitable for anomaly abstraction and display.

Zero Median/Mean Traverse

The median (or mean) of each traverse is calculated ignoring data outside a threshold value, the median (or mean) is then subtracted from the traverse. The process is used to equalise slight differences between the set-up and stability of gradiometer sensors and can remove striping. The process can remove archaeological features that run along a traverse so data analysis is also carried out prior its application.

De-stagger

Compensates for small positional errors within data collection by shifting the position of the readings along each traverse by a specified amount. Data lost at the end of each traverse are extrapolated from adjacent value in the same row.

Deslope

Corrects for striping and distortion caused by metal objects/services etc.. The process calculates a curve based on a polynomial best fit mathematical function for each traverse. This curve is then subtracted from the actual data.

Edge Match

Calculates the mean of the 2 lines (rows or columns) of data either side of the edge to match. It then subtracts the difference between the means from all datapoints in the selected area.

FFT (Fast Fourier Transform) spectral filtering

A mathematical process used to determine the frequency components of a traverse. Repetitive features, such as plough marks, produce characteristic spectral zones that can be suppressed allowing greyscale images to appear clearer.

Appendix C – survey and data information

Raw data

COMPOSITE
Filename: J383-mag-raw.xcp
Instrument Type: Bartington (Gradiometer)
Units: nT
Surveyed by: on 24/11/2011
Assembled by: on 24/11/2011
Direction of 1st Traverse: 315 deg
Collection Method: ZigZag
Sensors: 2 @ 1.00 m spacing.
Dummy Value: 32702

Dimensions
Composite Size (readings): 480 x 180
Survey Size (meters): 120 m x 180 m
Grid Size: 30 m x 30 m
X Interval: 0.25 m
Y Interval: 1 m

Stats
Max: 30.00
Min: -30.00
Std Dev: 8.94
Mean: -3.24
Median: -2.38
Composite Area: 2.16 ha
Surveyed Area: 1.133 ha

Processes: 2
1 Base Layer
2 Clip from -30.00 to 30.00 nT

Source Grids: 21
1 Col:0 Row:0 grids\16.xgd
2 Col:0 Row:1 grids\17.xgd
3 Col:0 Row:2 grids\18.xgd
4 Col:0 Row:3 grids\19.xgd
5 Col:0 Row:4 grids\20.xgd
6 Col:0 Row:5 grids\21.xgd
7 Col:1 Row:0 grids\10.xgd
8 Col:1 Row:1 grids\11.xgd
9 Col:1 Row:2 grids\12.xgd
10 Col:1 Row:3 grids\13.xgd
11 Col:1 Row:4 grids\14.xgd
12 Col:1 Row:5 grids\15.xgd
13 Col:2 Row:0 grids\04.xgd
14 Col:2 Row:1 grids\05.xgd
15 Col:2 Row:2 grids\06.xgd
16 Col:2 Row:3 grids\07.xgd
17 Col:2 Row:4 grids\08.xgd
18 Col:2 Row:5 grids\09.xgd
19 Col:3 Row:0 grids\01.xgd
20 Col:3 Row:1 grids\02.xgd
21 Col:3 Row:2 grids\03.xgd

Processed data

COMPOSITE
Filename: J383-mag-proc.xcp

Stats
Max: 5.00
Min: -5.00
Std Dev: 2.80
Mean: -0.74
Median: -0.62
Composite Area: 2.16 ha
Surveyed Area: 1.1319 ha

Processes: 18
1 Base Layer
2 DeStripe Mean Traverse: Grids: 17.xgd 18.xgd 19.xgd 11.xgd 12.xgd 13.xgd Threshold: 1 SDs
3 DeStripe Mean Traverse: Grids: 20.xgd 21.xgd 14.xgd 15.xgd 08.xgd 09.xgd Threshold: 1 SDs
4 DeStripe Mean Traverse: Grids: 07.xgd Threshold: 0.5 SDs
5 DeStripe Mean Traverse: Grids: 06.xgd Threshold: 0.5 SDs
6 DeStripe Mean Traverse: Grids: 04.xgd 05.xgd 01.xgd 02.xgd Threshold: 0.5 SDs
7 Clip from -5.00 to 5.00 nT
8 Edge Match (Area: Top 120, Left 240, Bottom 149, Right 359) to Left edge
9 Edge Match (Area: Top 90, Left 240, Bottom 119, Right 359) to Left edge
10 Edge Match (Area: Top 60, Left 240, Bottom 89, Right 359) to Left edge
11 Edge Match (Area: Top 30, Left 240, Bottom 59, Right 359) to Left edge
12 Edge Match (Area: Top 150, Left 240, Bottom 179, Right 359) to Left edge
13 Clip from -5.00 to 5.00 nT
14 De Stagger: Grids: 20.xgd Mode: Both By: 1 intervals
15 De Stagger: Grids: 17.xgd Mode: Both By: 1 intervals
16 De Stagger: Grids: 18.xgd Mode: Both By: 1 intervals
17 De Stagger: Grids: 13.xgd Mode: Both By: 1 intervals
18 Clip from -5.00 to 5.00 nT

Appendix D – digital archive

Archaeological Surveys Ltd hold the primary digital archive at Castle Combe, Wiltshire (see inside cover for address). Data are backed-up onto an on-site data storage drive and at the earliest opportunity data are copied to CD ROM for storage on-site and off-site. Digital data are also supplied to the client on CD ROM, see below.

Surveys are reported on in hardcopy (recycled paper) using A4 for text and A3 for plots (all plots are scaled for A3). A bound copy of the report, together with a pdf version will be made available to the Gloucestershire County Council Archaeologist.

This report has been prepared using the following software on a Windows XP platform:

- ArcheoSurveyor version 2.5.14.0 (geophysical data analysis),
- ProgeCAD Professional 2009 (report graphics),
- AutoCAD LT 2007 (report figures),
- OpenOffice.org 3.0.1 Writer (document text),
- PDF Creator version 0.9 (PDF archive).

Digital data are supplied on CD ROM which includes the following files:

- ArcheoSurveyor grid and composite files for all geophysical data,
- CSV files for raw and processed composites,
- geophysical composite file graphics as Bitmap images,
- AutoCAD DWG files in 2000 and 2007 versions,
- report text as OpenOffice.org ODT file,
- report text as Word 2000 doc file,
- report text as rich text format (RTF),
- report text as PDF,
- PDFs of all figures.

The CD ROM structure is formed from a tree of directories under the title J383 Campden – CD. Directory titles include Data, Documentation, CAD and PDFs. Multiple directories exist under Data and hold Grid, Composite and Graphic files with CSV composite data held in Export.

The CAD file contains externally referenced graphics that are rotated with separate A3 size layouts for each figure. Layouts are fixed using frozen layers and named views allowing straightforward plotting or analysis on screen. (Note – CAD files are prepared using AutoCAD's e Transmit function to produce a directory containing the digital drawing along with any externally referenced graphics which may need reloading).