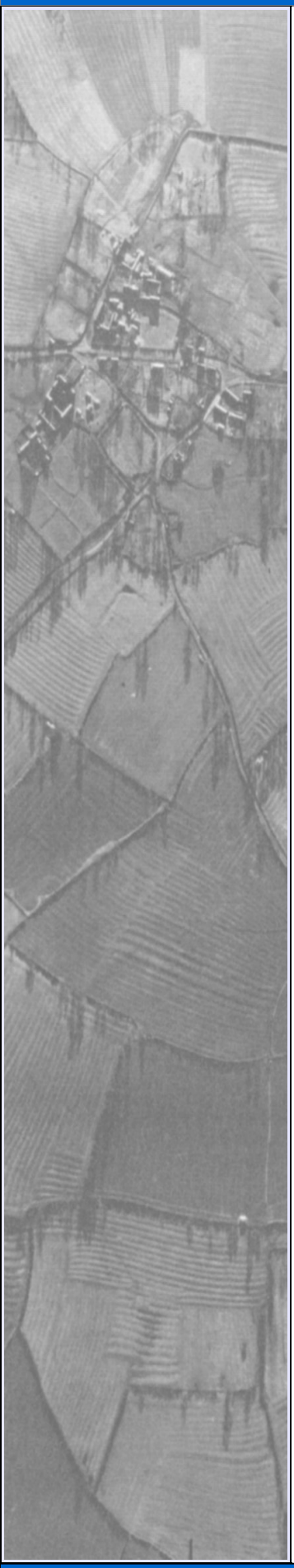

# Land at Hartpury College
# Hartpury
# Gloucestershire

## MAGNETOMETER SURVEY REPORT

for

## Cotswold Archaeology

Kerry Donaldson & David Sabin

April 2019

Ref. no. J787

ARCHAEOLOGICAL SURVEYS LTD

# Land at Hartpury College
# Hartpury
# Gloucestershire

Magnetometer Survey Report

for

## Cotswold Archaeology

Fieldwork by David Sabin BSc (Hons) MCIfA
Report by Kerry Donaldson BSc (Hons)
Report checked by David Sabin
Primary archive location - Archaeological Surveys Ltd, Yatesbury, Wiltshire

Survey date – 4th April 2019
Ordnance Survey Grid Reference – **SO 78971 22784**

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# CONTENTS

LIST OF FIGURES



LIST OF PLATES



LIST OF TABLES

# SUMMARY

Detailed magnetometry revealed a small number of positive discrete, linear and amorphous responses within the site; however, it is not possible to determine if they are anthropogenic or natural features. In the north western corner there are two broad negative responses that appear to correspond to low banks within the field. They are not parallel with former ridge and furrow identified within the survey results and their date and function is uncertain.

# 1 INTRODUCTION

## *1.1 Survey background*

1.1.1 Archaeological Surveys Ltd was commissioned by Cotswold Archaeology to undertake a magnetometer survey of an area of land at Hartpury College in Gloucestershire. The site has been outlined for a proposed development of new student accommodation, and the survey forms part of an archaeological assessment.

## *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. The methodology is considered an efficient and effective approach to archaeological prospection.

1.2.2 Geophysical survey can provide useful information on the archaeological potential of a site; however, the outcome of any survey relies on a number of factors and as a consequence results can vary. The success in meeting the aims and objectives of a survey is, therefore, often impossible to predetermine.

## *1.3 Standards, guidance and recommendations for the use of this report*

*1.3.1* The survey and report generally follow the recommendations set out by: European Archaeological Council (2015) *Guidelines for the Use of Geophysics in Archaeology;* Institute for Archaeologists (2002) *The use of Geophysical Techniques in Archaeological Evaluations.* The work has been carried out to the Chartered Institute for Archaeologists (2014) *Standard and Guidance for Archaeological Geophysical Survey.* Note: currently Historic England (2018) no longer support the guidelines set out in English Heritage (2008) *Geophysical survey in archaeological field evaluation* and there are currently no plans to update the document. As a consequence other sources of written guidance referring to this document may be out of date and/or contain unsupported information *(e.g. Chartered Institute for Archaeologists, 2014).*

1.3.2 Archaeological Surveys Ltd provide a detailed geophysical survey report and it is recommended that where possible the contents should be considered in full. The Summary provides a brief overview of the results with more detail available in the Discussion and/or Conclusion. The *List of anomalies* within the Results provides a detailed assessment of the anomalies within separate categories which can be useful in inferring a level of confidence to the interpretation. Quality and factors influencing the interpretation of anomalies is also set out within the results.

1.3.3 It is recommended that the full report should always be considered when using data and interpretation plots; where this is not possible, in the field for example, the abstraction and interpretation plots should retain their colour coding and be used with a corresponding legend.

1.3.4 Where targeting of anomalies by excavation is to be carried out, care should be taken to place trenches over solid lines or features visible on the abstraction and interpretation plots. Archaeological Surveys abstraction and interpretation avoids the use of dashed or dotted lines; broken or fragmented anomalies may well correspond closely with subsurface truncation.

### *1.4 Site location, description and survey conditions*

1.4.1 The site is located on land to the south of Hartpury College in Gloucestershire. It is centred on Ordnance Survey National Grid Reference (OS NGR) SO 78971 22784, see Figs 01 and 02.

1.4.2 The geophysical survey covers approximately 0.75ha within three small paddocks, separated by post and wire fencing. The survey area only covered the proposed development boundary and not the two westernmost paddocks in entirety.

1.4.3 The ground conditions across the site were generally considered to be favourable for the collection of magnetometry data due to short grass cover. Weather conditions during the survey were poor due to sleet, snow and periods of heavy rain.

Plate 1: Looking NW towards survey area beyond the fence line

### *1.5 Site history and archaeological potential*

1.5.1 A Heritage Desk-Based Assessment has been carried out for the site by Cotswold Archaeology (2018). It outlines that the National Mapping Programme identified linear cropmarks within the site that do not appear to correspond to any formerly mapped field boundaries. It was part of an open field system from the medieval period and part of a large pasture field within the Hartpury Park Estate from at least 1840 to 1949.

1.5.2 The recorded cropmark within the site may indicate that there is potential for the survey to locate this and other archaeological features, should they be present within the site.

1.5.3 During the course of the survey two low linear banks of uncertain origin were noted in the north western part of the site.

### *1.6 Geology and soils*

1.6.1 The underlying geology is Triassic mudstone from the Branscombe Mudstone Formation with overlying Redmarley Member sand and gravel deposits in the eastern part of the site (BGS, 2017).

1.6.2 The overlying soil across the site is from the Whimple 3 association and is a stagnogleyic argillic brown earth. It consists of a reddish, fine loamy or fine silty over clayey soil (Soil Survey of England and Wales, 1983).

1.6.3 Magnetometry carried out over similar geology and soil has produced good

results. The site is, therefore, considered suitable 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 SENSYS MAGNETO®MXPDA 5 channel cart-based system. The instrument has 5 fluxgate gradiometers (FGM650) spaced 0.5m apart with readings recorded at 20 Hz. The cart is pushed at walking speed and not towed. Each sensor is not zeroed in the field as the vertical axis alignment is precisely fixed leaving sensor offsets that are removed during data processing. The fixing of the vertical alignment ensures the sensors are not unduly influenced by localised magnetic fields and that the vertical component of a magnetic anomaly is measured. The gradiometers have a range of recording data between ±0.1nT and ±10,000nT. They are linked to a Leica GS10 RTK GPS with data recorded by SENSYS MAGNETO®MXPDA software on a rugged PDA computer system.

2.2.2 Due to the fixed offsets within the fluxgate sensors, as a result of the manufacturing and tensioning process, the survey data do not provide a visually useful dataset until a zero median traverse algorithm is applied. It is recognised that this has the potential to affect some anomalies detrimentally by removing linear features

orientated parallel to survey transects. However, this has not been noted as a particular problem with the system due to the high resolution data collection, generally long length of traverses and variability within the magnetic characteristics of a linear anomaly.

2.2.3 Data are collected along a series of parallel survey transects to achieve 100% coverage of the surveyable land. The length of each transect is variable and relates to the size of the survey area and other factors including ground conditions. A visual display allows accurate placing of transects and helps maintain the correct separation between adjacent traverses. Data are not collected within fixed grids and data points are considered to be random even though the data are collected in a systematic manner covering all accessible areas (Aspinall, Gaffney and Schmidt, 2009).

2.2.4 Fluxgate sensors are highly sensitive to temperature change and this manifests as drift during the course of a survey. This can be particularly noticeable during the morning as temperatures rise and the equipment warms or cools. Sensor drift within the course of a traverse will appear as a line trending from negative to positive after processing with a zero median traverse algorithm. To remove the potential for temperature drift, data were collected after a 20 minute stabilisation period and traverses were limited to a time of generally <60s.

### *2.3 Data processing and presentation*

2.3.1 Magnetic data collected by the MAGNETO®MXPDA cart-based system are initially prepared using SENSYS MAGNETO®DLMGPS software. The software effectively allocates a geographic position for each data point and can compensate for fixed offsets present within the FGM650 sensors. The offsets are positive or negative values present on all fluxgate gradiometer sensors. Some systems use manual or electronic balancing to effectively zero the sensors; however, this is a short term measure that is prone to drift through temperature changes and vibration and can easily be incorrectly set due to localised magnetic fields. The FGM650 sensors are very accurately aligned to the vertical magnetic gradient and are highly stable showing negligible drift on long traverses. The offset values are removed using TerraSurveyor software.

2.3.2 Survey tracks are analysed and georeferenced raw data (UTM Z30N) are then exported in ASCII format for further analysis and display within TerraSurveyor. The removal of offset values (compensation) of the sensors is also carried out in TerraSurveyor using a zero median traverse function. Data are then considered to be minimally processed. Note: without the zero median traverse function it is not possible to create a meaningful data plot as all sensors have a different offset value. Although a zero median traverse algorithm can remove anomalies aligned with the survey tracks, in practice this rarely occurs due to the use of long traverses, high resolution measurement and variability within the magnetic susceptibility of long linear features.

2.3.3 The minimally processed data are collected between limits of ±10000nT and clipped for display at ±3nT. Data are interpolated to a resolution of effectively 0.5m between tracks and 0.15m along each survey track.

2.3.4 Appendix C contains metadata concerning the survey and data attributes and is derived directly from TerraSurveyor. Reference should be made to Appendix B for further information on processing.

2.3.5 A TIF file is produced by TerraSurveyor software along with an associated world file (.TFW) that allows automatic georeferencing (OSGB36 datum) when using GIS or CAD software. The main form of data display used in the report is the minimally processed greyscale plot. With regard to the Sensys MXPDA, minimally processed data are considered by the manufacturer to be data that are compensated by SENSYS MAGNETO DLMGPS software, see 2.3.1 and 2.3.2. Note: traceplots are not considered to be appropriate as they do not provide an accurate or useful assessment of the magnetic anomalies due to the very high density of data collection.

2.3.6 The raster images are combined with base mapping using ProgeCAD Professional 2016, creating DWG (2010) file formats. All images are externally referenced to the CAD drawing in order to maintain good graphical quality. The CAD plots are effectively georeferenced facilitating relocation of features using GPS, resection method, etc.

2.3.7 An abstraction and interpretation is drawn and plotted for all geophysical anomalies located by the survey. Anomalies are abstracted using colour coded points, lines and polygons. All plots are scaled to landscape A3 for paper printing. Appendix E sets out CAD layer names with colour and graphic content for each interpretation category, see 3.3.

2.3.8 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.

2.3.9 A digital archive is produced with this report, see Appendix D below. The main archive is held at the offices of Archaeological Surveys Ltd.

# 3 RESULTS

## *3.1 General assessment of survey results*

3.1.1 The detailed magnetic survey was carried out over 0.75ha within three land parcels.

3.1.2 Magnetic anomalies located can be generally classified as positive and negative anomalies of an uncertain origin, linear anomalies of an agricultural origin, areas of magnetic disturbance, strong discrete dipolar anomalies

relating to ferrous objects and strong multiple dipolar linear anomalies relating to buried services or pipelines. Anomalies located within each survey area have been numbered and are described in 3.4 below.

### *3.2 Statement of data quality and factors influencing the interpretation of anomalies*

3.2.1 Data are considered representative of the magnetic anomalies present within the site. There are no significant defects within the dataset.

3.2.2 The western part of the site contains a zone of low magnitude magnetic disturbance or debris that has the potential to obscure other weak anomalies if they are present within this area. The origin of the material is uncertain but it may relate to magnetically thermoremnant within soil used for landscaping, ground make-up or consolidation.

### *3.3 Data interpretation*

3.3.1 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, see Table 1.

| Interpretation category | Description and origin of anomalies |
|---|---|
| ***Anomalies with an uncertain origin*** | The category applies to a range of anomalies where there is not enough evidence to confidently suggest an origin. Anomalies in this category may well be related to archaeologically significant features, but equally relatively modern features, geological/pedological features and agricultural features should be considered. Morphology may be unclear or uncharacteristic and there may be a lack of additional supporting information. 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*** | 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. This category does not include agricultural features of early date or considered to be of archaeological potential (e.g. animal stockades, enclosures, farmsteads, etc). |
| ***Anomalies associated with magnetic debris*** | Strong discrete dipolar anomalies are responses to ferrous objects within the topsoil. |
| ***Anomalies with a modern origin*** | 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 these 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 adjacent to strong magnetic sources. Buried services may produce characteristic multiple dipolar anomalies dependant upon their construction. |

Table 1: List and description of interpretation categories

### *3.4 List of anomalies*

Area centred on OS NGR 378971 222784, see Fig 03 & 04.

*Anomalies with an uncertain origin*

(1) - Located in the north eastern corner of the survey area are a number of discrete positive responses. It is possible that they could relate to pit-like features or areas of burning, but their archaeological potential cannot be determined as a natural or modern origin is possible.

(2) - A weakly positive response can be seen towards the centre of the site. This type of response could relate to variations within the underlying sands and gravels.

(3) - A number of short, weakly positive linear anomalies have been located within the survey area. They are generally short, fragmented and lack a coherent morphology.

(4) - In the north western part of the site are two broad negative linear anomalies which appear to correspond to low extant banks.

*Anomalies with an agricultural origin*

(5) - Parallel linear anomalies, oriented east north east to west south west appear to relate to former ridge and furrow cultivation.

(6) - Parallel linear anomalies, oriented north south also appear to relate to former ridge and furrow.

*Anomalies associated with magnetic debris*

(7) - Strong, discrete dipolar anomalies relate to ferrous and other magnetically thermoremnant objects, such as brick and tile, within the topsoil.

*Anomalies with a modern origin*

(8) - A strong, multiple dipolar linear anomaly crosses the eastern part of the survey area from north to south and relates to a ferrous pipe.

(9) - A negative linear anomaly extends south westwards from the north eastern corner of the survey area. The response is indicative of a plastic pipe.

# 4 CONCLUSION

4.1.1 A small number of discrete positive responses have been located in the north eastern corner of the site, but their archaeological potential is uncertain. Other short, weakly positive linear anomalies and a broad weakly positive response have also been located, but they lack a coherent morphology and it is not clear if they relate to cut features, or are associated with variations in the underlying geology. Two broad negative linear anomalies with flanking positive responses can be seen in the north western corner of the site and these appear to correspond with low banks in the field; however, it is not clear if they pre or post-date the ridge and furrow that has also been located.

# 5 REFERENCES

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# 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 SENSYS gradiometer is a passive instrument consisting of two fluxgate sensors mounted vertically 65cm apart. The instrument is carried about 10-20cm 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 magnetic field. The difference between the two sensors will relate to the strength of the magnetic field created by the buried feature.

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 ±3nT 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 (destripe) 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 differences between the baseline value of gradiometer sensors.

*High Pass Filtering*

A mathematical process used to remove low frequency anomalies relating to survey tracks, modern agricultural features and other large magnetic bodies within or adjacent to survey areas.

*Low Pass Filtering*

A mathematical process used to remove high frequency anomalies relating to uneven ground, vibration, etc.

# Appendix C – survey and data information

Filename: J787-mag-proc.xcp
Description: Imported as Composite from: J787-mag.asc
Instrument Type: Sensys DLMGPS
Units: nT
UTM Zone: 30U
Survey corner coordinates (X/Y):OSGB36
Northwest corner: 378902.84, 222844.48 m
Southeast corner: 379051.94, 222743.98 m
Collection Method: Randomised
Sensors: 5
Dummy Value: 32702
Source GPS Points: 246400
Dimensions
Composite Size (readings): 994 x 670
Survey Size (meters): 149 m x 101 m
Grid Size: 149 m x 101 m
X Interval: 0.15 m
Y Interval: 0.15 m
Stats
Max: 3.32
Min: -3.30
Std Dev: 1.42
Mean: -0.06
Median: 0.05
Composite Area: 1.4985 ha
Surveyed Area: 0.65354 ha
PROGRAM
Name: TerraSurveyor
Version: 3.0.23.0
GPS based Proce4
1 Base Layer.
2 Unit Conversion Layer (Lat/Long to OSGB36).
3 DeStripe Median Traverse:
4 Clip from -3.00 to 3.00 nT

# Appendix D – digital archive

Archaeological Surveys Ltd hold the primary digital archive at their offices in Wiltshire. 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.

A copy of the report in PDF/A format will be supplied to the Gloucestershire Historic Environment Record, together with a DXF of the survey boundary. In order to comply with the Gloucestershire Archaeological Archive Standards (SWMDP, 2017) the data will be archived with the Archaeology Data Service (ADS) and the report uploaded to Online AccesS to the Index of archaeological investigationS (OASIS) in the formats stated below for archiving:

Archive contents:

| File type | Naming scheme | Description |
|---|---|---|
| Data | J787_mag_raw.csv<br>J787_mag_proc.csv | Raw data as ASCII CSV<br>TerraSurveyor minimally processed data |
| Graphics | J787_mag_proc.tif | Image in TIF format |
| Drawing | J787_CAD].dwg | CAD file in 2010 dwg format |
| Report | J787 Hartpury mag survey report.pdf | Report text as PDF/A |

Table 2: Archive metadata

# Appendix E – CAD layers for abstraction and interpretation plots

The table below sets out Archaeological Surveys Ltd CAD layer names with associated colours and graphical content. Where CAD files are available layers may be extracted for further CAD/GIS use. Note: hatched polygon boundaries are contained within layers with the RGB colour code 254, 255, 255 (near white) in order to prevent their visibility.

| Report sub-heading and associated CAD layer names | Colour with RGB index | | Layer content |
|---|---|---|---|
| ***Anomalies with an uncertain origin*** | | | |
| AS-ABST MAG POS LINEAR UNCERTAIN | | 255,127,0 | Line, polyline or polygon (solid) |
| AS-ABST MAG POS DISCRETE UNCERTAIN | | 255,127,0 | Solid donut, point or polygon (solid) |
| AS-ABST MAG POS UNCERTAIN | | 255,127,0 | Polygon (cross hatched ANSI37) |
| AS-ABST MAG NEG UNCERTAIN | | Blue 0,0,255 | Polygon (cross hatched ANSI37) |
| ***Anomalies with an agricultural origin*** | | | |
| AS-ABST MAG AGRICULTURAL | | Green 0,255,0 | Line or polyline |
| AS-ABST MAG RIDGE AND FURROW | | 0,127,63 | Line, polyline or polygon (cross hatched ANSI37) |
| ***Anomalies associated with magnetic debris*** | | | |
| AS-ABST MAG STRONG DIPOLAR | | 132, 132, 132 | Solid donut, point or polygon (solid) |
| ***Anomalies with a modern origin*** | | | |
| AS-ABST MAG SERVICE | | 132, 132, 132 | Line or polyline |

Table 3: CAD layering

## Appendix F – copyright and intellectual property

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Survey location


N


Survey location

Site centred on OS NGR
SO 78971 22784

SCALE 1:25 000

0m 500m 1000m

SCALE TRUE AT A3



Archaeological Surveys Ltd

# Geophysical Survey
# Land at Hartpury College
# Hartpury
# Gloucestershire

## Map of survey area

| DRAWN BY | CHECKED BY | |
|---|---|---|
| KTD | DJS | FIG 01 |

Archaeological Surveys Ltd

# Geophysical Survey
# Land at Hartpury College
# Hartpury
# Gloucestershire

## Referencing information

Referencing grid to OSGB36 datum at 50m intervals

Data collected at 20Hz and georeferenced to ETRS89 zone 30 with conversion to OSGB36 using OSTN02

- 378950 222800
- Survey tracks
- Survey track start
- Survey track stop
- Development boundary

SCALE 1:1000

0m 10 20 30 40 50m

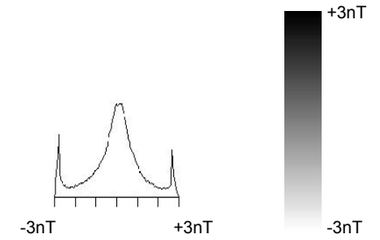
SCALE TRUE AT A3

| DRAWN BY | CHECKED BY | |
|---|---|---|
| KTD | DJS | FIG 02 |

Archaeological Surveys Ltd

**Geophysical Survey**
**Land at Hartpury College**
**Hartpury**
**Gloucestershire**

**Greyscale plot of minimally processed magnetometer data**




SCALE 1:500

0m 5 10 15 20 25m

SCALE TRUE AT A3

| DRAWN BY | CHECKED BY | |
|---|---|---|
| KTD | DJS | FIG 03 |

Archaeological Surveys Ltd

# Geophysical Survey
# Land at Hartpury College
# Hartpury
# Gloucestershire

## Abstraction and interpretation of magnetic anomalies

N

4
5
6
7
3
1
2
9
8

- Positive linear anomaly - possible ditch-like feature
- Linear anomaly - ridge and furrow
- Discrete positive response - possible pit-like feature
- Positive anomaly - magnetically enhanced material
- Negative anomaly - material with low magnetic susceptibility
- Magnetic disturbance from ferrous material
- Strong multiple dipolar linear anomaly - pipeline / cable / service
- Strong dipolar anomaly - ferrous object

SCALE 1:500

0m 5 10 15 20 25m

SCALE TRUE AT A3

| DRAWN BY | CHECKED BY | |
|---|---|---|
| KTD | DJS | FIG 04 |