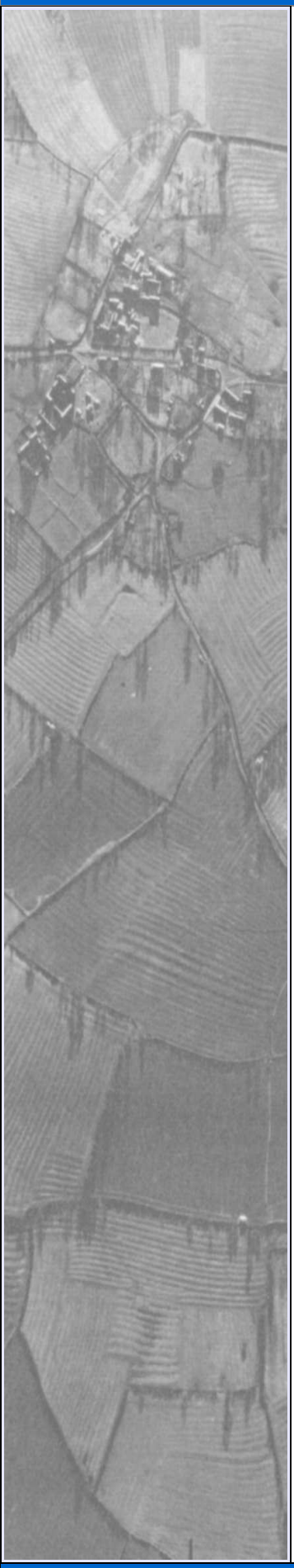

Barbury Castle Estate
Ogbourne St Andrew
Wiltshire

MAGNETOMETER SURVEY REPORT

for

Wessex Woodland Management

on behalf of

Barbury Castle Estate

Kerry Donaldson & David Sabin

December 2018

Ref. no. J772

ARCHAEOLOGICAL SURVEYS LTD

Barbury Castle Estate
Ogbourne St Andrew
Wiltshire

Magnetometer Survey Report

for

Wessex Woodland Management

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 – 10th December 2018
Ordnance Survey Grid Reference – **SU 14645 74390 & SU 15325 75280**

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CONTENTS

LIST OF FIGURES

LIST OF PLATES

LIST OF TABLES

SUMMARY

Detailed magnetometry was carried out within two areas at the Barbury Castle Estate within the parish of Ogbourne St Andrew in Wiltshire. The survey was carried out ahead of tree planting. The results indicate the presence of a positive linear and discrete positive responses within Area 1, situated in a dry valley at Dean Bottom. The survey area lies between two Bronze Age field systems and 200m north of a Bronze Age settlement enclosure and while the anomalies revealed in the survey could relate to ditch-like and pit-like features with an anthropogenic or archaeological origin, a response to natural variations and build-up of soils within the valley base is also possible. Area 2 is located approximately 1km to the north east, near Barbury Castle Farm, and the results indicate the presence of a former boundary ditch that could be a continuation of extant lynchets seen within the field immediately to the north west. A second linear anomaly to the south of it may also have a similar origin.

1 INTRODUCTION

1.1 Survey background

1.1.1 Archaeological Surveys Ltd was commissioned by Wessex Woodland Management Ltd to undertake a magnetometer survey of two areas of land within the Barbury Castle Estate, Ogbourne St Andrew in Wiltshire. The areas have been outlined for proposed new woodland within the estate. The new planting would provide bird cover and also help improve water quality with the removal of the areas from arable cultivation.

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 the tree planting scheme. 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.

1.4 Site location, description and survey conditions

1.4.1 The survey areas are located within the Barbury Castle Estate, approximately 4.5km north north west of Ogbourne St Andrew and 6km north west of Marlborough in Wiltshire. Area 1 is centred on Ordnance Survey National Grid Reference (OS NGR) SU 14645 74390 at Dean Bottom and Area 2 is at SU 15325 75280 near Barbury Castle Farm, see Figs 01 and 02.

1.4.2 Area 1 was situated in the base of a dry valley at Dean Bottom, the area outlined for planting is 0.16ha with the survey covering approximately 0.3ha of pasture land adjacent to a shelter belt. The north eastern and south western sides of the survey area are bounded by a line of trees.

1.4.3 Area 2 was situated 950-1300m to the north east of Area 1 within an arable field near Barbury Castle Farm. The area outlined for planting is 1.77ha and a total of 2.2ha was surveyed around the north western and south western edges of the field in an approximately 35m wide swathe. The northern end of Area 2 is on elevated land facing the south west with the central part of the area crossing a dry valley and the southern part of the area running along the western side of the valley which continues to fall towards the south.

Plate 1: Area 1 in mid-ground looking west

Plate 2: Area 2 looking south west along north western boundary

1.4.4 The ground conditions across the site were generally considered to be favourable for the collection of magnetometry data, with low grass in Area 1 and a mixture of short vegetation and stubble covering much of Area 2. Some sticky conditions were encountered within the southern part of Area 2 due to wet soil and patchy ground cover; however, survey was still possible within this zone. Weather conditions during the survey were fine.

1.5 Site history and archaeological potential

1.5.1 The wider landscape within which the two survey areas are located contain widespread evidence for Bronze Age field systems, settlements and barrows. A number of enclosures, known as the Ogbourne Enclosures lie within 500m-

5km of the survey areas.

1.5.2 Area 1 is situated within a dry valley at Dean Bottom and lies 200m to the north of a Bronze Age settlement enclosure and adjacent to the associated field system. The enclosure was visible as an earthwork feature and was partially excavated in 1951 by Owen Meyrick. At this time a V-shaped ditch was uncovered on the south side of the enclosure. Subsequent heavy ploughing and deep subsoiling during the mid 20th century had denuded the earthwork features to an extent that by the 1970s the enclosure was only visible as a soil mark. Further evaluation in 1977-79 (Gingell, 1992) revealed that the enclosure ditch and much of the occupation surface had been removed by ploughing. Within one of the trenches the natural chalk had been terraced into on two sides to produce a house platform with sarsen blocks placed at the south east end of the main platform floor. These were interpreted as a stone foundation for a possible cob-built structure. The associated pottery and bronze artefacts dated the enclosure to the Middle Bronze Age (1660-1200BC). A pit, containing a large quantity of pottery was dated to the Beaker period with calibrated radiocarbon dating indicating a range of between 2484-2130BC. This related to an earlier, short-lived phase of occupation within the site, shortly after an episode of woodland clearance. The Dean Bottom site lies within a zone containing similar settlements and field systems such as at Preshute Down to the west, Rockley Down to the east and Ogbourne Maisey Down and Burderop Down to the north east. Widespread scatters of Beaker pottery have also been found on the south facing slopes immediately to the north and north east of Area 1. Evidence for WW2 military activity was also discovered during the 1970s excavations as an American army slit-trench had been dug into the terraced platform.

1.5.3 Area 2 lies approximately 1km to the north east, close to Barbury Castle Farm. Within the field immediately to the north west is evidence for several medieval lynchets. Bronze Age pottery scatters were also located 200m north west of the survey area. A Bronze Age barrow at Ogbourne Maisey Down is situated 180m south east of the survey area, with the Bronze Age enclosure at Ogbourne Maisey Down situated less than 500m to the south east.

1.6 Geology and soils

1.6.1 The underlying geology is Holywell Nodular Chalk Formation (Middle Chalk) with overlying head deposits within Area 1 and the south western part of Area 2. The northern end of Area 2 is underlain by New Pit Chalk Formation (Upper Chalk) (BGS, 2018).

1.6.2 Area 1 crosses the base of a dry valley with land rising to the north east and south west, the axis of the valley generally running north west to south east and sloping down gently towards the latter. The central part of Area 2 crosses a separate dry valley at approximately a right angle with the southern half of the survey area located on the western side of this valley, which has a central axis aligned approximately north north west to south south east and sloping

down towards the latter.

1.6.3 The overlying soil within Area 1 and the north western part of Area 2 is from the Icknield association and is a humic rendzina. It consists of a shallow, mostly humose, well drained, calcareous soil over chalk on steep slopes and hill tops. Deeper, fine, silty, calcareous soils in combes and dry valleys. The south western part of Area 2 lies on the edge of the Andover 1 association which is a brown rendzina. It consists of a shallow, well drained, calcareous silty soil over chalk on slopes and crests, deep, calcareous and non-calcareous fine soils in valley bottoms and striped soil patterns locally (Soil Survey of England and Wales, 1983).

1.6.4 The underlying geology and soils are frequently associated with low magnetic contrast and low levels of magnetic susceptibility. They can also be associated with naturally formed features which can at times be difficult to distinguish from those with an anthropogenic or archaeological origin. However, cut features of archaeological potential may be located where human activity has altered the magnetic characteristics of the soil sufficiently. 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 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 ±2,500nT. 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 <100s.

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 each survey area. Where further interpretation is possible, or where a number of possible origins should be considered, more subjective discussion is set out in Section 4.

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 a total of two survey areas covering approximately 2.5ha.

3.1.2 Magnetic anomalies located can be generally classified as positive and negative anomalies of an uncertain origin, anomalies associated with land management, 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.

3.1.3 Anomalies located within each survey area have been numbered and are described in 3.4 below with subsequent discussion in Section 4.

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 Magnetic anomalies appear to display good magnetic contrast and infer useful conditions for magnetometry. The presence of modern agricultural anomalies associated with cultivation and naturally formed anomalies, caused by fluvial and colluvial action, also infer the potential for good magnetic contrast within former cut features should they be present.

3.2.3 Linear and curvilinear anomalies relating to naturally formed features and to modern cultivation may obscure or confuse anomalies associated with archaeological features. In addition, the full extent of anomalies may not be revealed due to the limited width of the survey areas, and interpretation may be limited as a consequence.

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 relating to land management	Anomalies are mainly linear and may be indicative of the magnetically enhanced fill of cut features (i.e. ditches). The anomalies may be long and/or form rectilinear elements and they may relate to topographic features or be visible on early mapping. Associated agricultural anomalies (e.g. headlands, plough marks and former ridge and furrow) may support the interpretation.
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.
Anomalies with a natural origin	Naturally formed magnetic anomalies are caused by localised variability in the magnetic susceptibility of soils, subsoils and other drift or solid geologies. Anomalies may be amorphous, linear or curvilinear and may appear 'fluvial' or discrete; the latter are almost impossible to distinguish from pit-like anomalies with an anthropogenic origin. Fluvial, glacial and periglacial processes may be responsible for their formation within drift material and subsoil. Igneous and metamorphic activity can lead to anomalies within more solid geology.

Table 1: List and description of interpretation categories

3.4 List of anomalies - Area 1

Area centred on OS NGR 414645 174390, see Fig 03.

Anomalies with an uncertain origin

(1) - A fragmented positive linear anomaly extends across the centre of the survey area with a north west to south east orientation. The survey area is situated in the

base of the valley and it is not clear if the anomaly is associated with a naturally formed feature, or if it relates to a cut, ditch-like feature. Bronze Age field systems are situated on the slopes to the south and north; however, those to the south, associated with the Dean Bottom enclosure, are oriented west north west to east south east and north north east to south south west. Those to the north are oriented slightly more to the north west to south east, but are still not at the same angle as anomaly (1).

(2) - Located predominantly to the north of anomaly (1) are a number of discrete, positive anomalies with a response of up to 6-7nT. This may indicate magnetic enhancement due to anthropogenic activity; however, while such anomalies could relate to pits with an archaeological origin, tree throw pits, variations within the underlying head/colluvium deposits and modern activity could also result in pit-like features.

(3) - In the southern part of the survey area are a number of negative linear anomalies. They are generally not parallel with agricultural anomalies (4), although such responses could relate to vehicle ruts or possible water run-off rills.

Anomalies with an agricultural origin

(4) - Parallel linear anomalies relate to former episodes of ploughing.

Anomalies associated with magnetic debris

(5) - Strong, discrete, dipolar anomalies are a response to ferrous objects within the topsoil.

Anomalies with a modern origin

(6) - A multiple dipolar linear anomaly extends along the southern edge of the survey area and relates to a buried pipe. This lies just beyond the southern limit of the area outlined for tree planting.

3.5 List of anomalies - Area 2

Area centred on OS NGR 415325 175280, see Figs 04 & 05.

Anomalies associated with land management

(7) - A positive linear anomaly extends across the northern part of the survey area. It is on the same orientation as a series of lynchets that lie within the field immediately to the north west and this could indicate a continuation of a lynchet or former field boundary.

Anomalies with an uncertain origin

(8) - Situated approximately 40m south west of, and generally parallel with, anomaly (7) is a broad, positive linear response. It has been truncated by modern ploughing and is not clearly defined, but it could relate to a further former lynchet.

(9) - Located in the southern part of the survey area is a positive linear anomaly with a north east to south west orientation. It is not generally parallel with the agricultural anomalies and could relate to a cut, ditch-like feature.

Anomalies with an agricultural origin

(10) - The survey area contains anomalies caused by agricultural activity. These are generally parallel with the adjacent field boundaries; however, those in the southern part of the site may also relate to vehicular activity associated with the movement of manure heaps.

Anomalies with a natural origin

(11) - Located towards the southern end of the survey area are a number of amorphous positive responses. This part of the survey area lies within a shallow dry combe, with underlying head deposits and soils associated with soil patterns. The responses are, therefore, likely to relate to variations within the underlying soils and colluvial deposits.

4 DISCUSSION

4.1.1 Crossing the centre of Area 1, located within the dry valley at Dean Bottom, is a positive linear anomaly with several discrete positive responses to the north. The location within the valley base may indicate that these anomalies are associated with colluvial build-up and variations within natural depressions; however, an association with anthropogenic activity is also possible. On the slopes to the north and south are Bronze Age field systems formed by widespread former enclosure banks and ditches, which have been greatly denuded by ploughing since the 1950s. The positive linear anomaly (1) that lies within the centre of the survey area could be associated with the former field systems, although it is not exactly parallel with either those to the south or those to the north. It is possible that it relates to more recent activity. Evidence for WW2 activity was recorded by Gingell during the 1970s excavations with an American slit-trench cut into the Bronze Age enclosure that lies 200m to the south of Area 1. Other military activities could result in the formation of ditch-like anomalies.

4.1.2 Within Area 2 there is evidence for at least one positive linear anomaly which indicates a former boundary ditch (7). Although no such features have been recorded on any former mapping, a series of linear medieval lynchets are still

extant in the field immediately to the north west. These are parallel with this feature and one appears to be a direct continuation of it. A second parallel anomaly (8) lies 40m south of (7) and could relate to another former lynchet. Both have been eroded by ploughing. In the southern part of Area 2 is a positive linear anomaly (9) that may relate to a cut, ditch-like feature with a north east to south west orientation. Other anomalies within the survey area relate to naturally formed features associated with colluviation.

5 CONCLUSION

5.1.1 The geophysical survey located a positive linear anomalies and a number of discrete responses within Area 1 at Dean Bottom. It is not clear if they relate to natural features formed within the valley base or if they relate to anthropogenic activity.

5.1.2 Within Area 2, situated near Barbury Castle Farm, the results indicate at least one linear ditch that could relate to a continuation of the lynchets situated immediately to the north west. Another linear anomaly in the southern part of the site could be associated with a ditch-like feature; however, the majority of the anomalies in this area relate to agricultural activity and natural features.

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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

Area 1

Filename: J772-mag-Area1-proc.xcp
Description: Imported as Composite from: J772-mag-Area1.asc
Instrument Type: Sensys DLMGPS
Units: nT
UTM Zone: 30U
Survey corner coordinates (X/Y):OSGB36
Northwest corner: 414609.26, 174431.54 m
Southeast corner: 414682.86, 174348.18 m
Direction of 1st Traverse: 90 deg
Collection Method: Randomised
Sensors: 5
Dummy Value: 32702
Source GPS Points: 82700
Dimensions
Composite Size (readings): 460 x 521
Survey Size (meters): 73.6 m x 83.4 m
Grid Size: 73.6 m x 83.4 m
X Interval: 0.16 m
Y Interval: 0.16 m
Stats
Max: 3.32
Min: -3.30
Std Dev: 1.30
Mean: -0.02
Median: 0.02
Composite Area: 0.61353 ha
Surveyed Area: 0.3078 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

Area 2

Filename: J772-mag-Area2.xcp
Description: Imported as Composite from: J772-mag-Area2.asc
Survey corner coordinates (X/Y):OSGB36
Northwest corner: 415252.31, 175506.83 m
Southeast corner: 415465.76, 175032.98 m
Source GPS Points: 721900
Dimensions
Composite Size (readings): 1423 x 3159
Survey Size (meters): 213 m x 474 m
Grid Size: 213 m x 474 m
X Interval: 0.15 m
Y Interval: 0.15 m
Stats
Max: 3.32
Min: -3.30
Std Dev: 1.11
Mean: 0.03
Median: 0.02
Composite Area: 10.114 ha
Surveyed Area: 2.2009 ha
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 PDF copy will be supplied to the Wiltshire Historic Environment Record with printed copies on request. The georeferenced greyscale images and abstraction layers will also be made available. The report will also be uploaded to the Online AccesS to the Index of archaeological investigationS (OASIS).

Archive contents:

File type	Naming scheme	Description
Data	J772-mag-**[area number/name]**.asc J772-mag-**[area number/name]**.xcp J772-mag-**[area number/name]**-proc.xcp	Raw data as ASCII CSV TerraSurveyor raw data TerraSurveyor minimally processed data
Graphics	J772-mag-**[area number/name]**-proc.tif	Image in TIF format
Drawing	J772-**[version number]**.dwg	CAD file in 2010 dwg format
Report	J772 report.odt	Report text in Open Office odt format

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 NEG LINEAR UNCERTAIN		Blue 0,0,255	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)
Anomalies relating to land management			
AS-ABST MAG BOUNDARY		127,0,0	Line, polyline or polygon (solid or cross hatched ANSI37)
Anomalies with an agricultural origin			
AS-ABST MAG AGRICULTURAL		Green 0,255,0	Line or polyline
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 DISTURBANCE		132, 132, 132	Polygon (hatched ANSI31)
AS-ABST MAG SERVICE		132, 132, 132	Line or polyline
Anomalies with a natural origin			
AS-ABST MAG NATURAL FEATURES		Yellow 255,255,0	Polygon (cross hatched ANSI37)

Table 3: CAD layering

Appendix F – copyright and intellectual property

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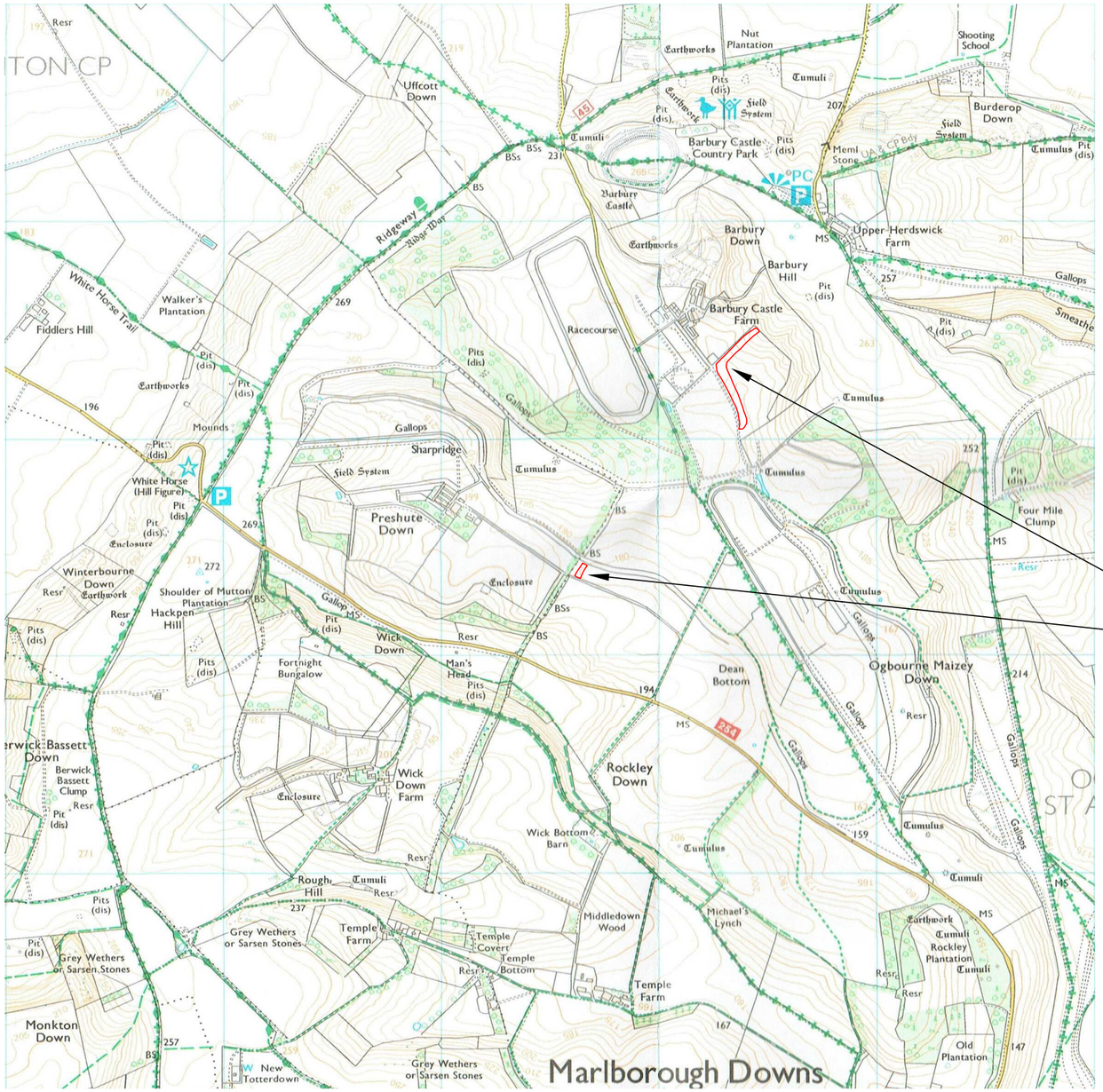
Geophysical Survey
Barbury Castle Estate
Ogbourne St Andrew
Wiltshire

Map of survey areas



● Survey location

Survey areas centred on OS NGR SU 14645 74390 & SU 15325 75280

SCALE 1:25 000

0m 500m 1000m

SCALE TRUE AT A3

DRAWN BY	CHECKED BY	
KTD	DJS	FIG 01

Archaeological Surveys Ltd

Geophysical Survey
Barbury Castle Estate
Ogbourne St Andrew
Wiltshire

Referencing information

Referencing grid to OSGB36 datum at 100m intervals

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

Area of proposed tree planting

SCALE 1:5000

0m 10 20 30 40 50m

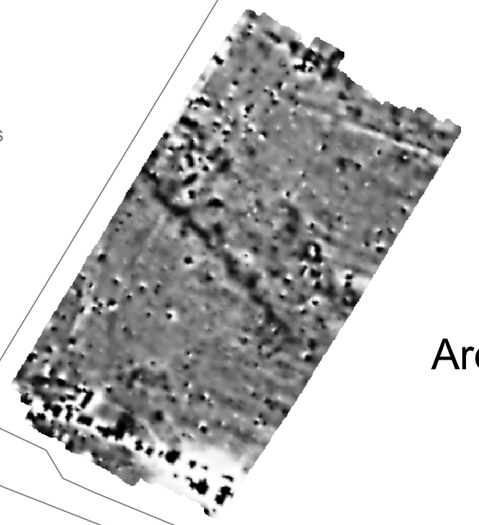
SCALE TRUE AT A3

DRAWN BY	CHECKED BY	
KTD	DJS	FIG 02

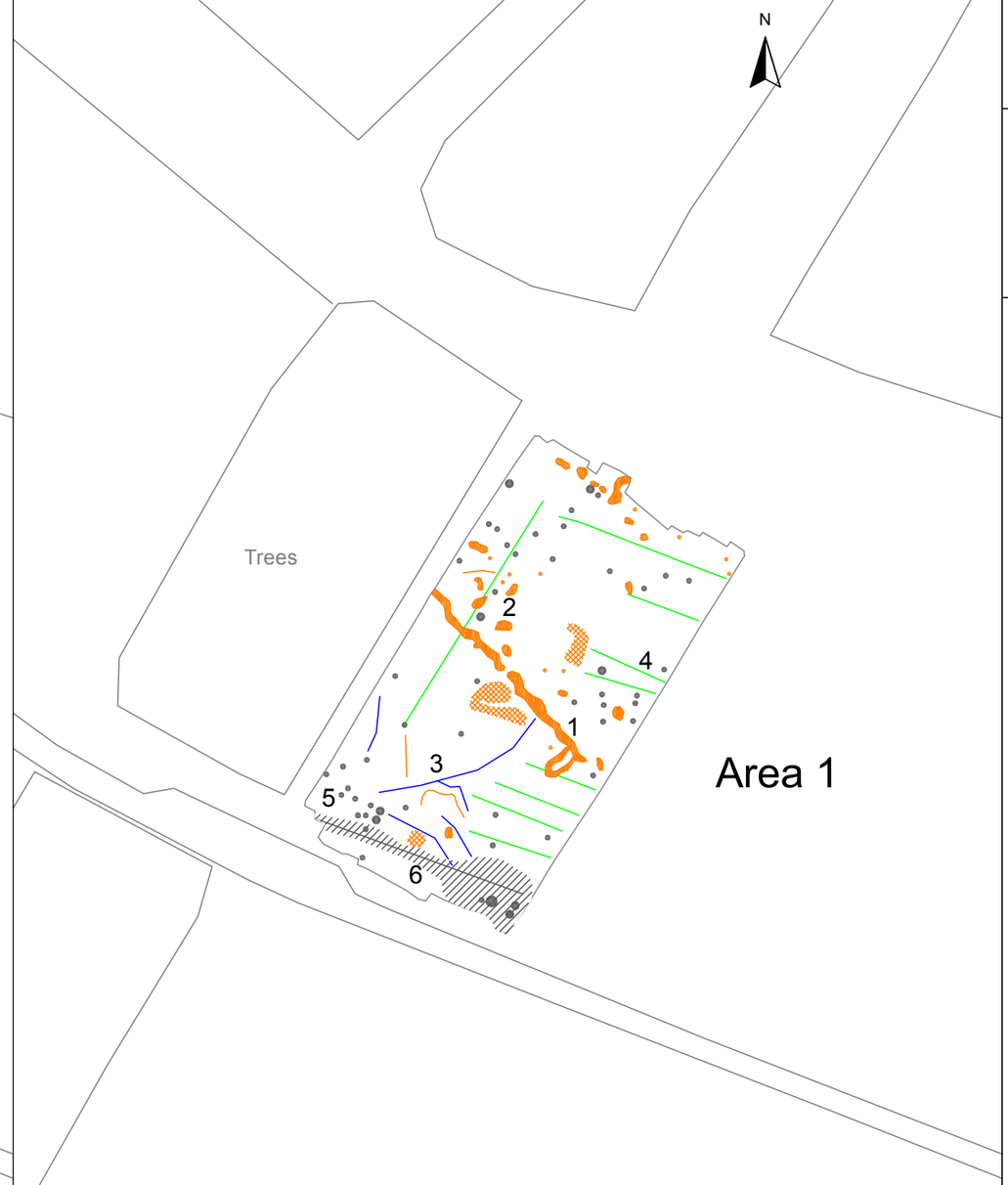
Archaeological Surveys Ltd

Geophysical Survey
Barbury Castle Estate
Ogbourne St Andrew
Wiltshire

Greyscale plot of processed magnetometer data



Greyscale plot of processed magnetometer data & abstraction & interpretation of magnetic anomalies - Area 1



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

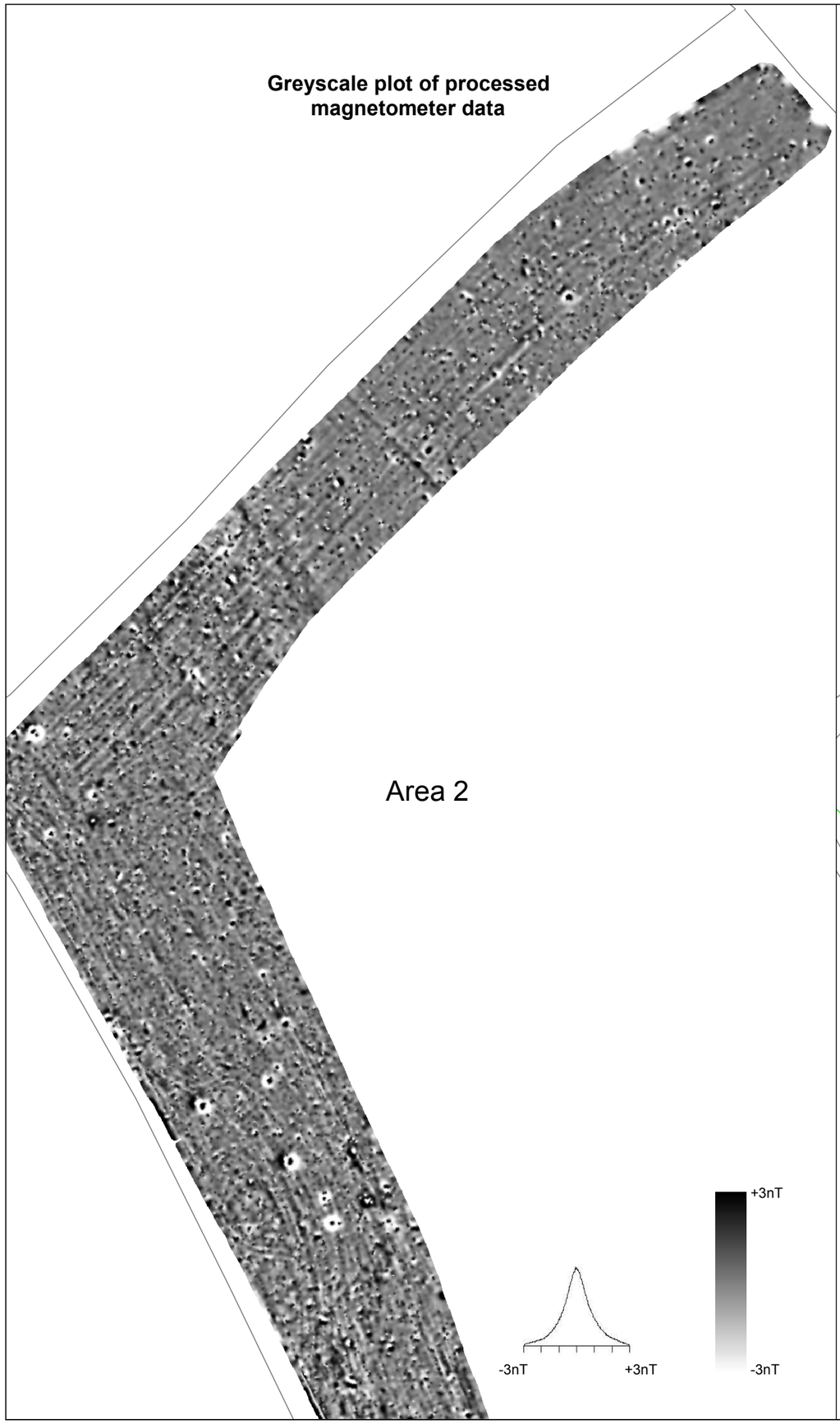
SCALE 1:1000

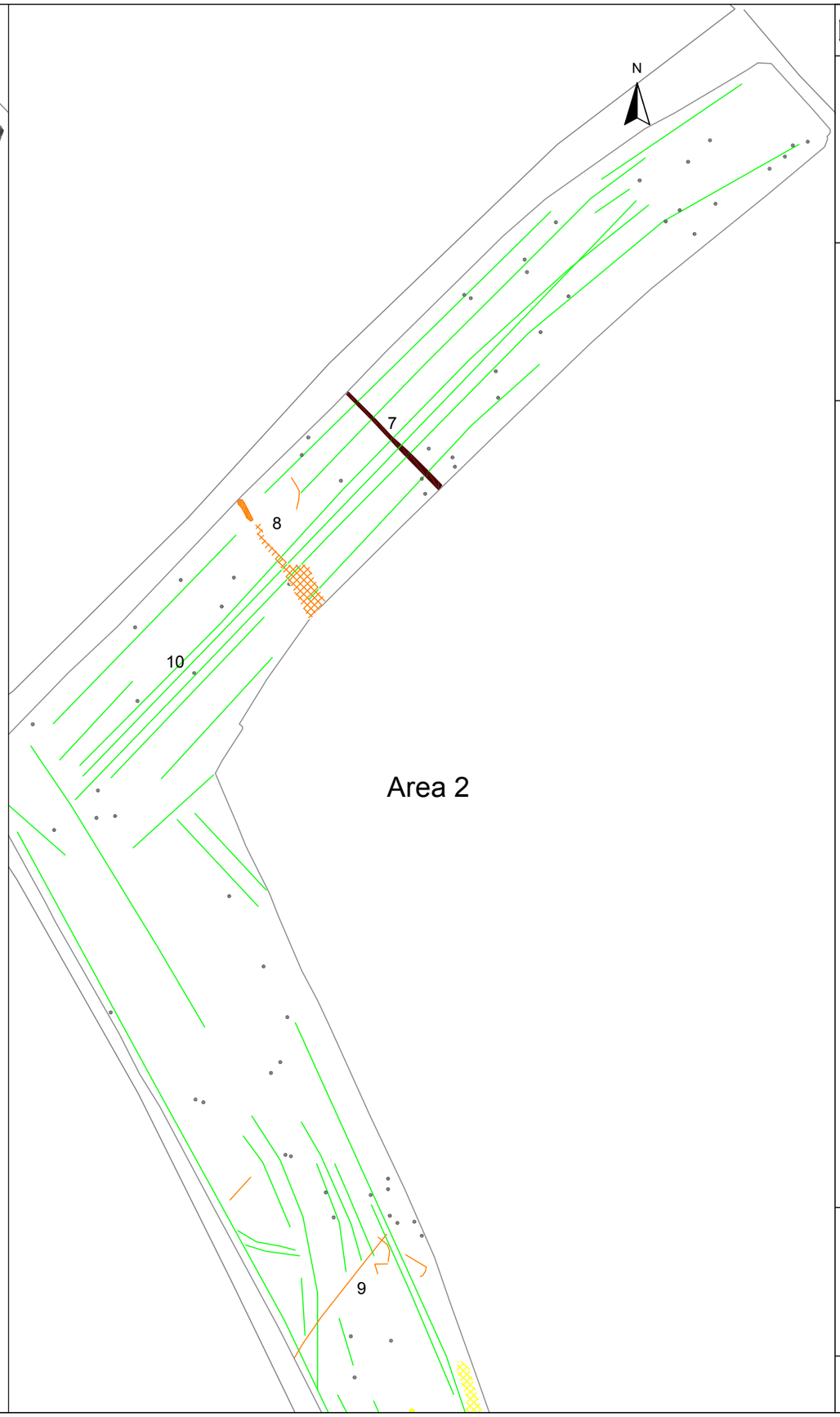
0m 10 20 30 40 50m

SCALE TRUE AT A3

DRAWN BY	CHECKED BY	
KTD	DJS	FIG 03

Greyscale plot of processed magnetometer data





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Geophysical Survey
Barbury Castle Estate
Ogbourne St Andrew
Wiltshire

Greyscale plot of processed magnetometer data & abstraction & interpretation of magnetic anomalies - Area 2 north

- Positive linear anomaly - possible former field boundary
- Positive linear anomaly - possible ditch-like feature
- Linear anomaly - of agricultural origin
- Positive anomaly - magnetically enhanced material
- Strong dipolar anomaly - ferrous object

SCALE 1:1250

0m 10 20 30 40 50m

SCALE TRUE AT A3

DRAWN BY	CHECKED BY	
KTD	DJS	FIG 04

Greyscale plot of processed magnetometer data

Area 2

-3nT +3nT

+3nT -3nT

Area 2

N

10

9

11

10

Archaeological Surveys Ltd

Geophysical Survey
Barbury Castle Estate
Ogbourne St Andrew
Wiltshire

Greyscale plot of processed magnetometer data & abstraction & interpretation of magnetic anomalies - Area 2 south

- Positive linear anomaly - possible ditch-like feature
- Linear anomaly - of agricultural origin
- Discrete positive response - possible pit-like feature
- Discrete positive response - of natural origin
- Positive magnetic response - of natural origin
- Strong dipolar anomaly - ferrous object

SCALE 1:1250

0m 10 20 30 40 50m

SCALE TRUE AT A3

DRAWN BY	CHECKED BY	
KTD	DJS	FIG 05