WYAS Archaeological Services

Land at East Hanney

Oxfordshire

Geophysical Survey

Report no. 2774
July 2015

Client: Barwood Development Securities Ltd

Land at East Hanney
Oxfordshire

Geophysical Survey

Summary

A geophysical (magnetometer) survey covering 10.2 hectares was carried out on agricultural land near East Hanney in advance of the submission of a planning application for a proposed development. No anomalies of archaeological potential have been identified by the geophysical survey. The survey has identified modern former field boundary and ploughing trends across the site. On the basis of the survey, the archaeological potential of the site is considered to be low.

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Services

Report Information

Client:	Barwood Development Securities Ltd
Address:	Grange Park Court, Roman Way, Northampton, NN4 5EA
Report Type:	Geophysical Survey
Location:	East Hanney
County:	Oxfordshire
Grid Reference:	SU 41827 92940
Period(s) of activity:	Modern
Report Number:	2774
Project Number:	4405
Site Code:	EHA15
OASIS ID:	archaeol11-216457
Planning Application No.:	N/A
Museum Accession No.:	N/A
Date of fieldwork:	May 2015
Date of report:	July 2015
Project Management:	Chris Sykes MA ACIfA
Fieldwork:	Mark Evans
	Rebecca Goulding
	Marina Ross
Report:	David Williams BA MCIfA
Illustrations:	David Williams, Ross Bishop BA
Photography:	Site Staff
Research:	N/A

Authorisation for distribution: ----------

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1 Introduction

Archaeological Services WYAS (ASWYAS) was commissioned by Jo Vallender of The Environmental Dimension Partnership (The Client) on behalf of their client Barwood Development Securities Ltd, to undertake a geophysical (magnetometer) survey of land directly east of the village of East Hanney, Oxfordshire (see Fig. 1). The work was undertaken in order to inform a planning application for the proposed development of the site for housing. The work was undertaken in accordance with policy contained within the National Planning Policy Framework (NPPF - DCLG 2012), in line with current best practice (CIfA 2014; David *et al.* 2008) and to a Project Design (Richardson 2015) approved by the Local Planning Archaeologist for Oxfordshire. The survey was carried out between May 11th and May 14th 2015 in order to provide additional information on the archaeological resource of the site.

Site location and topography and land use

The geophysical survey area (GSA) is located to the east of the village of East Hanney, 5km to the north of Wantage. The GSA is bound to the west by the A338 and Steventon Road to the north with the east and south boundaries bordering onto agricultural land. The GSA covers approximately 10.2 hectares of agricultural farmland, centred at SU 41827 92940. It comprises one large roughly rectangular field, currently under arable cultivation, a public footpath runs through the southern part of the GSA with agricultural buildings located towards the north and south (see Fig. 2). The GSA is a generally flat, located around 62-63m above Ordnance Datum (aOD).

Soils and geology

The underlying bedrock geology comprises mudstone of the Ampthill clay Formation and Kimmeridge clay formation. This is overlain with superficial deposits of Northmoor sand and gravel (British Geological Survey 2015). The soils in the area are classified in the Grove association, characterised as moderate, permeable loamy calcareous soils over chalky gravel (Soil Survey of England and Wales 1983).

2 Archaeological and Historical Background

An archaeological desk-based assessment by EDP (Vallender 2015) established that the site did not contain any previously recorded designated or non-designated heritage assets. Iron Age remains have been located in the wider landscape as part of the Abingdon reservoir project *c.* 300m to the north and also *c.* 500m to the south-west. The course of the modern A338, located along the western side of the site, follows the course of Margary's Roman Road 164 (Margary 1973) and as such roadside features could be expected.

The medieval settlement of East Hanney appears to have been focused upon the Letcombe Brook located 450m to the west of the GSA. Cartographic evidence suggest the GSA has been used as agricultural fields, but had been subdivided. Aerial photographic analysis indicated the GSA has previously retained evidence for ridge and furrow cultivation, the remains of which have been subsequently removed by modern ploughing.

3 Aims, Methodology and Presentation

The general objective of the geophysical survey was to provide information about the presence/absence, character, and extent of any archaeological remains identified within the GSA and to help inform further strategies, should they be required.

Specifically, the objectives of the geophysical survey were:

- to provide information about the nature and possible interpretation of any magnetic anomalies identified;
- to therefore determine the presence/absence and extent of any buried archaeological features; and
- to prepare a report summarising the results of the survey.

Magnetometer survey

The site grid was laid out using a Trimble VRS differential Global Positioning System (Trimble 5800 model). Bartington Grad601 magnetic gradiometers were used during the survey, taking readings at 0.25m intervals on zig-zag traverses 1.0m apart within 30m by 30m grids, so that 3600 readings were recorded in each grid. These readings were stored in the memory of the instrument and later downloaded to computer for processing and interpretation. Geoplot 3 (Geoscan Research) software was used to process and present the data. Further details are given in Appendix 1.

Reporting

A general site location plan, incorporating the 1:50000 Ordnance Survey (OS) mapping, is shown in Figure 1. A large scale (1:2000) survey location plan, showing the processed data, is provided as Figure 2 with an overall interpretation of the data at the same scale included as Figure 3. The processed and minimally processed data, together with an interpretation of the survey results are presented in Figures 4 to 9 inclusive, at a scale of 1:1000.

Technical information on the equipment used, data processing and survey methodologies are given in Appendix 1 and Appendix 2. Appendix 3 describes the composition and location of the archive. A copy of the OASIS form is in Appendix 4.

The survey methodology, report and any recommendations comply with guidelines outlined by English Heritage (David *et al.* 2008) and by the Chartered Institute for Archaeologists (CIfA 2014).

The figures in this report have been produced following analysis of the data in 'raw' and processed formats and over a range of different display levels. All figures are presented to most suitably display and interpret the data from this site based on the experience and knowledge of Archaeological Services staff.

4 Results and Discussion (see Figures 4 to 12 inclusive)

Generally, the survey has identified an abundance of small discreet geological anomalies and modern ploughing anomalies, across the GSA. The anomalies that have been identified by the survey are discussed below and cross-referenced to specific examples depicted on the interpretative figures, where appropriate.

Ferrous anomalies

Ferrous anomalies, as individual 'spikes', are typically caused by ferrous (magnetic) material, either on the ground surface or in the plough-soil. Little importance is normally given to such anomalies, unless there is any supporting evidence for an archaeological interpretation, as modern ferrous debris or material is common on rural sites, often being present as a consequence of manuring or tipping/infilling. There is no obvious pattern or clustering to their distribution on this site, other than as described below, to suggest anything other than a random background scatter of ferrous debris in the plough-soil.

A single linear dipolar anomaly, (**A**), approximately north/south is located within the centre of the survey area. This anomaly is caused by a sub-surface pipe or drain but also appears to represent the boundary between two differing alignments of post-medieval ploughing (see below).

Several other groups of high magnitude 'spike' responses, **B**, **C** and **D**, also appear to be aligned upon anomaly **A** and as such the latter could represent an internal division within the field most likely early modern in date. These anomalies do not correspond with any surface features.

There is a cluster of ferrous responses, **E**, along the southern side of the site where a modern footpath and track runs to some agricultural buildings. These are likely to be due to modern dumping in the corner of the field.

Agricultural anomalies

Across the survey area there are vague linear trends in the data aligned parallel with the existing field boundary. There are two separate regimes, one (**F**) aligned north/south is located in the north and west of the site, while the other regime (**G**), is aligned east/west and located in the south-eastern corner of the survey area. These anomalies reflect the ridge and furrow ploughing that has subsequently been removed by modern ploughing of the GSA.

Geological Anomalies

Throughout the site small anomalies of slightly enhanced magnetic response are identified. These are interpreted as geological in origin being caused by minor changes in the composition of the soils or the superficial deposits.

5 Conclusions

No anomalies of archaeological potential have been identified by the geophysical survey. The survey has identified modern former field boundary and ploughing trends that represent previous ridge and furrow cultivation across the site. On the basis of the survey, the archaeological potential of the site is considered to be low.

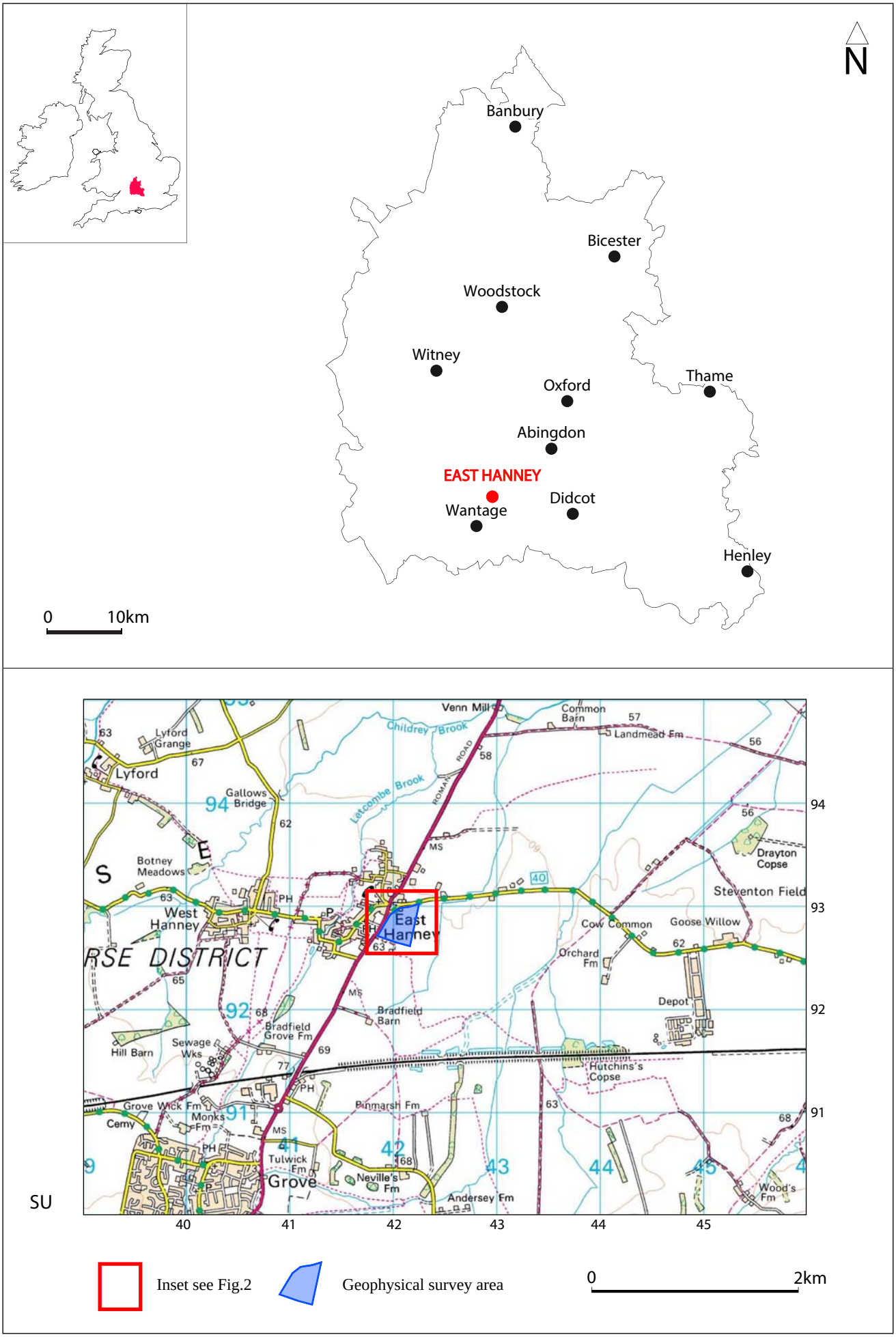

Fig. 1. Site location

GEOPHYSICAL SURVEY AREA

LOCATION AND DIRECTION OF PLATES

N

SECTOR 1
SEE FIGS 4-6

SECTOR 2
SEE FIGS 7-9

2.0

-1.0

nT

1930 00

4420 00

0 100m

Archaeological Services W Y A S
PO Box 30, Nepshaw Lane South, Morley, LS27 0UG
Tel: 0113 383 7500 Fax:0113 383 7501

Fig. 2. Survey location showing greyscale magnetometer data (1:2000 @ A3)

TYPE OF ANOMALY		INTERPRETATION
•	DIPOLAR ISOLATED	FERROUS MATERIAL
——	DIPOLAR LINEAR	SERVICE PIPE
	MAGNETIC DISTURBANCE	FERROUS MATERIAL
	LINEAR TREND	AGRICULTURAL
	MAGNETIC ENHANCEMENT	GEOLOGY

N

193000

442000

A

B

C

D

E

F

G

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Tel: 0113 383 7500 Fax:0113 383 7501

0 100m

Fig. 3.Overall interpretation of magnetometer data (1:2000 @ A3)

SECTOR BOUNDARY

N

193000

2.0

-1.0

nT

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420000

422000

0 30m

Fig. 4. Processed greyscale magnetometer data; Sector 1 (1:1000 @ A3)

SECTOR BOUNDARY

N

61

193000

20.0 nT/cm

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Tel: 0113 383 7500 Fax:0113 383 7501

420000

422000

0 30m

Fig. 5. XY trace plot of minimally processed magmetometer data; Sector 1 (1:1000 @ A3)

SECTOR BOUNDARY

TYPE OF ANOMALY		INTERPRETATION
•	DIPOLAR ISOLATED	FERROUS MATERIAL
—	DIPOLAR LINEAR	SERVICE PIPE
	MAGNETIC DISTURBANCE	FERROUS MATERIAL
	LINEAR TREND	AGRICULTURAL
	MAGNETIC ENHANCEMENT	GEOLOGY

N

61

D

C

A

F

193000

2.0

-1.0

nT

Archaeological Services W Y A S
PO Box 30, Nepshaw Lane South, Morley, LS27 0UG
Tel: 0113 383 7500 Fax:013 383 7501

420000

422000

0 30m

Fig. 6. Interpretation of magnetometer data; Sector 1 (1:1000 @ A3)

SECTOR BOUNDARY

N

1928 00

2.0

-1.0

nT

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Tel: 0113 383 7500 Fax:0113 383 7501

4420 00

4422 00

0 30m

Fig. 7. Processed greyscale magnetometer data; Sector 2 (1:1000 @ A3)

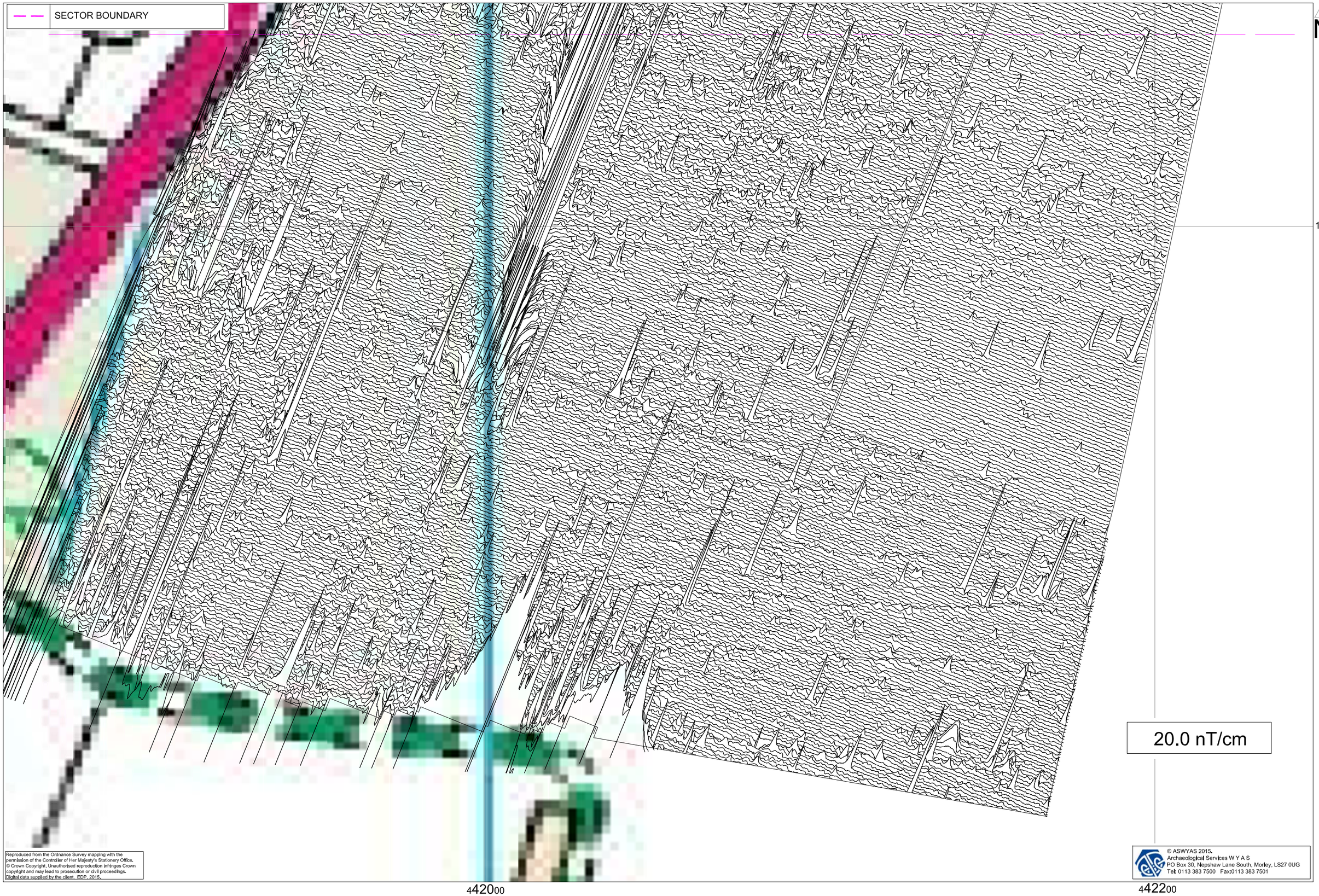

Fig. 8. XY trace plot of minimally processed magmetometer data; Sector 2 (1:1000 @ A3)

SECTOR BOUNDARY

N

A

B

G

E

1928 00

4420 00

4422 00

0 30m

Fig. 8. Interpretation of magnetometer data; Sector 2 (1:1000 @ A3)

Plate 1. General view of survey area, looking south-west

Plate 2. General view of survey area, looking south

Plate 3. General view of survey area, looking north-east

Plate 4. General view of survey area, looking west

Appendix 1: Magnetic survey - technical information

Magnetic Susceptibility and Soil Magnetism

Iron makes up about 6% of the Earth's crust and is mostly present in soils and rocks as minerals such as maghaemite and haemetite. These minerals have a weak, measurable magnetic property termed magnetic susceptibility. Human activities can redistribute these minerals and change (enhance) others into more magnetic forms. Areas of human occupation or settlement can then be identified by measuring the magnetic susceptibility of the topsoil because of the attendant increase (enhancement) in magnetic susceptibility. If the enhanced material subsequently comes to fill features, such as ditches or pits, localised isolated and linear magnetic anomalies can result whose presence can be detected by a magnetometer (fluxgate gradiometer).

In general, it is the contrast between the magnetic susceptibility of deposits filling cut features, such as ditches or pits, and the magnetic susceptibility of topsoils, subsoils and rocks into which these features have been cut, which causes the most recognisable responses. This is primarily because there is a tendency for magnetic ferrous compounds to become concentrated in the topsoil, thereby making it more magnetic than the subsoil or the bedrock. Linear features cut into the subsoil or geology, such as ditches, that have been silted up or have been backfilled with topsoil will therefore usually produce a positive magnetic response relative to the background soil levels. Discrete feature, such as pits, can also be detected. The magnetic susceptibility of a soil can also be enhanced by the application of heat and the fermentation and bacterial effects associated with rubbish decomposition. The area of enhancement is usually quite large, mainly due to the tendency of discard areas to extend beyond the limit of the occupation site itself, and spreading by the plough. An advantage of magnetic susceptibility over magnetometry is that a certain amount of occupational activity will cause the same proportional change in susceptibility, however weakly magnetic is the soil, and so does not depend on the magnetic contrast between the topsoil and deeper layers. Susceptibility survey is therefore able to detect areas of occupation even in the absence of cut features. On the other hand susceptibility survey is more vulnerable to the masking effects of layers of colluvium and alluvium as the technique, using the Bartington system, can generally only measure variation in the first 0.15m of ploughsoil.

Types of Magnetic Anomaly

In the majority of instances anomalies are termed 'positive'. This means that they have a positive magnetic value relative to the magnetic background on any given site. However some features can manifest themselves as 'negative' anomalies that, conversely, means that the response is negative relative to the mean magnetic background.

Where it is not possible to give a probable cause of an observed anomaly a '?' is appended.

It should be noted that anomalies interpreted as modern in origin might be caused by features that are present in the topsoil or upper layers of the subsoil. Removal of soil to an archaeological or natural layer can therefore remove the feature causing the anomaly.

The types of response mentioned above can be divided into five main categories that are used in the graphical interpretation of the magnetic data:

Isolated dipolar anomalies (iron spikes)
These responses are typically caused by ferrous material either on the surface or in the topsoil. They cause a rapid variation in the magnetic response giving a characteristic 'spiky' trace. Although ferrous archaeological artefacts could produce this type of response, unless there is supporting evidence for an archaeological interpretation, little emphasis is normally given to such anomalies, as modern ferrous objects are common on rural sites, often being present as a consequence of manuring.

Areas of magnetic disturbance
These responses can have several causes often being associated with burnt material, such as slag waste or brick rubble or other strongly magnetised/fired material. Ferrous structures such as pylons, mesh or barbed wire fencing and buried pipes can also cause the same disturbed response. A modern origin is usually assumed unless there is other supporting information.

Linear trend
This is usually a weak or broad linear anomaly of unknown cause or date. These anomalies are often caused by agricultural activity, either ploughing or land drains being a common cause.

Areas of magnetic enhancement/positive isolated anomalies
Areas of enhanced response are characterised by a general increase in the magnetic background over a localised area whilst discrete anomalies are manifest by an increased response (sometimes only visible on an XY trace plot) on two or three successive traverses. In neither instance is there the intense dipolar response characteristic exhibited by an area of magnetic disturbance or of an 'iron spike' anomaly (see above). These anomalies can be caused by infilled discrete archaeological features such as pits or post-holes or by kilns. They can also be caused by pedological variations or by natural infilled features on certain geologies. Ferrous material in the subsoil can also give a similar response. It can often therefore be very difficult to establish an anthropogenic origin without intrusive investigation or other supporting information.

Linear and curvilinear anomalies
Such anomalies have a variety of origins. They may be caused by agricultural practice (recent ploughing trends, earlier ridge and furrow regimes or land drains), natural geomorphological features such as palaeochannels or by infilled archaeological ditches.

Methodology: Gradiometer Survey

The main method of using the fluxgate gradiometer for commercial evaluations is referred to as ***detailed survey*** and requires the surveyor to walk at an even pace carrying the instrument within a grid system. A sample trigger automatically takes readings at predetermined points,

typically at 0.25m intervals, on traverses 1m apart. These readings are stored in the memory of the instrument and are later dumped to computer for processing and interpretation.

During this survey a Bartington Grad601 magnetic gradiometer was used taking readings on the 0.1nT range, at 0.25m intervals on zig-zag traverses 0.5m apart within 30m by 30m square grids. The instrument was checked for electronic and mechanical drift at a common point and calibrated as necessary. The drift from zero was not logged.

Data Processing and Presentation

The detailed gradiometer data has been presented in this report in XY trace and greyscale formats. In the former format the data shown is 'raw' with no processing other than grid biasing having been done. The data in the greyscale images has been interpolated and selectively filtered to remove the effects of drift in instrument calibration and other artificial data constructs and to maximise the clarity and interpretability of the archaeological anomalies.

An XY plot presents the data logged on each traverse as a single line with each successive traverse incremented on the Y-axis to produce a 'stacked' plot. A hidden line algorithm has been employed to block out lines behind major 'spikes' and the data has been clipped. The main advantage of this display option is that the full range of data can be viewed, dependent on the clip, so that the 'shape' of individual anomalies can be discerned and potentially archaeological anomalies differentiated from 'iron spikes'. Geoplot 3 software was used to create the XY trace plots.

Geoplot 3 software was used to interpolate the data so that 3600 readings were obtained for each 30m by 30m grid. The same program was used to produce the greyscale images. All greyscale plots are displayed using a linear incremental scale.

The results and subsequent interpretation of data from geophysical surveys should not be treated as an absolute representation of the underlying archaeological and non-archaeological remains. Confirmation of the presence or absence of archaeological remains can only be achieved by direct investigation of sub-surface deposits.

Appendix 2: Survey location information

The site grid was laid out using a Trimble dual frequency Global Positioning System (GPS) with two Rovers (Trimble 5800 models) working in real-time kinetic mode. The accuracy of such equipment was better than 0.02m. However, it should be noted that Ordnance Survey positional accuracy for digital map data has an error of 0.5m for urban and floodplain areas, 1.0m for rural areas and 2.5m for mountain and moorland areas. This potential error must be considered if co-ordinates are measured off for relocation purposes.

Archaeological Services WYAS cannot accept responsibility for errors of fact or opinion resulting from data supplied by a third party.

Appendix 3: Geophysical archive

The geophysical archive comprises:-

- an archive disk containing compressed (WinZip 8) files of the raw data, report text (Microsoft Word 2000), and graphics files (Adobe Illustrator CS2 and AutoCAD 2008) files; and
- a full copy of the report.

At present the archive is held by Archaeological Services WYAS although it is anticipated that it may eventually be lodged with the Archaeology Data Service (ADS). Brief details may also be forwarded for inclusion on the English Heritage Geophysical Survey Database after the contents of the report are deemed to be in the public domain (i.e. available for consultation in the Oxfordshire Historic Environment Record).

Appendix 4: OASIS Form

OASIS DATA COLLECTION FORM: England

Printable version

OASIS ID: archaeol11-216457

Project details

Project name	Land at East Hanney
Short description of the project	A geophysical (magnetometer) survey covering 10.2 hectares was carried out on agricultural land near East Hanney in advance of the submission of a planning application for a proposed development. No anomalies of archaeological potential have been identified by the geophysical survey. The survey has identified modern former field boundary and ploughing trends across the site. On the basis of the survey, the archaeological potential of the site is considered to be low.
Project dates	Start: 11-05-2015 End: 14-05-2015
Previous/future work	No / Not known
Type of project	Field evaluation
Site status	None
Current Land use	Cultivated Land 4 - Character Undetermined
Monument type	NONE None
Significant Finds	NONE None
Methods & techniques	"Geophysical Survey"
Development type	Housing estate
Prompt	National Planning Policy Framework - NPPF
Position in the planning process	Pre-application
Solid geology	AMPTHILL AND KIMMERIDGE CLAY
Drift geology	SAND AND GRAVEL OF UNCERTAIN AGE OR ORIGIN
Techniques	Magnetometry

Project location

Country	England
Site location	OXFORDSHIRE VALE OF WHITE HORSE EAST HANNEY Land at East Hanney
Study area	10.20 Hectares
Site coordinates	SU 41827 92940 51.6332448926 -1.39559154583 51 37 59 N 001 23 44 W Point

Height OD / Depth	Min: 62.00m Max: 63.00m

Project creators

Name of Organisation	Archaeological Services WYAS
Project brief originator	Environmental Dimension Partnership
Project design originator	Archaeological Services WYAS
Project director/manager	C. Sykes
Project supervisor	Evans, M.
Type of sponsor/funding body	Developer
Name of sponsor/funding body	Barwood Development Securities Ltd

Project archives

Physical Archive Exists?	No
Digital Archive recipient	N/A
Digital Contents	"none"
Digital Media available	"Geophysics","Images raster / digital photography","Text"
Paper Archive Exists?	No

Project bibliography 1

Publication type	Grey literature (unpublished document/manuscript)
Title	Land at East Hanney, Oxfordshire, Geophysical Survey
Author(s)/Editor(s)	Williams, D.
Other bibliographic details	Report No. 2774
Date	2015
Issuer or publisher	Archaeological Services WYAS
Place of issue or publication	Leeds

Entered by	David Williams (dwilliams@aswyas.com)
Entered on	2 July 2015

OASIS:

Please e-mail Historic England for OASIS help and advice
 Created by Jo Gilham and Jen Mitcham, email Last modified Wednesday 9 May 2012
Cite only: http://www.oasis.ac.uk/form/print.cfm for this page

Bibliography

British Geological Survey, 2015. www.bgs.ac.uk/discoveringGeology/geology Of Britain/viewer.html. (viewed May 2015)

Chartered Institute for Archaeologists, 2014. *Standard and Guidance for Archaeological Geophysical Survey*. CIfA

David, A., N. Linford, P. Linford and L. Martin, 2008. *Geophysical Survey in Archaeological Field Evaluation: Research and Professional Services Guidelines (2nd edition)* English Heritage

DCLG, 2012. *National Planning Policy Framework.* Department of Communities and Local Government

Margary, I. D., 1973. *Roman Roads in Britain*

Richardson, J. 2015. *Project Design for Geophysical Survey for Land at East Hanney, Oxfordshire.* Unpublished ASWYAS document

Soil Survey of England and Wales, 1983. *Soil Survey of England and Wales: Soils of Midland and Western England,* Sheet 3

Vallender, J., 2015. *Land East of East Hanney, Oxfordshire Archaeological and Heritage Assessment.* Draft EDP report, No. EDP2603_02