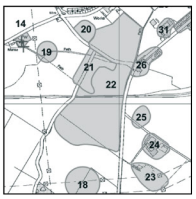
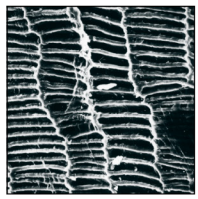
GCBU/01










LAND AT GERRARDS CROSS GOLF COURSE, BUCKINGHAMSHIRE

GEOPHYSICAL SURVEY

commissioned by BSA Heritage Ltd

December 2015

HEADLAND ARCHAEOLOGY

REGISTERED · CIfA · ORGANISATION

LAND AT GERRARDS CROSS GOLF COURSE, BUCKINGHAMSHIRE

GEOPHYSICAL SURVEY

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December 2015

project info

HA JOB NO.	GCBU/01
NGR	TQ 01400 90080
PARISH	South Banks
LOCAL AUTHORITY	Buckinghamshire
OASIS REF.	headland5-235308

project team

PROJECT MANAGER	Sam Harrison
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APPROVED BY	Sam Harrison – Project Manager

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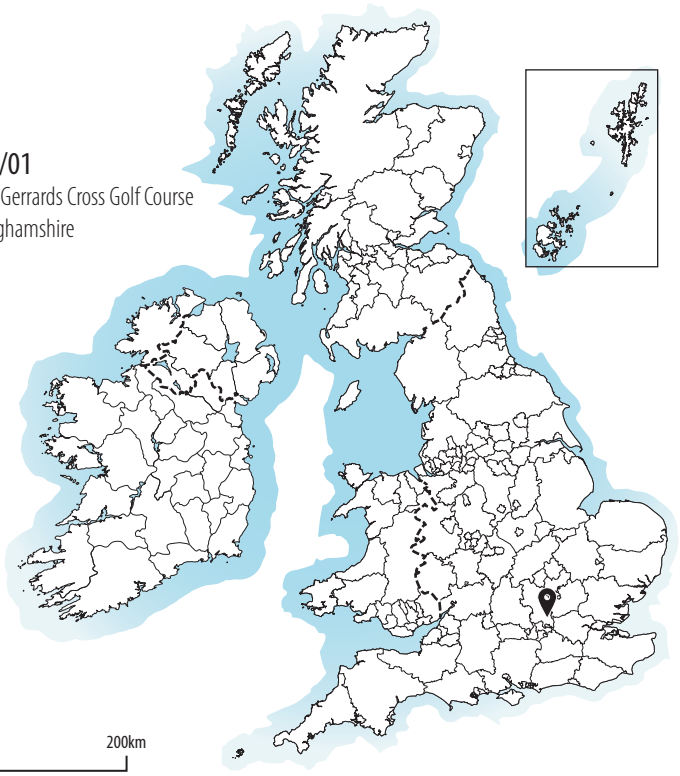
PROJECT SUMMARY

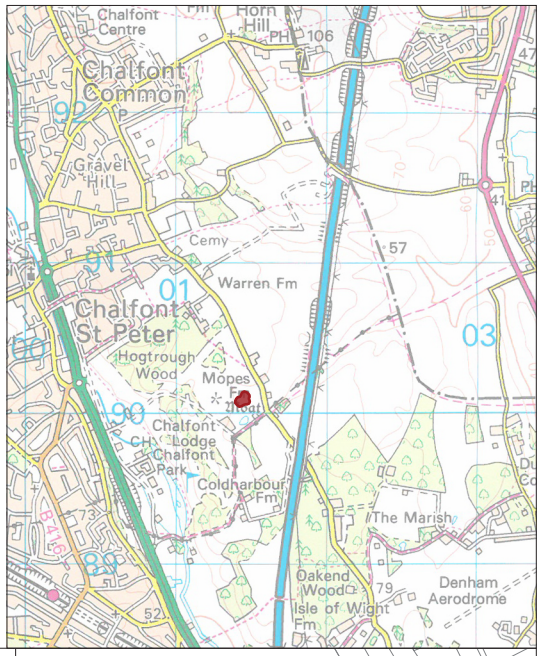
Headland Archaeology (UK) Ltd undertook a geophysical (magnetometer) survey covering 1.2 hectares of land to the south of Gerrards Cross Golf Course to provide information about the archaeological potential of land proposed for development. No anomalies of definite archaeological potential have been identified by the survey although two faint linear anomalies may have been some archaeological potential, perhaps forming part of an enclosure, although a modern agricultural origin is considered equally possible. There is no indication from any other source to suggest that the magnetic data provides anything other than an accurate representation of the sub-surface conditions within the survey area. Therefore, based on the results and interpretation of the data, the archaeological potential of the site is considered to be low.

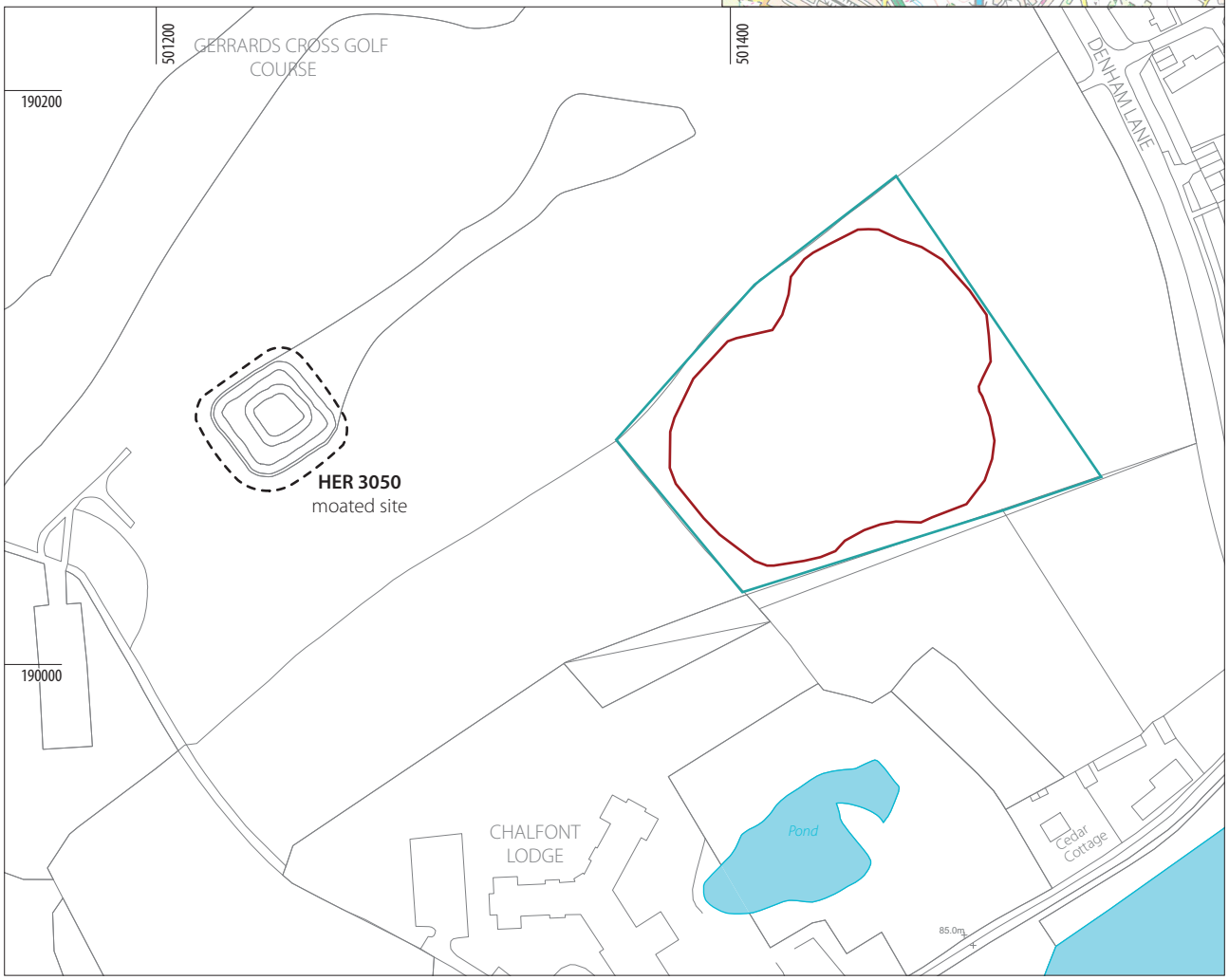
CONTENTS

LIST OF ILLUSTRATIONS

GCBU/01
land at Gerrards Cross Golf Course
Buckinghamshire







KEY
- proposed development boundary
- geophysical survey area

N
0
125m
scale 1:2,500 @ A4

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ILLUS 1 Site location

LAND AT GERRARDS CROSS GOLF COURSE, BUCKINGHAMSHIRE

GEOPHYSICAL SURVEY

1 INTRODUCTION

Headland Archaeology (UK) Ltd was commissioned by BSA Heritage Ltd (The Client) to undertake a geophysical (magnetometer) survey on land south of Gerrards Cross Golf Course, Buckinghamshire, where it is proposed to construct a reservoir. The work was undertaken in accordance with a Written Scheme of Investigation (Headland Archaeology 2015) which was submitted to and approved by Phil Markham, Senior Archaeologist with Buckinghamshire County Council, with guidance within the National Planning Policy Framework (DCLG 2012) and in line with current best practice (David et al. 2008). The survey was carried out on 26th November 2015 in order to provide additional information on the archaeological potential of the site.

1.1 SITE LOCATION, TOPOGRAPHY AND LAND-USE

The proposed development area (PDA) comprises of an irregularly shaped parcel of land within the west of a trapezoidal-shaped field south of Gerrards Cross Golf Course, Buckinghamshire, centred at NGR 501400,190080 (see **ILLUS 1**). The field is bound to the north and west by the golf course, and to the east by Denham Lane. The southern boundary is defined by a wooden fence. The survey area was sub-divided by into three paddocks by temporary electric fencing (see **ILLUS 2** and **ILLUS 3**).

The local topography is gently undulating, but generally the PDA sits on a south-facing gradient being at 89m above Ordnance Datum (aOD) in the north and 87m aOD in the south.

1.2 GEOLOGY AND SOILS

The underlying bedrock geology consists of Lambeth Group, clays, silts and sands, overlain by Gerrards Cross Gravel, sand and gravel superficial deposits (British Geological Survey 2015).

The soils are classified in the Soilscape 6 association, characterised as freely draining, slightly acid loams (LandIS 2015).

2 ARCHAEOLOGICAL BACKGROUND

An Archaeology and Heritage Statement (BSA 2015) has identified a designated heritage asset 130m to the west of the PDA. The site is a small medieval moated site and is protected as a Scheduled Monument (HER 3050; see **ILLUS 4**).

The Buckinghamshire HER records finds and investigations in the surrounding landscape suggesting activity from prehistory, with likely Iron Age to Roman field system remains having been investigated east of the site.

2.1 AIMS, METHODOLOGY AND PRESENTATION

The main aim of the geophysical survey was to provide sufficient information to enable an assessment to be made of the impact of any proposed development on any potential sub-surface archaeological remains and for further evaluation or mitigation proposals, if appropriate, to be recommended.

The general archaeological objectives of the geophysical survey were:

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

2.2 MAGNETOMETER SURVEY

Magnetic survey methods rely on the ability of a variety of instruments to measure very small magnetic fields associated with buried archaeological remains. Features such as a ditch, pit or kiln can act like a small magnet, or series of magnets, that produce distortions (anomalies) in the Earth's magnetic field. In mapping these slight variations, detailed plans of sites can be obtained as buried features often produce reasonably characteristic anomaly shapes and strengths (Gaffney and Gater, 2003). Further information on soil magnetism and the interpretation of magnetic anomalies is provided in Appendix 1.

ILLUS 2 General view of survey area, looking north-east

The survey was undertaken using four Bartington Grad601 sensors mounted at 1m intervals (1m traverse interval) onto a rigid carrying frame. The system is programmed to take readings at a frequency of 10Hz (allowing for a 10–15cm sample interval) on roaming traverses 4m apart. These readings are stored on an external weatherproof laptop and later downloaded for processing and interpretation. The system is linked to a Trimble R8s Real Time Kinetic (RTK) differential Global Positioning System (dGPS) outputting in NMEA mode to ensure a high positional accuracy for each data point.

MLGrad601 and MultiGrad601 (Geomar Software Inc.) software has been used to collect and export the data. Terrasurveyor V3.0.27.1 (DWConsulting) software has been used to process and present the data.

2.3 REPORTING

A general site location plan is shown in **ILLUS 1** at a scale of 1:2,500. **ILLUS 2** and **ILLUS 3** are general site condition photographs. **ILLUS 4** is a large scale (1:4,000) survey location plan showing the processed greyscale magnetometer data. Detailed data plots ('raw' and processed) and an interpretative illustration are presented at a scale of 1:1,000 in **ILLUS 5**, **ILLUS 6** and **ILLUS 7**.

Technical information on the equipment used, data processing and magnetic survey methodology is given in Appendix 1. Appendix 2 details the survey location information and Appendix 3 describes the composition and location of the site archive. A copy of the OASIS entry (Online Access to the Index of Archaeological Investigations) is reproduced in Appendix 4.

The survey methodology, report and any recommendations comply with the Written Scheme of Investigation (Headland Archaeology 2015) and guidelines outlined by English Heritage (David et al. 2008) and by the Chartered Institute for Archaeologists (ClfA 2014). All illustrations reproduced from Ordnance Survey mapping are with the permission of the controller of Her Majesty's Stationery Office (Ó Crown copyright).

The illustrations 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 illustrations are presented to most suitably display and interpret the data from this site based on the experience and knowledge of management and reporting staff.

3 RESULTS AND DISCUSSION

Other than the high-magnitude anomalies caused by ferrous contamination, the geophysical survey has recorded a low level of background magnetic variation. Nevertheless, occasional discrete areas of magnetic enhancement have been identified. These are discussed below and cross-referenced to specific examples on the interpretive figures, where appropriate.

3.1 FERROUS/MODERN ANOMALIES

Ferrous anomalies, characterised 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

ILLUS 3 General view of survey area, looking east

to such anomalies, unless there is any supporting evidence for an archaeological interpretation, as modern ferrous debris or material is common on most sites, often being present as a consequence of manuring or tipping/infilling.

Two parallel linear dipolar anomalies, A and B, are visible on a north-west/south-east alignment. These correspond to temporary electric fences (see **ILLUS 2** and **ILLUS 3**).

Magnetic disturbance at the perimeter of the survey area is caused by ferrous material within, or forming part of, the adjacent field boundaries and by large ferrous objects such as water troughs and horse riding apparatus (see **ILLUS 3**).

3.2 GEOLOGICAL ANOMALIES

Numerous discrete areas of magnetic enhancement have been identified across the PDA. In theory, any of these discrete anomalies could be due to an isolated pit. However, their sheer number and widespread distribution tends to suggest a geological rather than archaeological origin. Furthermore, there is no discernible pattern to the anomalies and therefore a geological interpretation is preferred with the anomalies likely to be due to localised variations in the soils and the superficial deposits from which they derive.

3.3 POSSIBLE ARCHAEOLOGICAL ANOMALIES

Two very weak linear trends, C and D, can be seen within the north of the dataset appearing to form the corner of an enclosure or an unmapped modern field boundary. The anomalies do not correspond to any above-ground features nor to any features depicted on historical mapping sources and therefore an archaeological origin remains possible. However, the eastern extent of D appears to terminate at a temporary electric fence, A, suggesting that the anomalies may be agricultural rather than archaeological in origin, perhaps being due to a recent sub-division or to buried water pipes or drains.

4 CONCLUSION

No anomalies of definite archaeological potential have been identified by the geophysical survey although two very faint linear trends may form the corner of an enclosure or an unmapped field boundary. However, the apparent termination of one of the trends at a temporary electric fence suggests that a modern, agricultural origin is equally likely.

Elsewhere, anomalies have been identified which are due to localised variations within the soils and to modern ferrous contamination.

There is no indication from any other source to suggest that the magnetic data provides anything other than an accurate representation of the sub-surface conditions within the geophysical survey area. Therefore, based solely on the results and interpretation of the geophysical data, the archaeological potential of the site is assessed to be low.

5 REFERENCES

British Geological Survey 2015 Available: www.bgs.ac.uk/discoveringGeology/geology_OfBritain/viewer.html; Viewed: November 27th 2015.

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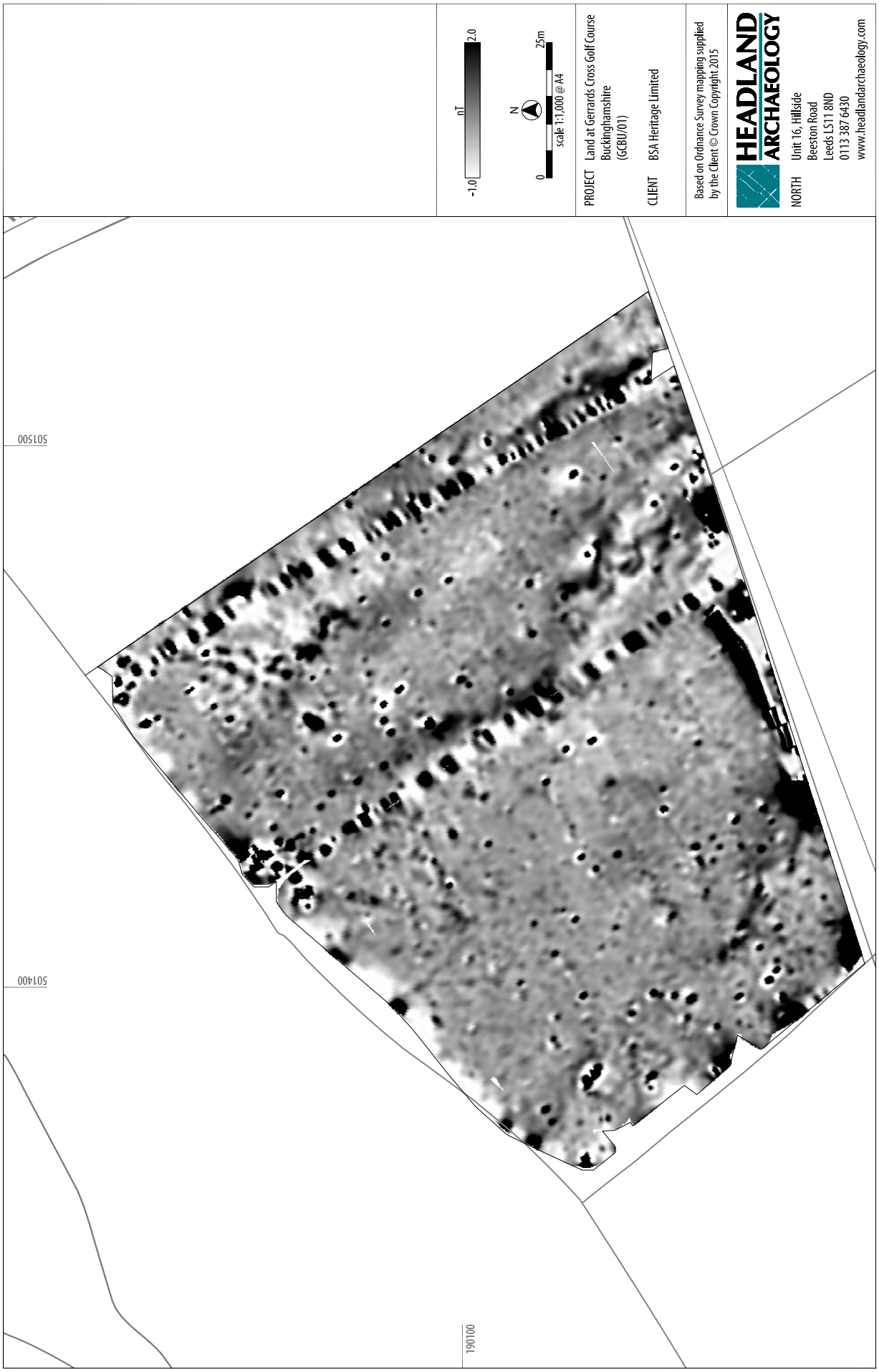
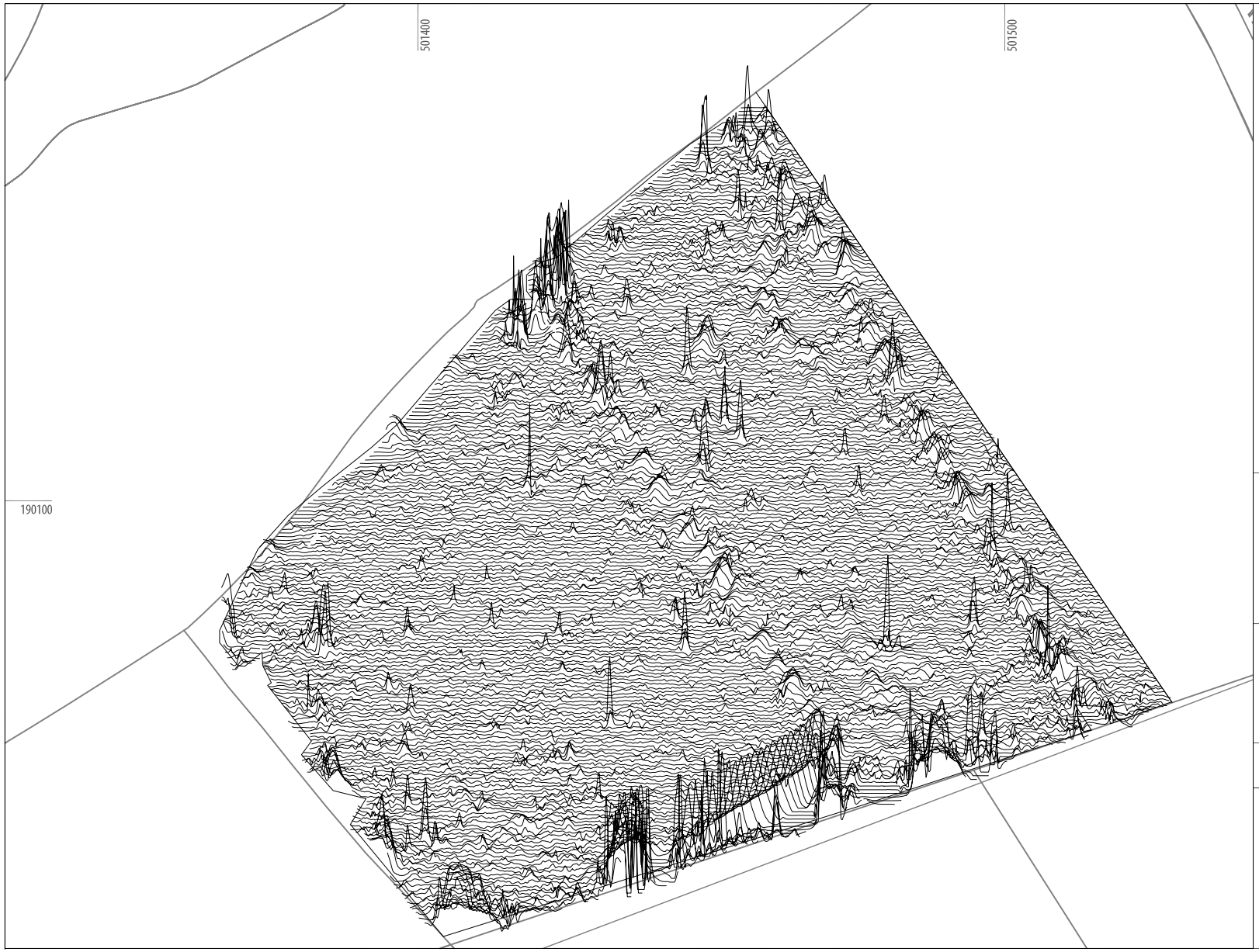
LandIS 2015 Available: www.landis.org.uk/soilscapes/; Viewed: November 27th 2015)

ILLUS 4 Survey location showing greyscale magnetometer data (1:4,000)



ILLUS 5 Processed greyscale magnetometer data (1:1,000)



PROJECT Land at Gerrards Cross Golf Course
Buckinghamshire
(GCBU/01)

CLIENT BSA Heritage Limited

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ILLUS 6 XY trace plot of minimally processed magnetometer data (1:1,000)

ILLUS 7 Interpretation of magnetometer data (1:1,000)

6 APPENDICES

APPENDIX 1 MAGNETOMETER SURVEY

Appendix 1.1 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 haematite. 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 so that by measuring the magnetic susceptibility of the topsoil, areas where human occupation or settlement has occurred can be identified by virtue 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. This effect can lead to the detection of features such as hearths, kilns or areas of burning.

Appendix 1.2 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.

APPENDIX 2 SURVEY LOCATION INFORMATION

An initial survey base station was established using a Trimble VRS differential Global Positioning System (dGPS). The magnetometer data was georeferenced using a Trimble RTK differential Global Positioning System (Trimble R8s model).

Temporary sight markers were laid out using a Trimble VRS differential Global Positioning System (Trimble R8s model) to guide the operator and ensure full coverage. The accuracy of this dGPS equipment is better than 0.01m.

The survey data were then super-imposed onto a base map provided by the client to produce the displayed block locations. 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 coordinates are measured off hard copies of the mapping rather than using the digital coordinates.

Headland Archaeology cannot accept responsibility for errors of fact or opinion resulting from data supplied by a third party.

APPENDIX 3 GEOPHYSICAL SURVEY ARCHIVE

The geophysical archive comprises:

- an archive disk containing the raw data in XYZ format, a raster image of each greyscale plot with associate world file, and a PDF of the report

The project will be archived in-house in accordance with recent good practice guidelines (http://guides.archaeologydataservice.ac.uk/g2gp/Geophysics_3). The data will be stored in an indexed archive and migrated to new formats when necessary.

APPENDIX 4 OASIS DATA COLLECTION FORM: ENGLAND

OASIS ID: headland5-235308

Project details	
Project name	Land at Gerrards Cross Golf Course
Short description of the project	Headland Archaeology (UK) Ltd undertook a geophysical (magnetometer) survey covering 1.2 hectares of land to the south of Gerrards Cross Golf Course to provide information about the archaeological potential of land proposed for development. No anomalies of definite archaeological potential have been identified by the survey although two faint linear anomalies may have been some archaeological potential, perhaps forming part of an enclosure, although a modern agricultural origin is considered equally possible. There is no indication from any other source to suggest that the magnetic data provides anything other than an accurate representation of the sub-surface conditions within the survey area. Therefore, based on the results and interpretation of the data, the archaeological potential of the site is considered to be low.
Project dates	Start: 26-11-2015 End: 26-11-2015
Previous/future work	Not known / Not known
Any associated project reference codes	CGBU15/01 - Contracting Unit No.
Type of project	Field evaluation
Site status	None
Current Land use	Cultivated Land 1 - Minimal cultivation
Monument type	N/A None
Monument type	N/A None
Significant Finds	N/A None
Significant Finds	N/A None
Methods & techniques	"Geophysical Survey"
Development type	Estate management (i.e. maintenance of existing structures and landscape by capital works and on-going maintenance)
Prompt	National Planning Policy Framework - NPPF
Position in the planning process	Not known / Not recorded
Solid geology (other)	Lambeth Group, clays, silts and sands
Drift geology (other)	Gerrards Cross Gravel, sand and gravel
Techniques	Magnetometry

Project location	
Country	England
Site location	BUCKINGHAMSHIRE SOUTH BUCKS GERRARDS CROSS Land at Gerrards Cross Golf Course
Study area	1.2 Hectares
Site coordinates	TQ 01400 90080 51.599945338521 -0.535791345729 51 35 59 N 000 32 08 W Point

Project creators	
Name of Organisation	Headland Archaeology
Project brief originator	Consultant
Project design originator	Headland Archaeology
Project director/manager	Harrison, S
Project supervisor	Schmidt, A

Project creators	
Type of sponsor/funding body	Developer

Project archives	
Physical Archive Exists?	No
Digital Archive recipient	In house
Digital Contents	"other"
Digital Media available	"Geophysics"
Paper Archive Exists?	No

Project bibliography 1	
Publication type	Grey literature (unpublished document/manuscript)
Title	Land at Gerrards Cross Golf Course
Author(s)/Editor(s)	Harrison, D. and Schmidt, A.
Other bibliographic details	GCBU15/01
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