THAMES VALLEY

ARCHAEOLOGICAL

SERVICES

Straighthanger Field, Sonning, Berkshire

Geophysical Survey (Magnetic)

by Tim Dawson

Site Code Geo12/6

(SU 7657 7593)

Straighthanger Field, Sonning, Berkshire

Geophysical Survey (Magnetic) Report

For University of Reading

by Tim Dawson

Thames Valley Archaeological Services Ltd

Site Code Geo12/6

November 2012

Summary

Site name: Straighthanger Field, Sonning, Berkshire

Grid reference: SU 76577 75937

Site activity: Magnetometer survey

Date and duration of project: 7th - 19th November 2012

Project manager: Steve Ford

Site supervisor: Tim Dawson

Site code: Geo12/6

Area of site: 8.15ha

Summary of results: A wide variety of probable archaeological features were identified by the geophysical survey. Of these, several had already been noted by aerial surveys but the geophysics served to extend and clarify these in addition to plotting previously unknown features. Those identified include a cursus, three rectangular enclosures, a ring ditch and several linear features. Additionally, a probable palaeochannel and several agricultural features and areas of magnetic disturbance were noted.

Location of archive: The archive is presently held at Thames Valley Archaeological Services, Reading in accordance with TVAS digital archiving policies.

Report edited/checked by: Steve Ford✓ 23.11.12
Andrew Mundin✓ 22.11.12

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Straighthanger Field, Sonning, Berkshire
A Geophysical Survey (Magnetic)

by Tim Dawson

Report Geo12/6

Introduction

This report documents the results of a geophysical survey (magnetic) carried out at Straighthanger Field, Sonning, Berkshire (SU 76577 75937) (Fig. 1). The work was undertaken as a research project with the permission of the landowner, the University of Reading, and English Heritage.

The field investigation was carried out to a specification approved by Mr Chris Welch, Inspector of Ancient Monuments at English Heritage and in accordance with an Ancient Monuments and Archaeological Areas Act 1979 (as amended) under licence to carry out a geophysical survey (Licence No: SL00042648). The fieldwork was undertaken by Marta Buczek, Aiji Castle and Tim Dawson between 7th and 19th November 2012 and the site code is Geo12/6.

The archive is presently held at Thames Valley Archaeological Services, Reading in accordance with TVAS digital archiving policies.

Location, topography and geology

The site is located on agricultural land halfway between the villages of Sonning and Charvil, to the east of Reading, in eastern Berkshire. The River Thames is located *c*.750m northwest of the site with the Bath Road (A4) located *c*.250m to the southeast (Fig. 1). The site itself is an irregularly-shaped field, currently lying fallow after a recent harvest with wide overgrown boundaries along all edges except the eastern. Topographically, the field is on two levels: a plateau *c*.40m above Ordnance Datum (aOD) in the south-eastern half that falls away to the edge of the Thames flood plain to the north at *c*.35m aOD. This reflects the underlying geology with the upper, south-eastern part of the site being located primarily on Taplow gravel formation with bands of Seaford chalk and Lambeth group clay along its southern edge while the remainder of the site is on Kempton Park gravel (BGS 1971).

Ground and weather conditions during the survey were favourable. Ground cover consisted of short wheat stubble with patches of nettles over a firm, largely level, topsoil while the weather remained largely dry during the survey period (Plates 1 and 2). There were however, particularly around the edges of the field, rutted, boggy trackways that were not conducive to the regular pacing required for accurate surveying.

Site history and archaeological background

An extensive series of cropmarks have been identified from aerial photography (Slade 1964; Gates 1975 map 19, and Pl. 11) and the RCHME's National Mapping Programme. Amongst these a Scheduled Ancient Monument has been defined warranting preservation due to 'nationally significant remains being identified' (SAM no.1006962). This includes a 35m-wide cursus and rectangular, circular and polygonal enclosures as well as several intercutting linear features (Ford 1987). Excavations on one of the rectangular enclosures (Slade 1964) confirmed the presence of archaeological remains of Neolithic date with some Roman activity.

Methodology

Sample interval

Data collection required a temporary grid to be established across the survey area using wooden pegs at 30m intervals with further subdivision where necessary. Readings were taken at 0.25m intervals along traverses 1m apart. This provides 3600 sampling points across a full 30m × 30m grid (English Heritage 2008), providing an appropriate methodology balancing cost and time with resolution. The proposed grid was to extend north and west to cover the western end of the field from a point at SU 7676 7576, targeting the cropmarks summarised by Gates and the RCHME. This would have consisted of a total of 125 30m × 30m grid squares. A new hedgerow had, however, divided the field in two, along the eastern edge of the survey grid, cutting across the proposed survey area. This obstruction had no effect on the position of the actual grid plan but did prevent the eastern edge from being surveyed fully. Other obstructions included the rough, boggy ground aforementioned and the strip of thick undergrowth around three sides of the field, all of which meant that the overall area available for surveying was somewhat reduced. In total, therefore, 98 grid squares were surveyed (Fig. 2).

The Grad 601-2 has a typical depth of penetration of 0.5m to 1.0m. This would be increased if strongly magnetic objects have been buried in the site. Under normal operating conditions it can be expected to identify buried features >0.5m in diameter. Features which can be detected include disturbed soil, such as the fill of a ditch, structures that have been heated to high temperatures (magnetic thermoremnance) and objects made from ferro-magnetic materials. The strength of the magnetic field is measured in nano Tesla (nT), equivalent to 10^{-9} Tesla, the SI unit of magnetic flux density.

Equipment

The purpose of the survey was to identify geophysical anomalies that may be archaeological in origin and compare the resulting plot with that drawn from cropmarks identified through aerial survey. The survey and report generally follow the recommendations set out by both English Heritage (2008) and the Institute for Archaeologists (2002).

Magnetometry was chosen as a survey method as it offers the most rapid ground coverage and responds to a wide range of anomalies caused by past human activity. These properties make it ideal for fast yet detailed survey of an area.

The detailed magnetometry survey was carried out using a dual sensor Bartington Instruments Grad 601-2 fluxgate gradiometer. The instrument consists of two fluxgates mounted 1m vertically apart with a second set positioned at 1m horizontal distance. This enables readings to be taken of both the general background magnetic field and any localised anomalies with the difference being plotted as either positive or negative buried features. All sensors are calibrated to cancel out the local magnetic field and react only to anomalies above or below this base line. On this basis, strong magnetic anomalies such as burnt features (kilns and hearths) will give a high response as will buried ferrous objects. More subtle anomalies such as pits and ditches, can be seem from their infilling soils containing higher proportions of humic material, rich in ferrous oxides, compared to the undisturbed subsoil. This will stand out in relation to the background magnetic readings and appear in plan following the course of a linear feature or within a discrete area.

A Trimble GeoXH 6000 handheld GPS system with sub-decimetre accuracy was used to tie the site grid into the Ordnance Survey national grid. This unit offers both real-time correction and post-survey processing; enabling a high level of accuracy to be obtained both in the field and in the final post-processed data.

Data gathered in the field was processed using the ArcheoSurveyorLite software package. This allows the survey data to be collated and manipulated to enhance the visibility of anomalies, particularly those likely to be of archaeological origin. The table below lists the processes applied to this survey, full survey and data information is recorded in Appendix 1.

Process	**Effect**
Clip from -7.00 to 7.00 nT	Enhance the contrast of the image to improve the appearance of possible archaeological anomalies.
De-stripe: sensors, median, all grids	Corrects for the striping effect caused by differences in calibration between the two sets of sensors.
De-spike: threshold 1, window size 3×3, all grids	Softens extreme values, enhancing the clarity of possible archaeological features.
De-stagger: out- and in-bound, by: -1 intervals	Shifts the results for each traverse 0.25m north or south

(0.25m), all grids	to correct for changes in pace.
Clip from -1.70 to 2.00 nT	Final enhancement of the contrast of the image to improve visibility of possible archaeological anomalies.

Once processed, the results are presented as a greyscale plot shown in relation to the site (Fig. 4), followed by a second plan to present the abstraction and interpretation of the magnetic anomalies (Fig. 5). Anomalies are shown as colour-coded lines, points and polygons. A minimally processed version of the greyscale results plot is presented in Figure 3 for comparison purposes. The grid layout and georeferencing information (Fig. 2) is prepared in EasyCAD v.7.22.01, producing a .FC7 file format, and printed as a .PDF for inclusion in the final report.

The greyscale plot of the processed data is exported from ArcheoSurveyorLite in portable network graphics (.PNG) format, a raster image format chosen for its lossless data compression and support for transparent pixels, enabling it to easily be overlaid onto an existing site plan. The data plot is rotated to orientate it to north and combined with grid and site plans in Adobe InDesign CS5.5, creating .INDD file formats. Once the figures are finalised they are exported in .PDF format for inclusion within the finished report.

Results

A wide range of magnetic anomalies are present across the majority of the site. These are described below grouped according to the type of anomaly.

<u>Certain and possible archaeological features</u>

Several substantial positive magnetic anomalies cross the centre of the site on a southwest-northeast axis.

The cursus

The most obvious anomaly is a very elongated rectangular enclosure with an opening at its eastern end (Figs. 3-5); most likely a Neolithic cursus monument as originally identified from aerial views of the cropmarks it created (Gates 1975, Slade 1964, RCHME) (Fig. 2). It is worth noting that although the aerial photographs allowed for the plotting of the cursus' eastern end and the majority of the side ditches, the western end and therefore the extent of the monument was previously unknown. The west end now appears to have been identified and which shows it to be rectilinear without an entrance. The cursus can now be shown to be 200 m long and 35m wide.

Ring ditch

The strongest of these positive anomalies is the circular feature, most likely a ring ditch, which is *c*.26m in diameter and, as with the cursus, was originally identified through its cropmarks (Fig. 2).

Rectangular enclosures

Two certain and one probable rectangular enclosures with the ring ditch extend on a north-easterly axis from the eastern end of the cursus. Either side of the ring ditch are two rectangular enclosures both recorded as cropmarks The westernmost (E2) is 25m by 32m aligned northwest - southeast. On the geophysical plot (Fig. 3) the north-western element is hardly visible, but is clearer on the aerial photograph. The eastern enclosure (E1) is 22m by 28m also aligned northwest - southeast. It is bisected by the modern hedgerow which formed the eastern boundary of the survey area and could not be fully surveyed. However, it was the latter that was excavated by Slade (1964) and considered to be a Neolithic mortuary enclosure. A Roman ditch partly overlying this enclosure can be seen on the aerial photographs but lies beyond the boundary of the geophysical survey.

The third rectangular enclosure (E3) is closest to the cursus and is aligned on a southwest-northeast axis. It was not previously identified on the aerial photographs but with hindsight might now be faintly visible. It is c. 25m x 20m across. The northwest and south east elements seem well defined (Fig. 3) but the north-eastern and south-western elements are ill-defined with further obscurity caused by a ferrous spike in the west. The relationship with Enclosure 2 is unclear.

Linear features

Several linear positive anomalies cut across the enclosures and cursus monument. These are all aligned roughly southwest-northeast with, in two places, two such features running parallel to each other giving the appearance of a trackway. Only a few of these anomalies have been previously identified through their cropmark signatures with the majority being newly discovered. A second set of linear positive anomalies is located in the southeastern corner of the survey site and approach the cursus before turning through a right angle. They are possibly old field boundaries.

Two linear negative anomalies run almost parallel to each other in a south-westerly direction from the ring ditch and across the eastern end of the cursus. While these may represent archaeological features it is possible that they just signify the presence of old field boundaries.

Polygonal enclosure?

Cropmarks interpreted as a polygonal enclosure are represented on the aerial photographs lying at the southern end of the survey area (Gates 1975 map 19). The geophysical survey has identified the elements forming this feature perhaps extending the recorded lengths of linear features and adding a few new components.

<u>Anomalies of probable geological origin</u>

A large section of the low-lying area of the site is characterised by a meandering line of slightly positive and negative magnetic anomalies. Due to the organic appearance of the anomalies they most likely represent a palaeo stream channel.

<u>Anomalies of post-medieval origin</u>

Two positive anomalies on the western edge of the site can be interpreted as being part of the relatively modern agricultural landscape as, not only do they extend at right-angles from the current field boundary, they also appear as field boundaries on historic Ordnance Survey maps of the area.

<u>Magnetic scatters, disturbance and ferrous spikes</u>

The entire site is scattered with areas of strong magnetic disturbance (Fig. 3). Of particular note is the scatter in the western-most tip of the site that coincides with the heavily rutted modern field entrance, in the surface of which patches of brick and rubble were seen. This cuts across a strong positive linear anomaly with associated negative response which runs parallel to the modern field boundary and represents a modern buried cable. This linear feature becomes weaker and to the north but can be confidently matched with a field boundary that appears on historic Ordnance Survey maps. Several other very strong dipolar anomalies were plotted in the southern area of the site and most likely represent buried ferrous objects. Slightly smaller dipolar anomalies are present around the enclosures in the north-eastern corner of the field with one in particular probably being associated with the backfill of Slade's excavations. Many smaller dipolar responses are scattered across the entire site, the most prominent of these are marked on Figure 5 and may represent buried ferrous debris or thermoremnant material.

Conclusion

The geophysical survey of the Straighthanger Field site has successfully identified all of the cropmark features previously plotted from aerial photographs and has served to clarify and extend these. It has, additionally, identified further features of archaeological potential. The most notable observations are the discovery of the full extent of the cursus and the plotting of a possible third rectangular enclosure.

References

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Ford, S, 1987, *East Berkshire Archaeological Survey*, Department of Highways and Planning Occasional Paper **1**, Reading

Gates, T, 1975, *The Middle Thames Valley: An archaeological survey of the river gravels*, Berkshire Archaeological Committee Publication **1**, Reading

IFA, 2002, *The Use of Geophysical Techniques in Archaeological Evaluation*, IFA Paper No. 6, Reading

Slade, C F, 1964, 'A late Neolithic enclosure at Sonning, Berkshire', *Berkshire Archaeological Journal* **61**, 4-19

Appendix 1. Survey and data information

Raw data
SITE:
Name: Straighthanger, Sonning
Location: Straighthanger Field, Sonning

COMPOSITE:
Filename: Nov 16.xcp
Instrument Type: Bartington (Gradiometer)
Units: nT
Surveyed by: Marta Buczek, Aiji Castle, Tim Dawson on 19/11/2012
Assembled by: Tim Dawson on 19/11/2012
Direction of 1st Traverse: 0 deg
Collection Method: ZigZag
Sensors: 2 @ 1.00 m spacing.
Dummy Value: 32000

Dimensions
Composite Size (readings): 1440 x 390
Survey Size (meters): 360 m x 390 m
Grid Size: 30 m x 30 m
X Interval: 0.25 m
Y Interval: 1 m

Stats
Max: 12.73
Min: -12.59
Std Dev: 1.77
Mean: 0.06
Median: 0.00
Composite Area: 14.04 ha
Surveyed Area: 8.1468 ha

Source Grids: 98
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2 Col:0 Row:9 grids\d25.xgd
3 Col:0 Row:10 grids\d15.xgd
4 Col:0 Row:11 grids\d06.xgd
5 Col:0 Row:12 grids\d01.xgd
6 Col:1 Row:7 grids\f45.xgd
7 Col:1 Row:8 grids\e36.xgd
8 Col:1 Row:9 grids\d26.xgd
9 Col:1 Row:10 grids\d16.xgd
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11 Col:1 Row:12 grids\d02.xgd
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13 Col:2 Row:5 grids\g65.xgd
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20 Col:2 Row:12 grids\d03.xgd
21 Col:3 Row:0 grids\i96.xgd
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94 Col:9 Row:10 grids\d24.xgd
95 Col:10 Row:5 grids\g73.xgd
96 Col:10 Row:6 grids\g63.xgd
97 Col:10 Row:7 grids\f54.xgd
98 Col:11 Row:6 grids\g64.xgd

Processes: 4
1 Base Layer
2 DeStripe Median Sensors: All
3 De Stagger: Grids: All Mode: Both By: -1 intervals
4 Clip at 3.00 SD

PROGRAMME:
Name: ArcheoSurveyor
Version: 2.5.19.6

Processed data
COMPOSITE
Filename: Nov 16 processed.xcp

Stats
Max: 2.00
Min: -1.70
Std Dev: 0.70
Mean: 0.03
Median: 0.00
Composite Area: 14.04 ha
Surveyed Area: 8.1468 ha

Processes: 13
1 Base Layer
2 Clip from -7.00 to 7.00 nT
3 DeStripe Median Sensors: All
4 Clip from -4.00 to 6.00 nT
5 Despike Threshold: 1 Window size: 3x3
6 De Stagger: Grids: All Mode: Both By: -1 intervals
7 Clip from -3.90 to 6.00 nT
8 Clip from -3.00 to 3.00 nT
9 Clip from -2.00 to 2.00 nT
10 De Stagger: Grids: f57.xgd f58.xgd Mode: Outbound By: -1 intervals
11 Clip from -1.70 to 2.00 nT
12 De Stagger: Grids: f57.xgd Mode: Outbound By: 2 intervals
13 Clip from -1.70 to 2.00 nT

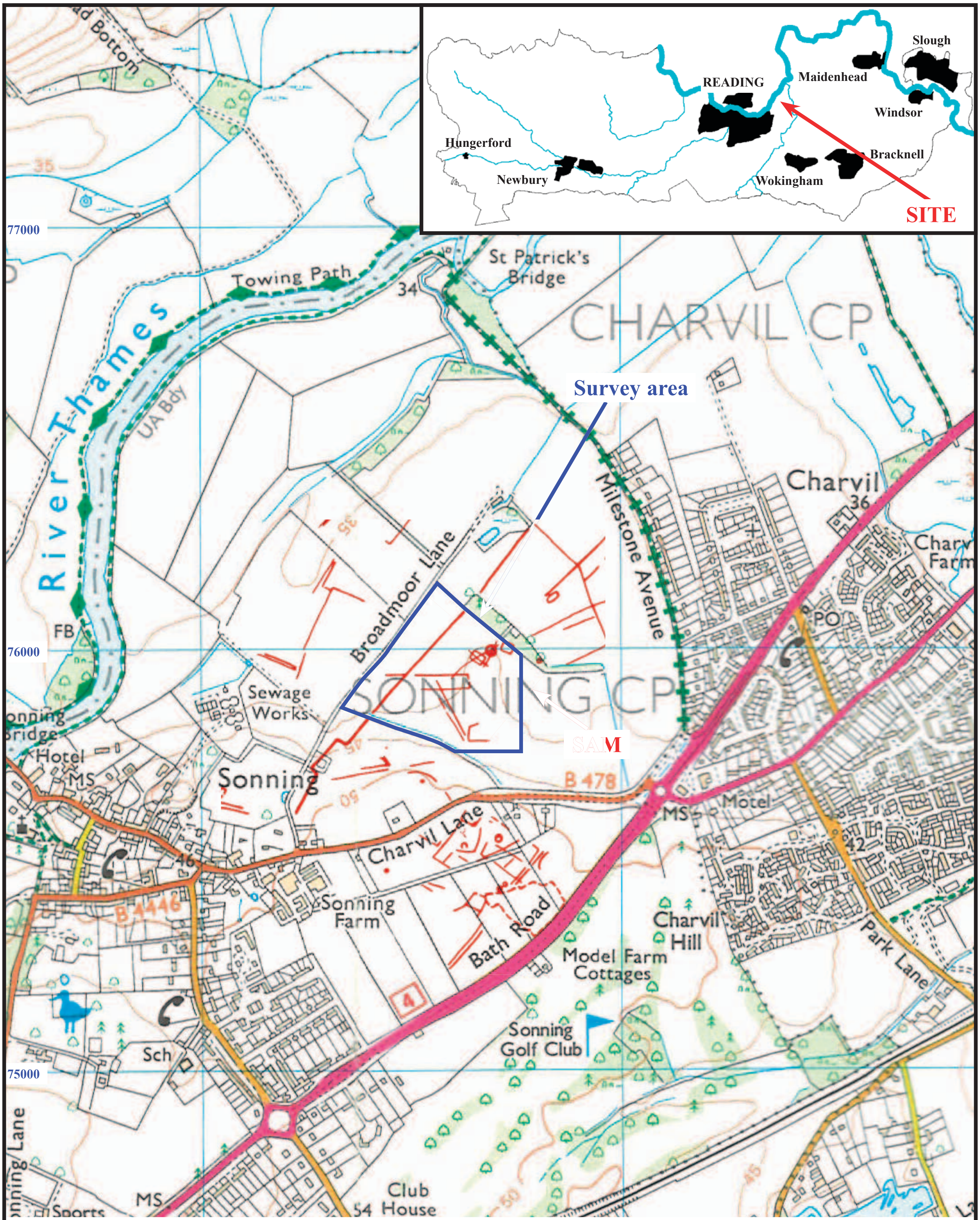

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Figure 1. Location of survey area within Sonning and Berkshire and in relation to cropmarks and SAM.

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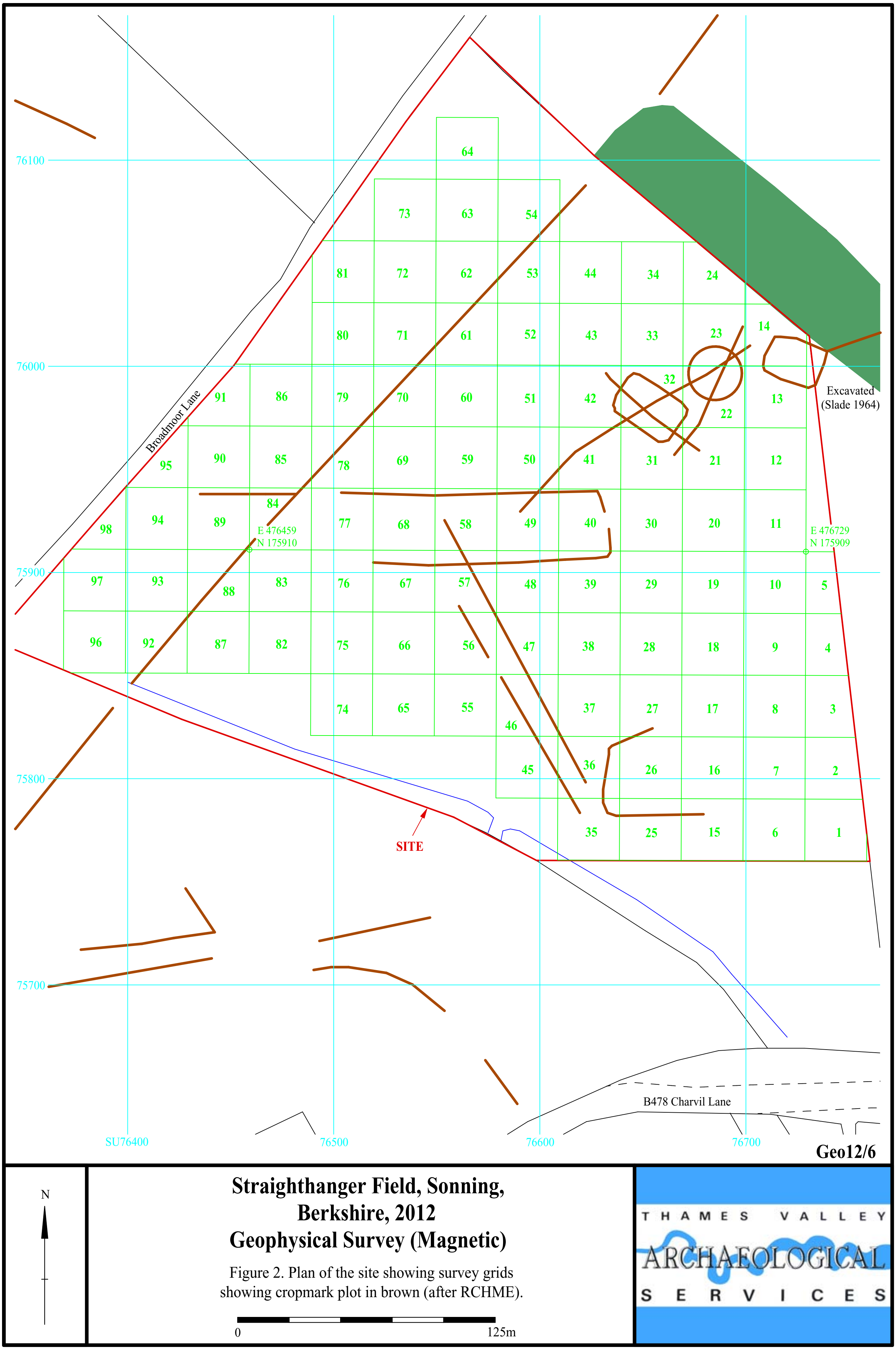

Straighthanger Field, Sonning, Berkshire, 2012
Geophysical Survey (Magnetic)

Figure 2. Plan of the site showing survey grids showing cropmark plot in brown (after RCHME).

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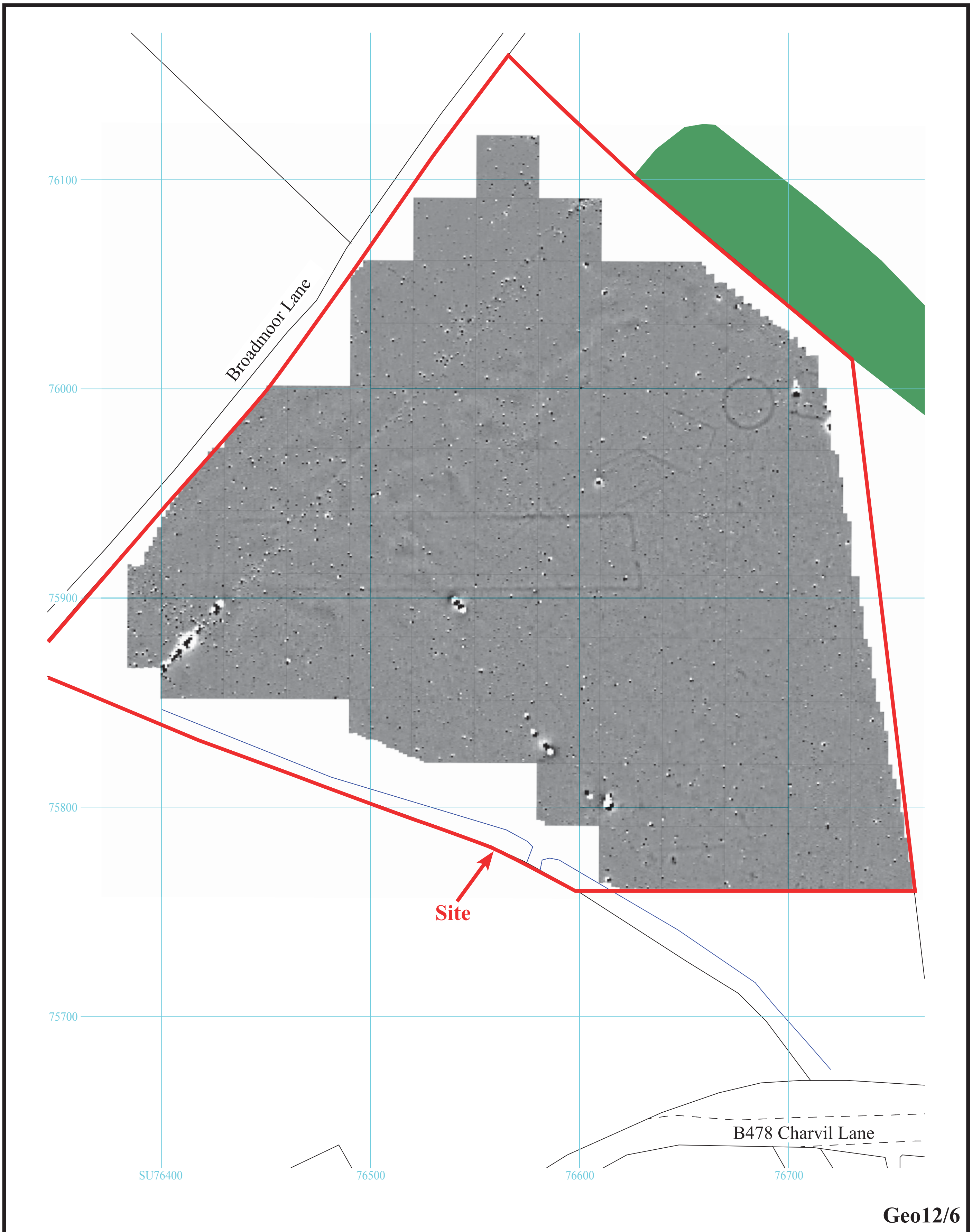

Straighthanger Field, Sonning, Berkshire, 2012
Geophysical Survey (Magnetic)

Figure 3. Plot of minimally processed gradiometer data.

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Straighthanger Field, Sonning, Berkshire, 2012
Geophysical Survey (Magnetic)

Figure 4. Plot of processed gradiometer data.

0m 100m

+2 nT
-1.7 nT

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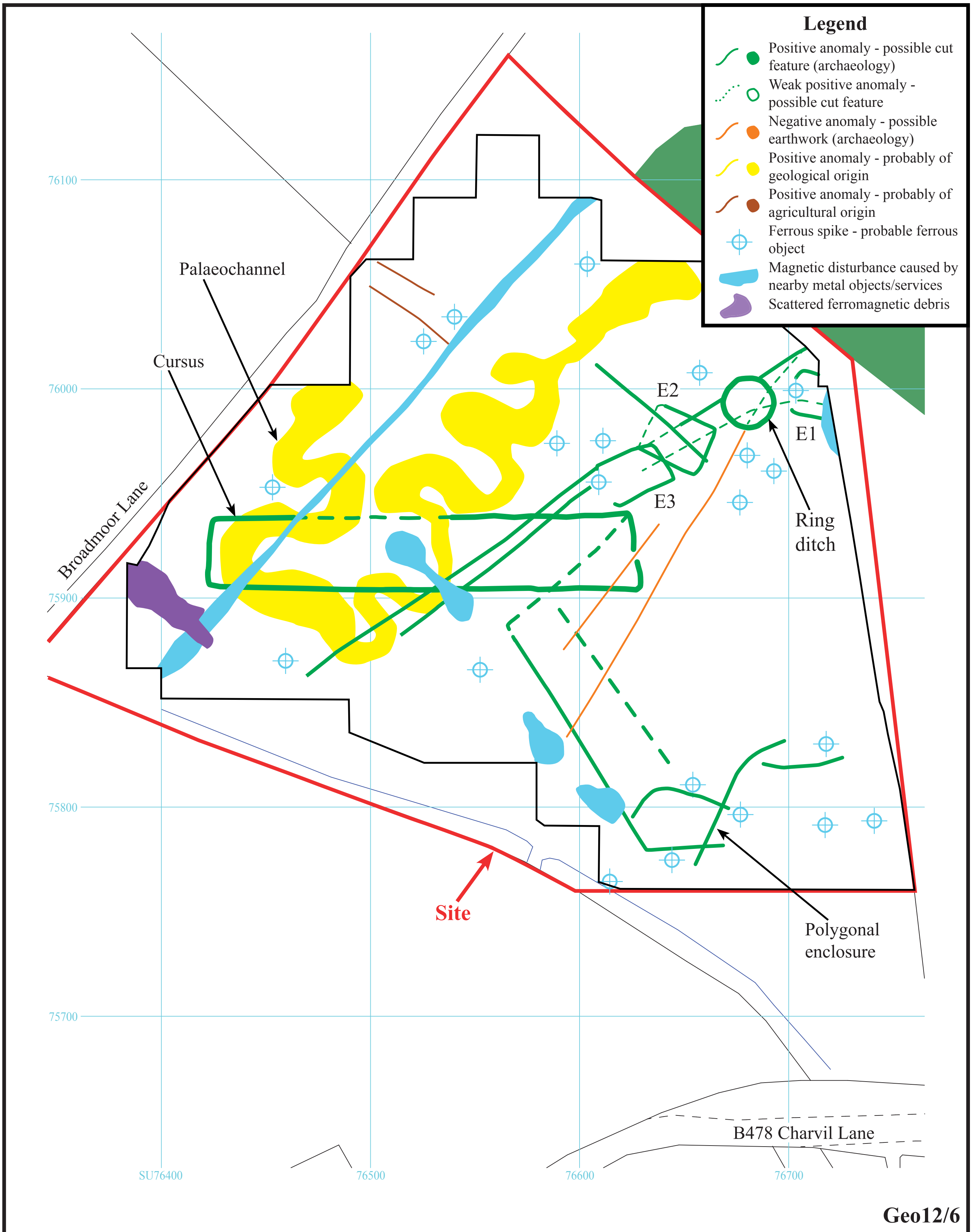

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Straighthanger Field, Sonning, Berkshire, 2012
Geophysical Survey (Magnetic)

Figure 5. Interpretation of processed gradiometer data.

0m 100m

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Plate 1. Straighthanger Field, looking north.

Plate 2. Straighthanger Field, looking northeast.

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Straighthanger Field, Sonning, Berkshire, 2012
Geophysical Survey (Magnetic)

Plates 1 and 2.

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TIME CHART

	Calendar Years
Modern	AD 1901
Victorian	AD 1837
Post Medieval	AD 1500
Medieval	AD 1066
Saxon	AD 410
Roman	AD 43
	BC/AD
Iron Age	750 BC
Bronze Age: Late	1300 BC
Bronze Age: Middle	1700 BC
Bronze Age: Early	2100 BC
Neolithic: Late	3300 BC
Neolithic: Early	4300 BC
Mesolithic: Late	6000 BC
Mesolithic: Early	10000 BC
Palaeolithic: Upper	30000 BC
Palaeolithic: Middle	70000 BC
Palaeolithic: Lower	2,000,000 BC
↓	↓

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