THAMES VALLEY

ARCHAEOLOGICAL

SERVICES

Land at Wainwrights, Long Crendon, Buckinghamshire

Geophysical Survey (Magnetic)

by Kyle Beaverstock

Site Code: WLC15/185

(SP 6980 0861)

Land at Wainwrights, Long Crendon, Buckinghamshire

Geophysical Survey (Magnetic) Report

For Rectory Homes

by Kyle Beaverstock

Thames Valley Archaeological Services Ltd

Site Code WLC 15/185

January 2017

Summary

Site name: Land at Wainwrights, Long Crendon, Buckinghamshire

Grid reference: SP 6980 0861

Site activity: Magnetometer survey

Date and duration of project: 19th - 20th of December 2016

Project manager: Steve Ford

Site supervisor: Kyle Beaverstock

Site code: WLC15/185

Area of site: *c*.2ha

Summary of results: A range of magnetic anomalies were recorded by the survey but these all appear to relate either to modern site features (e.g. services or previous field boundaries) or ridge and furrow farming activity.

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✓ 11.01.17
	Tim Dawson✓ 11.01.17

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Land at Wainwrights, Long Crendon, Buckinghamshire
A Geophysical Survey (Magnetic)

by Kyle Beaverstock

Report 16/185b

Introduction

This report documents the results of a geophysical survey (magnetic) carried out at Waiwrights, Long Crendon, Buckinghamshire (SP 6980 0861) (Fig. 1). The work was commissioned by Mr Tim Northey of Rectory Homes, Rectory House, Thame Road, Haddenham, Buckinghamshire HP17 8DA.

Planning permission (15/03650/AOP) has been gained from Aylesbury Vale District Council to erect new houses on a *c*.2ha parcel of land. The consent is subject to a condition relating to archaeology. This is in accordance with the Department for Communities and Local Government's National Planning Policy Framework (NPPF 2012), and the District's policies on archaeology. The fieldwork was undertaken by Kyle Beaverstock and Maisie Foster from the 19th to the 20th of December 2016 and the site code is WLC15/185.

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 the south-eastern edge of the village of Long Crendon. This sub-rectangular parcel of land is approximately 2ha and was formally pastoral land but is currently not being utilised. The site slopes from 93m above Ordnance Datum (aOD) in the west to approximately 83m aOD in the east. It is bounded on all sides by hedgerows containing post and wire fencing and has a set of electric cables and their supporting poles crossing the site on an east-west orientation. There is a group of wooden fences forming a smaller enclosure within the site at its western end with a deep hollow in the ground immediately to the north, possibly an old quarry pit. The underlying geology is stated as consisting of Portland Group - Limestone and Calcareous Sandstone (BGS 1994). Conditions during the survey were overcast and foggy (Pl. 1-2).

Site history and archaeological background

A more detailed analysis of the archaeological background can be found in the desk-based assessment (Bermingham 2015) which draws upon the Buckinghamshire County Council's *Long Crendon: Historic Town Assessment Report* (BCC 2009). There are no known heritage assets on site and it is marginal to the historic core

of the settlement. The settlement is mentioned in the Domesday Book (Williams and Martin 2002) and it is believed that any Saxon origins will be in the general vicinity of the church.

Methodology

Sample interval

Data collection required a temporary grid to be established across the survey area using wooden pegs at 20m intervals with further subdivision where necessary. Readings were taken at 0.25m intervals along traverses 1m apart. This provides 1600 sampling points across a full 20m × 20m grid (English Heritage 2008), providing an appropriate methodology balancing cost and time with resolution. The majority of the site was unobstructed; however there were a few notable exceptions. In the south-western corner of the field was a small curved fence and a metal trough. To the north of these was a large depression with a steep bank along the western edge and a nearby pylon with associated grounding cables.

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 in order to inform a targeted archaeological investigation of the site prior to development. The survey and report generally follow the recommendations and standards set out by both English Heritage (2008) and the Chartered Institute *for* Archaeologists (2002, 2011, 2014).

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 the fast yet detailed surveying 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 seen 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 Geo7x handheld GPS system with sub-decimetre real-time 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 TerraSurveyor 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 -1.80 to 2.20 nT	Enhance the contrast of the image to improve the appearance of possible archaeological anomalies.
Interpolate: *y* doubled	Increases the resolution of the readings in the *y* axis, enhancing the shape of anomalies.
De-stripe: median, all sensors	Removes the striping effect caused by differences in sensor calibration, enhancing the visibility of potential archaeological anomalies.
De-spike: threshold 1, window size 3×3	Compresses outlying magnetic points caused by interference of metal objects within the survey area.
De-stagger: all grids, both by -1 intervals	Cancels out effects of site's topography on irregularities in the traverse speed.

The raw data plot is presented as a greyscale plot shown in relation to the site (Fig. 3) with the processed data then presented as a second figure (Fig. 4), followed by a third plan to present the abstraction and interpretation of the magnetic anomalies (Fig. 5). Anomalies are shown as colour-coded lines, points and polygons. The grid layout and georeferencing information (Fig. 2) is prepared in EasyCAD v.7.58.00, 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 TerraSurveyor in a georeferenced 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 combined with grid and site plans in QGIS 2.16.2 and exported again in .PNG format in order to present them in figure templates 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

Several magnetically strong readings were detected over the course of the survey. Bipolar linear **[Fig 5: 1]** in the south west of the site is aligned south-west to north-east and is most likely a modern service such as a pipe and may be associated with the troth seen in the south-west corner of the field. Dipolar anomalies **[2, 3]** seen in the central and north-east area of the site are most likely the manholes seen during the survey. The area of positive anomalies **[4]** which runs in a strip down the centre of the field aligning north to south is most likely related to the field boundary seen on the 1974 and 1993 Ordinance Survey maps. In the north-west area of the site a large depression can be seen, although part of it could not be surveyed due to the gradient of the bank and part of it is obscured by the strong readings from the nearby pylon cables the outline of a positive anomaly **[5]** can be seen and suggests as was supposed that this is a possible quarry pit. Across the eastern half of the field running along an east-west alignment can be seen a series of parallel weak positive linear anomalies **[6]** evenly spaced, these are more than likely representative of ridge and furrow.

Conclusion

The geophysical survey revealed a number of magnetic anomalies which most likely represent the modern disturbance of the site, such as pipes and previous field boundaries. Positive linear anomalies representing previous ridge and furrow agricultural activity can be clearly seen across the eastern half of the site area. There are no obvious anomalies of archaeological interest.

References

BCC 2009, *Long Crendon: Historic Town Assessment Report,* Buckinghamshire County Council

Bermingham, N, 2015, Land at Wainwrights, Long Crendon, Buckinghamshire an archaeological desk-based assessment, Thames Valley Archaeological Services report 15/185, Reading

BGS, 1994, *British Geological Survey*, 1:50,000, Sheet 237, Solid and Drift Edition, Keyworth

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

CI*f*A, 2011, *Standard and Guidance: for archaeological geophysical survey*, Reading

CI*f*A, 2014, *Standard and Guidance: for archaeological geophysical survey*, Reading

NPPF, 2012, *National Planning Policy Framework*, Dept Communities and Local Government, London

Appendix 1. Survey and data information

Programme:
Name: TerraSurveyor
Version: 3.0.25.0

Raw data
Survey corner coordinates (X/Y):
Northwest corner: 469680.2, 208560.38 m
Southeast corner: 469820.2, 208340.38 m
Direction of 1st Traverse: 8.08987 deg
Collection Method: ZigZag
Sensors: 2 @ 1.00 m spacing.
Dummy Value: 2047.5

Stats
Max: 96.26
Min: -100.00
Std Dev: 20.06
Mean: -4.32
Median: -0.14
Composite Area: 3.08 ha
Surveyed Area: 1.9536 ha

Source Grids: 67
1 Col:0 Row:4 grids\62.xgd
2 Col:0 Row:5 grids\63.xgd
3 Col:0 Row:6 grids\64.xgd
4 Col:0 Row:7 grids\65.xgd
5 Col:0 Row:8 grids\66.xgd
6 Col:0 Row:9 grids\67.xgd
7 Col:1 Row:1 grids\52.xgd
8 Col:1 Row:2 grids\53.xgd
9 Col:1 Row:3 grids\54.xgd
10 Col:1 Row:4 grids\55.xgd
11 Col:1 Row:5 grids\56.xgd
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13 Col:1 Row:7 grids\58.xgd
14 Col:1 Row:8 grids\59.xgd
15 Col:1 Row:9 grids\60.xgd
16 Col:1 Row:10 grids\61.xgd
17 Col:2 Row:0 grids\41.xgd
18 Col:2 Row:1 grids\42.xgd
19 Col:2 Row:2 grids\43.xgd
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26 Col:2 Row:9 grids\50.xgd
27 Col:2 Row:10 grids\51.xgd
28 Col:3 Row:0 grids\30.xgd
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30 Col:3 Row:2 grids\32.xgd
31 Col:3 Row:3 grids\33.xgd
32 Col:3 Row:4 grids\34.xgd
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63 Col:6 Row:6 grids\04.xgd
64 Col:6 Row:7 grids\05.xgd
65 Col:6 Row:8 grids\06.xgd
66 Col:6 Row:9 grids\07.xgd
67 Col:6 Row:10 grids\08.xgd

Processed data
Stats
Max: 2.20
Min: -1.80
Std Dev: 1.14
Mean: 0.01
Median: 0.02

Processes: 6
1 Base Layer
2 De Stagger: Grids: All Mode: Both By: -1 intervals
3 DeStripe Median Sensors: Grids: All
4 Despike Threshold: 1 Window size: 3x3
5 Interpolate: Y Doubled.
6 Clip from -1.80 to 2.20 nT

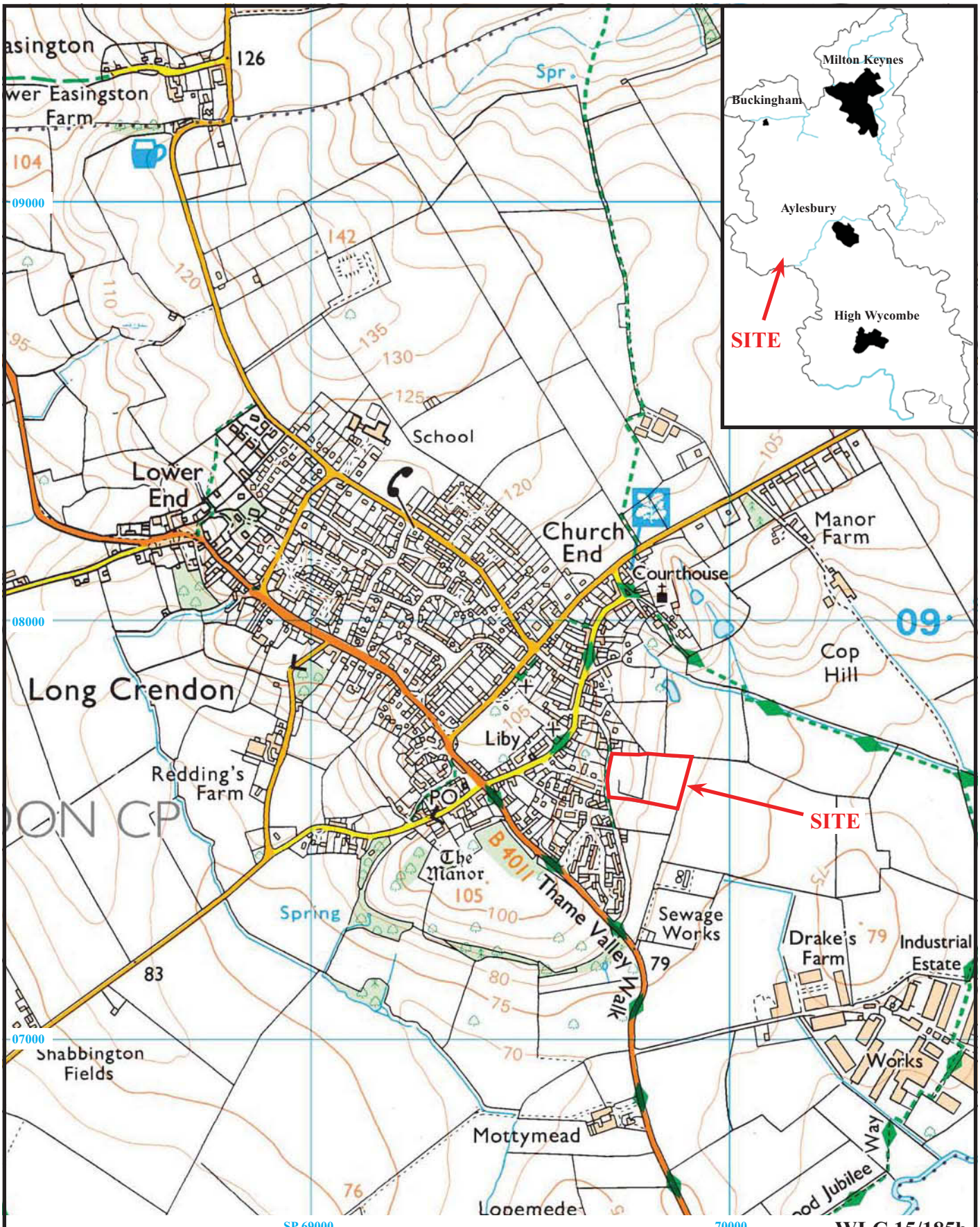

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Figure 1. Location of site within Long Crendon and Buckinghamshire.

Reproduced from Ordnance Survey Explorer digital mapping at 1:12500

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Figure 2. Survey grid layout.

0 50m

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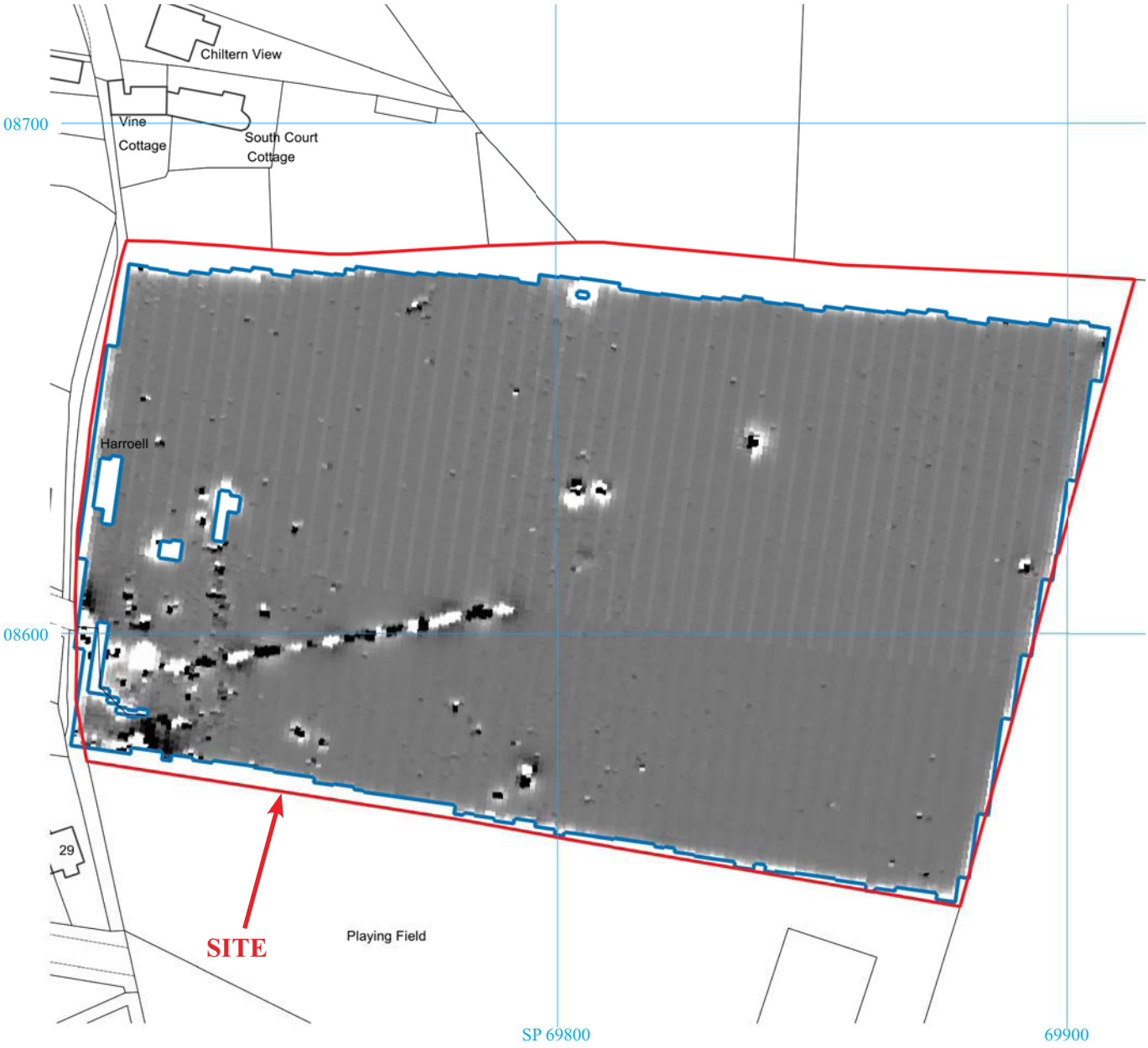

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Figure 3. Plot of raw gradiometer data.

0m 100m

+100 nT

-100 nT

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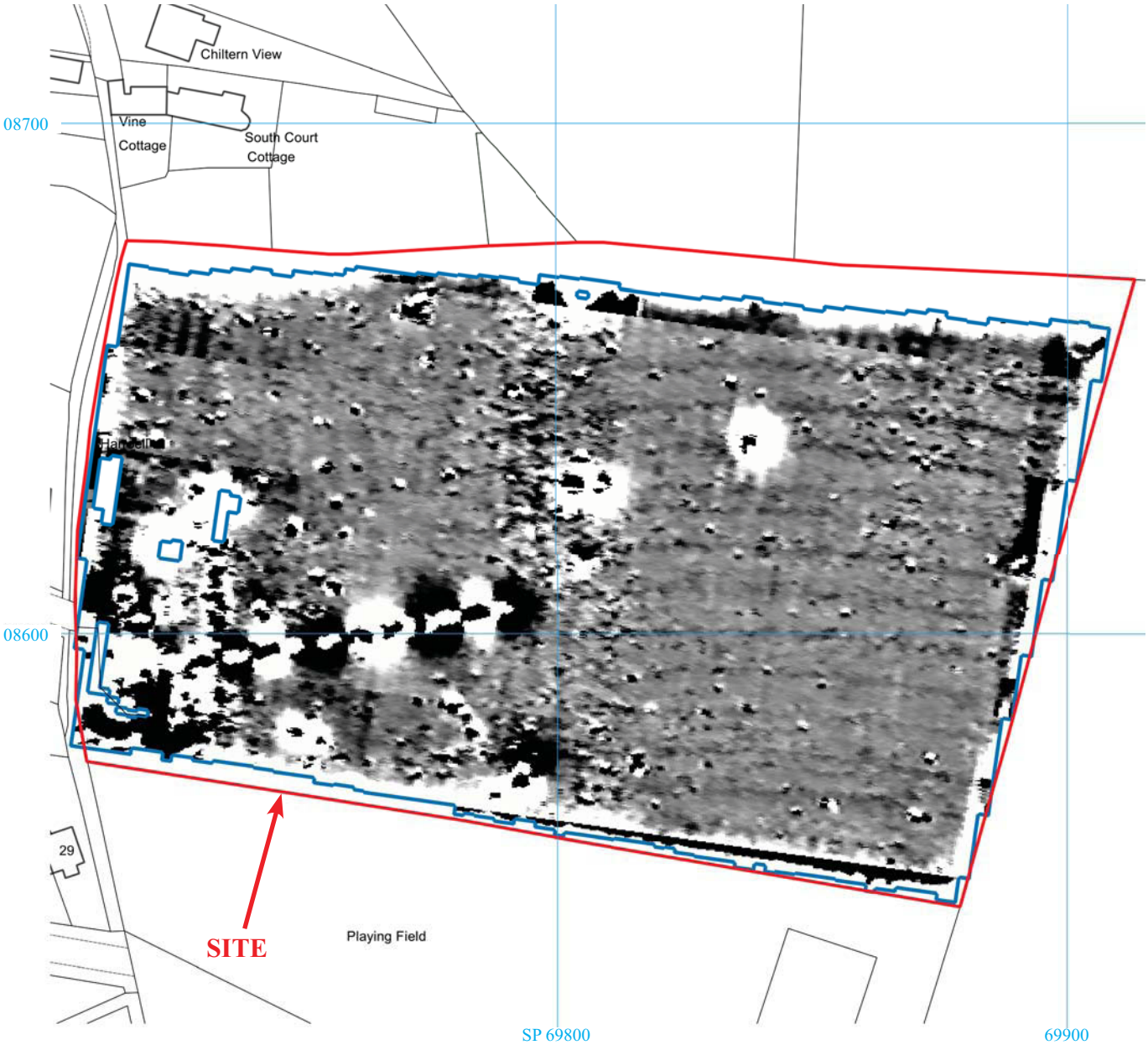

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Figure 4. Plot of minimally processed gradiometer data.

0m 100m

+2.2 nT
-1.8 nT

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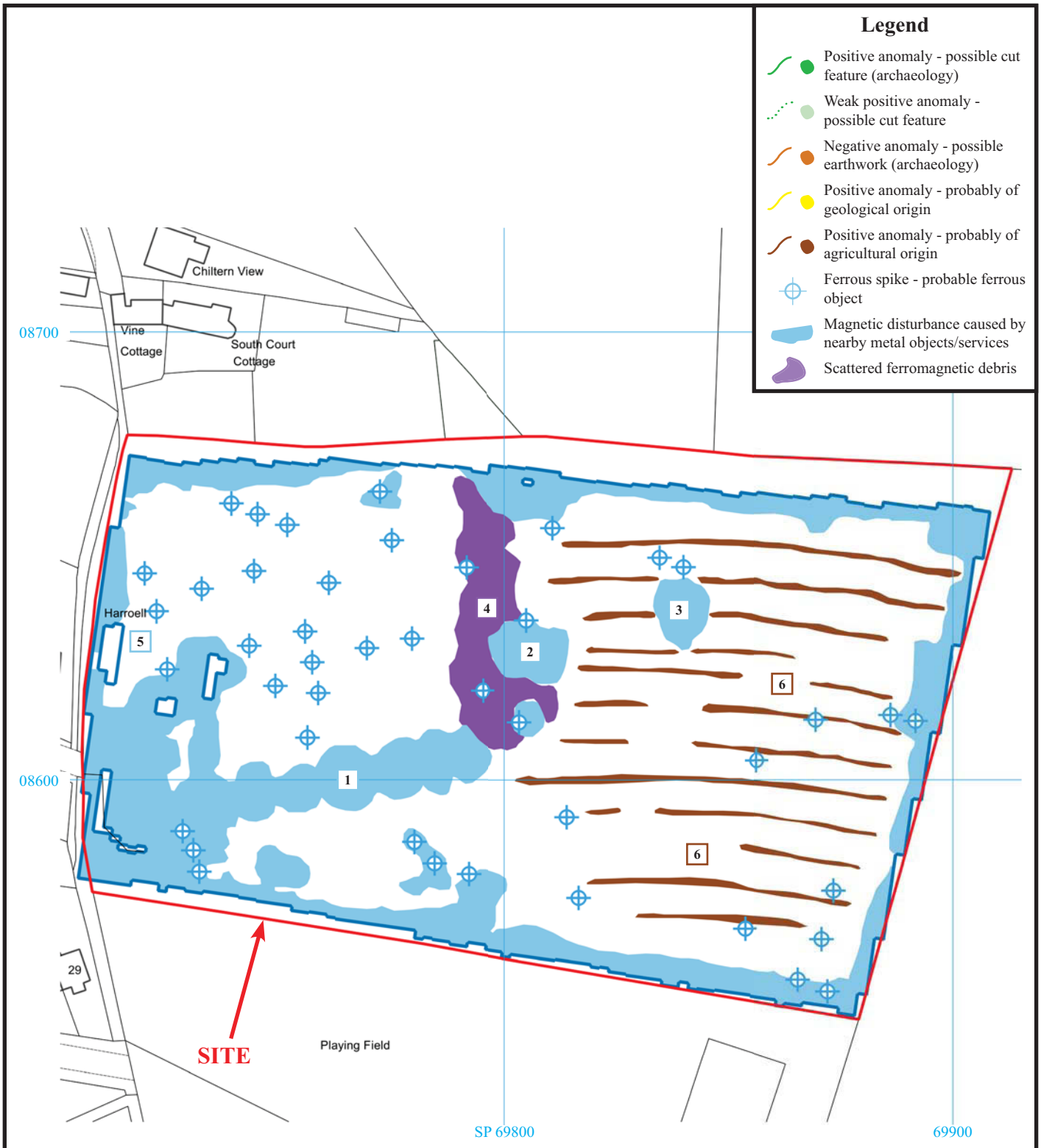

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Figure 5. Interpretation plot.

0m 100m

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Plate 1. Site, looking east.

Plate 2. Site, looking ENE along the line of electric cables and manholes.

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Plates 1 - 2.

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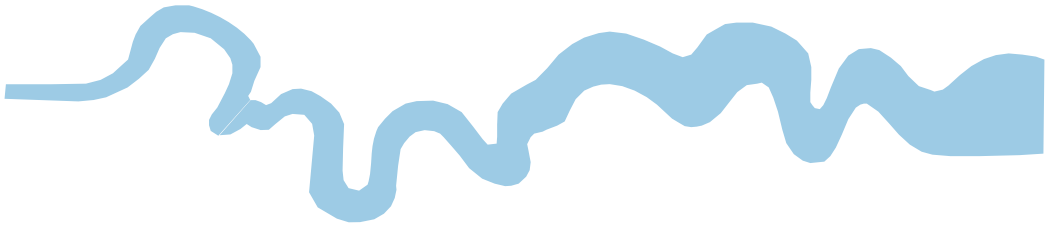
TIME CHART

	Calendar Years
Modern	AD 1901
Victorian	AD 1837
Post Medieval	AD 1500
Medieval	AD 1066
Saxon	AD 410
Roman	AD 43
Iron Age	BC/AD 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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