

T H A M E S V A L L E Y

ARCHAEOLOGICAL

S E R V I C E S

**Land adjacent to 71 Daventry Road, Barby,
Northamptonshire**

Geophysical Survey (Magnetic)

by Tim Dawson and Lizzi Lewins

Site Code: DRW14/221

(SP 5434 6975)

Land Adjacent to 71 Daventry Road, Barby, Northamptonshire

Geophysical Survey (Magnetic) Report

For Mr H McGowen

by Tim Dawson and Lizzi Lewins

Thames Valley Archaeological Services Ltd

Site Code DRW 14/221

November 2014

Summary

Site name: Land Adjacent to 71 Daventry Road, Barby, Northamptonshire

Grid reference: SP 5434 6975

Site activity: Magnetometer survey

Date and duration of project: 18th November 2014

Project manager: Steve Ford

Site supervisor: Lizzi Lewins

Site code: DRW 14/221

Area of site: 0.67ha

Summary of results: A range of magnetic anomalies were recorded by the survey. These primarily represent the ridge and furrow farming system that is visible as earthworks across the northern half of the survey area. Three weak anomalies were identified which may indicate the presence of buried archaeological deposits although due to their nature there is the possibility that they represent natural variations in the underlying geology.

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

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www.tvas.co.uk/reports/reports.asp.*

Report edited/checked by: Steve Ford ✓ 28.11.14 Andrew Muddin ✓ 28.11.14

Land Adjacent to 71 Daventry Road, Barby, Northamptonshire A Geophysical Survey (Magnetic)

by Tim Dawson and Lizzi Lewins

Report 14/221

Introduction

This report documents the results of a geophysical survey (magnetic) carried out on a plot of land adjacent to 71 Daventry Road, Barby, Northamptonshire (SP 5434 6975) (Fig. 1). The work was commissioned by Mr Robert Froud-Williams of Kemp & Kemp LLP, 1-3 Ock Street, Abingdon OX14 5AL on behalf of Mr H McGowen.

A planning application has been submitted (DA/2014/0796) for the development of 12 dwellings and a geophysical survey and targeted trial trenching have been requested in order to further inform the application. 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 field investigation was carried out to a specification approved by Ms Lesley-Ann Mather, County Archaeological Advisor at Northamptonshire County Council Planning Services. The fieldwork was undertaken by Rebecca Constable and Lizzi Lewins on 18th November 2014 and the site code is DRW 14/221.

The archive is presently held at Thames Valley Archaeological Services, Reading in accordance with TVAS digital archiving policies. A CD containing a copy of the report in PDF/A format and the raw survey data will be submitted to the Northamptonshire HER.

Location, topography and geology

The site is located at the southern end of Barby, a large village in western Northamptonshire, *c.*6km north of Daventry and *c.*4km south-east of Rugby (Fig. 1). The village lies on the northern slope of a ridge that overlooks the Oxford Canal and M45 motorway to the north. The site itself, centred on NGR SP 5434 6975 and with an area of 0.67ha, lies near the top of the ridge at a height of 166.2m above Ordnance Datum. It is currently a grassy paddock bordered by a hedgerow to the west and post-and-wire fencing on the remaining sides. Beyond the boundaries, Daventry Road runs along the western edge with Barby C of E Primary School beyond, there is housing to the north and further paddocks to the east and south. The underlying geology is recorded as Dyrham Formation Middle Lias siltstones and mudstones (BGS 1980). Conditions during the survey were dry and cloudy although previous rain had moistened the ground (Pl. 1-2).

Site history and archaeological background

The archaeological potential of the site area has been highlighted in a consultation letter prepared by Ms Lesley-Ann Mather, Northamptonshire County Archaeological Advisor. In summary, the site lies within a landscape containing extensive areas of well preserved ridge and furrow. This extends around the village on the eastern side linking up with a series of medieval earthworks which survive on the north-eastern site of the village. Barby has late Saxon origins and is mentioned as a medium-sized manor in Domesday Book (Williams and Martin 2002).

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. Due to the complex nature of the site boundary and its position within a larger field it was decided to lay out the survey grids in a way that would maximise the number of unobstructed squares (Fig. 2). The survey was only limited by the thick overhanging hedgerow that bordered the site to the west, causing several of the western grids to be truncated along that side.

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 Institute *for* Archaeologists (2002, 2011).

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 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 -3.00 to 3.00 nT	Enhance the contrast of the image to improve the appearance of possible archaeological 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	Cancel out effects of site's topography on irregularities in the traverse speed.

Once processed, the results are presented as a greyscale plot shown in relation to the site (Fig. 3), followed by a second plan to present the abstraction and interpretation of the magnetic anomalies (Fig. 4). 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 2.4.0 Chugiak 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

The survey recorded a variety of magnetic anomalies across the entire site area (Fig. 3). These can be divided into three categories (Fig. 4): positive anomalies caused by agricultural activity, weak positive anomalies of possible archaeological origin and magnetic disturbance caused by near-by or buried ferromagnetic objects. Agricultural activity, in this case ridge and furrow method farming, is the probable cause of the 15 linear positive anomalies that run in a regular, parallel pattern into the northern edge of the site from the north [Fig. 4: 1]. This type of anomaly usually indicates the presence of buried cut features, e.g. furrows, which, on this site, were also seen as above-ground earthworks across much of this area (Pl. 1-2). Three weak or dubious positive magnetic anomalies were identified which may be of archaeological origin. The first of these, a linear anomaly which may represent a ditch, runs at a slightly different angle to the furrows on the western side of the survey area [2]. The remaining two are diffuse areas roughly linear in shape that were recorded in the centre and eastern end of the site [3, 4]. These, particularly anomaly [4], may represent earlier man-made features that have been partly ploughed out by the ridge and furrow and subsequent farming or, alternatively, they may be caused by naturally occurring hollows within the underlying geology.

The remaining anomalies are most likely caused by magnetic disturbance resulting from ferromagnetic objects close to the survey area. A weak linear anomaly [5] may represent a buried pipe with the magnetic spike towards its western end being a ferrous fitting. The patches of strong magnetic disturbance along the northern and southern site boundaries are caused by the post-and-wire fencing that borders the site in these locations with while the larger area which extends into the site from the southern edge may be the site of a previous structure or object associating with the site's use as a paddock.

Conclusion

The geophysical survey of the proposal site identified a series of magnetic anomalies which may represent buried features and objects. These included the furrows of the ridge and furrow farming system that was employed across the northern part of the survey area and was still visible as earthworks in the ground. Three weak anomalies were recorded that may be the result of buried archaeological deposits although their precise nature cannot be determined due to their weak signatures. Because of this they may equally be caused by natural variations in the underlying geology. The strong signal of a large area of magnetic disturbance on the site's southern boundary potentially obscures weaker anomalies caused by further archaeological deposits.

References

- BGS, 1980, *British Geological Survey*, 1:50,000, Sheet 185, Solid and Drift Edition, Keyworth
- English Heritage, 2008, *Geophysical Survey in Archaeological Field Evaluation*, English Heritage, Portsmouth (2nd edn)
- IFA, 2002, *The Use of Geophysical Techniques in Archaeological Evaluation*, IFA Paper No. 6, Reading
- IFA, 2011, *Standard and Guidance: for archaeological geophysical survey*, Reading
- NPPF, 2012, *National Planning Policy Framework*, Dept Communities and Local Government, London
- Williams, A and Martin, G H, 2002, *Domesday Book: A Complete Translation*, London

Appendix 1. Survey and data information

Programme

Name: TerraSurveyor
Version: 3.0.25.1

Raw data

Instrument Type: Grad 601 (Magnetometer)
Units: nT
Direction of 1st Traverse: 253.504 deg
Collection Method: ZigZag
Sensors: 2 @ 1.00 m spacing.
Dummy Value: 2047.5

Dimensions

Composite Size (readings): 480 x 100
Survey Size (meters): 120 m x 100 m
Grid Size: 20 m x 20 m
X Interval: 0.25 m
Y Interval: 1 m

Stats

Max: 100.00
Min: -100.00
Std Dev: 16.90
Mean: -3.06
Median: -0.30
Composite Area: 1.2 ha
Surveyed Area: 0.67835 ha

Source Grids: 19

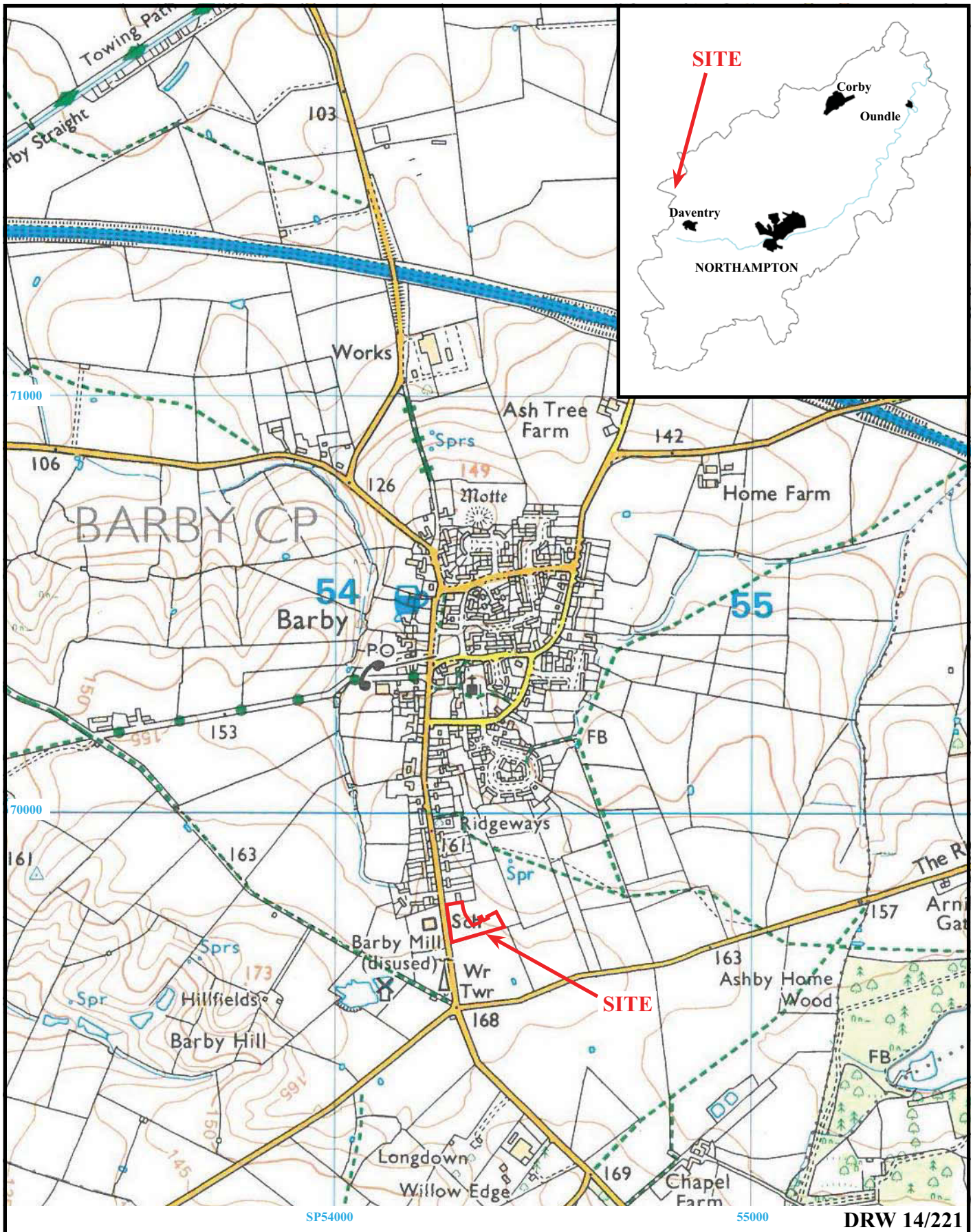
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2 Col:0 Row:1 grids\02.xgd
3 Col:1 Row:0 grids\03.xgd
4 Col:1 Row:1 grids\04.xgd
5 Col:2 Row:0 grids\05.xgd
6 Col:2 Row:1 grids\06.xgd
7 Col:3 Row:0 grids\07.xgd
8 Col:3 Row:1 grids\08.xgd
9 Col:3 Row:2 grids\09.xgd
10 Col:4 Row:0 grids\10.xgd
11 Col:4 Row:1 grids\11.xgd
12 Col:4 Row:2 grids\12.xgd
13 Col:4 Row:3 grids\13.xgd
14 Col:4 Row:4 grids\14.xgd
15 Col:5 Row:0 grids\15.xgd
16 Col:5 Row:1 grids\16.xgd
17 Col:5 Row:2 grids\17.xgd
18 Col:5 Row:3 grids\18.xgd
19 Col:5 Row:4 grids\19.xgd

Processed data

Stats
Max: 3.00
Min: -3.00
Std Dev: 1.25
Mean: -0.14
Median: 0.00

Processes: 7

1 Base Layer
2 De Stagger: Grids: All Mode: Both By: -1 intervals
3 DeStripe Median Sensors: All
4 De Stagger: Grids: 01.xgd 02.xgd 03.xgd 04.xgd 05.xgd 06.xgd
07.xgd 08.xgd 09.xgd Mode: Both By: -1 intervals
5 De Stagger: Grids: All Mode: Both By: -1 intervals
6 Clip from -3.00 to 3.00 nT
7 Despiking Threshold: 1 Window size: 3x3



**Land Adjacent to 71 Daventry Road, Barby
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Figure 1. Location of site within Barby and Northamptonshire.

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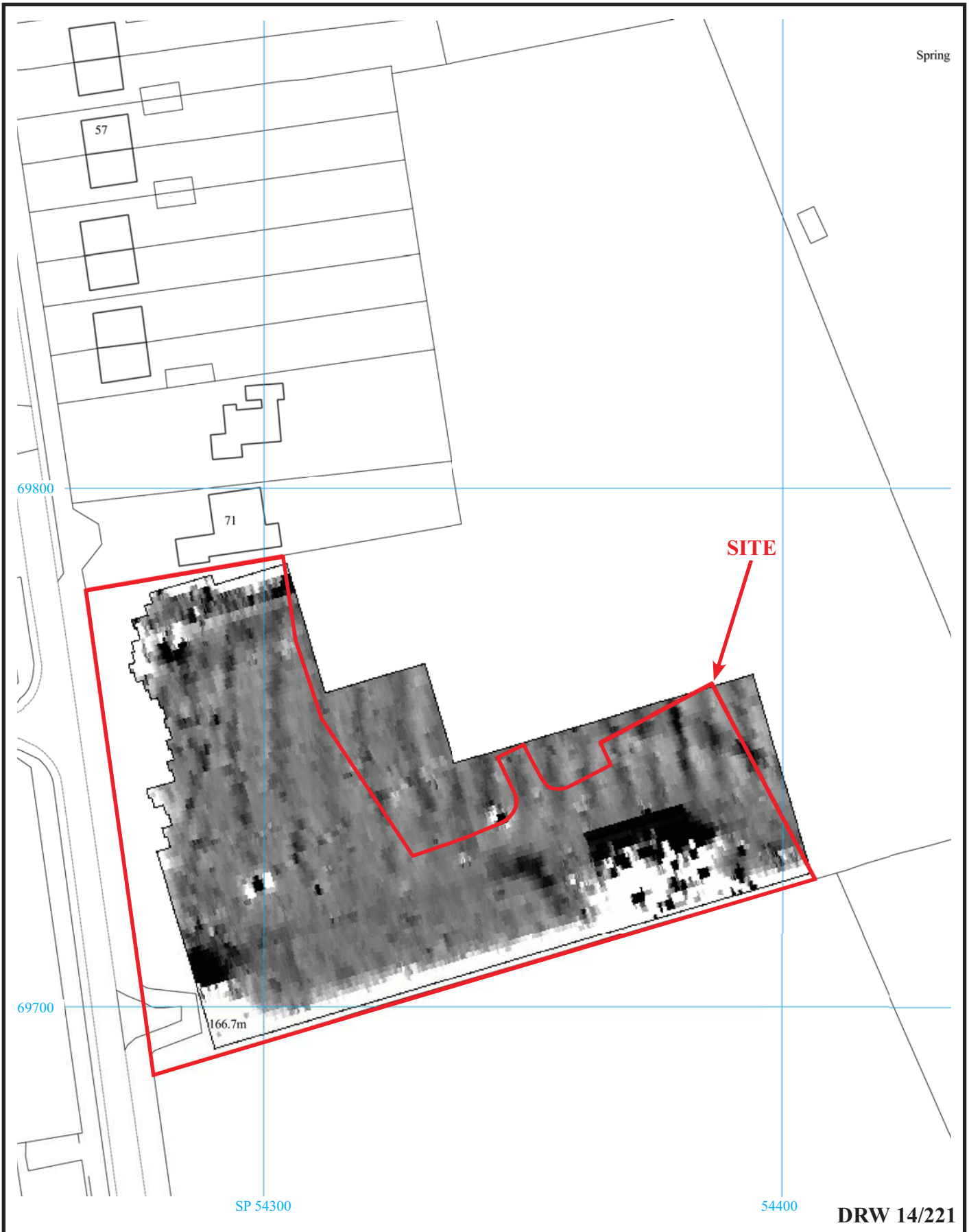
DRW 14/221



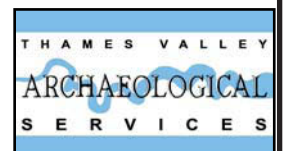
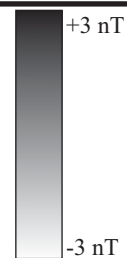
**Land Adjacent to 71 Daventry Road,
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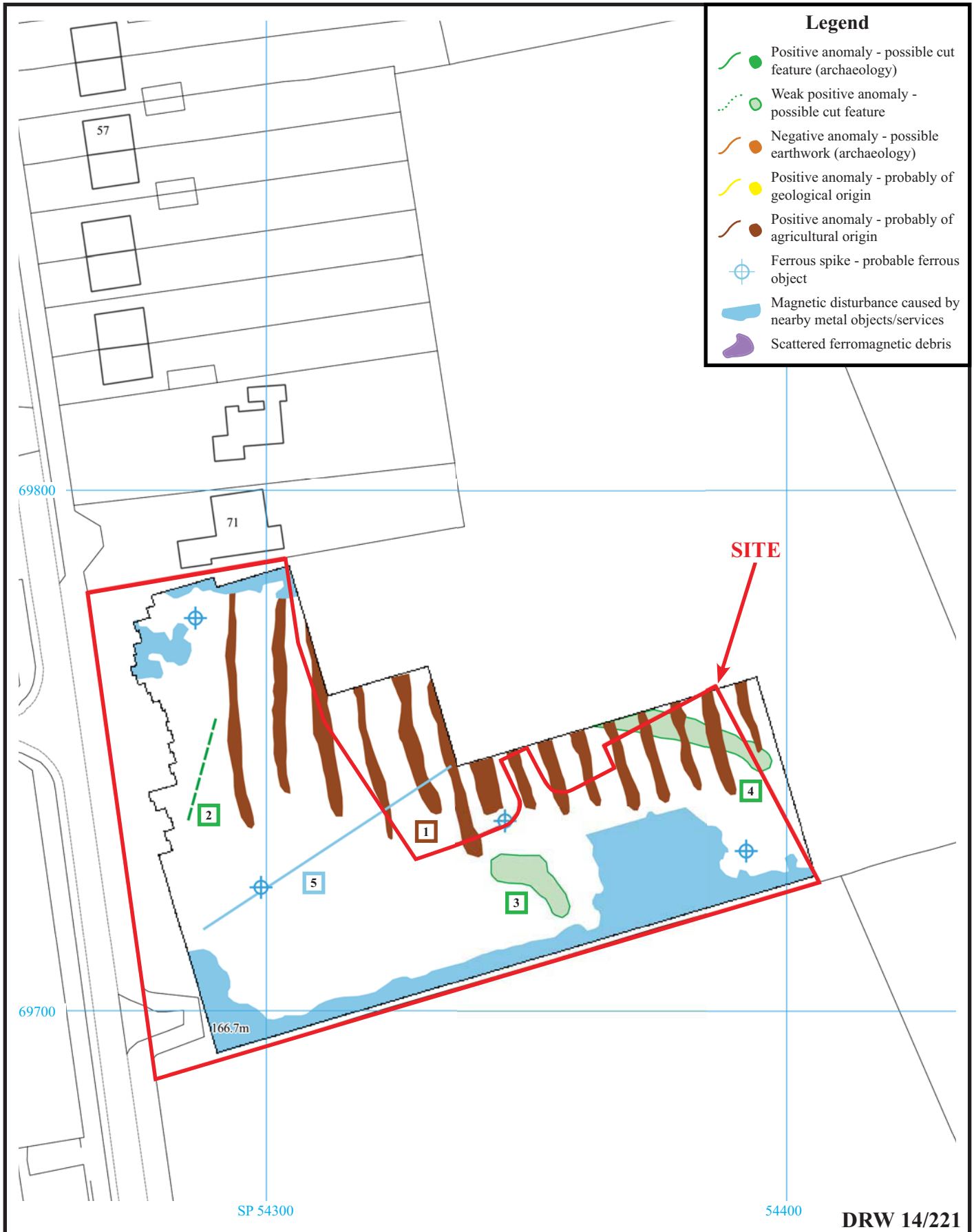
Figure 2. Survey grid layout.





**Land Adjacent to 71 Daventry Road, Barby,
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Figure 3. Plot of minimally processed gradiometer data.





**Land Adjacent to 71 Daventry Road, Barby,
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Figure 4. Interpretation plot.





Plate 1. The southern edge of the site, looking east from the south-western corner.



Plate 2. The site, looking north-west from the south-eastern corner.

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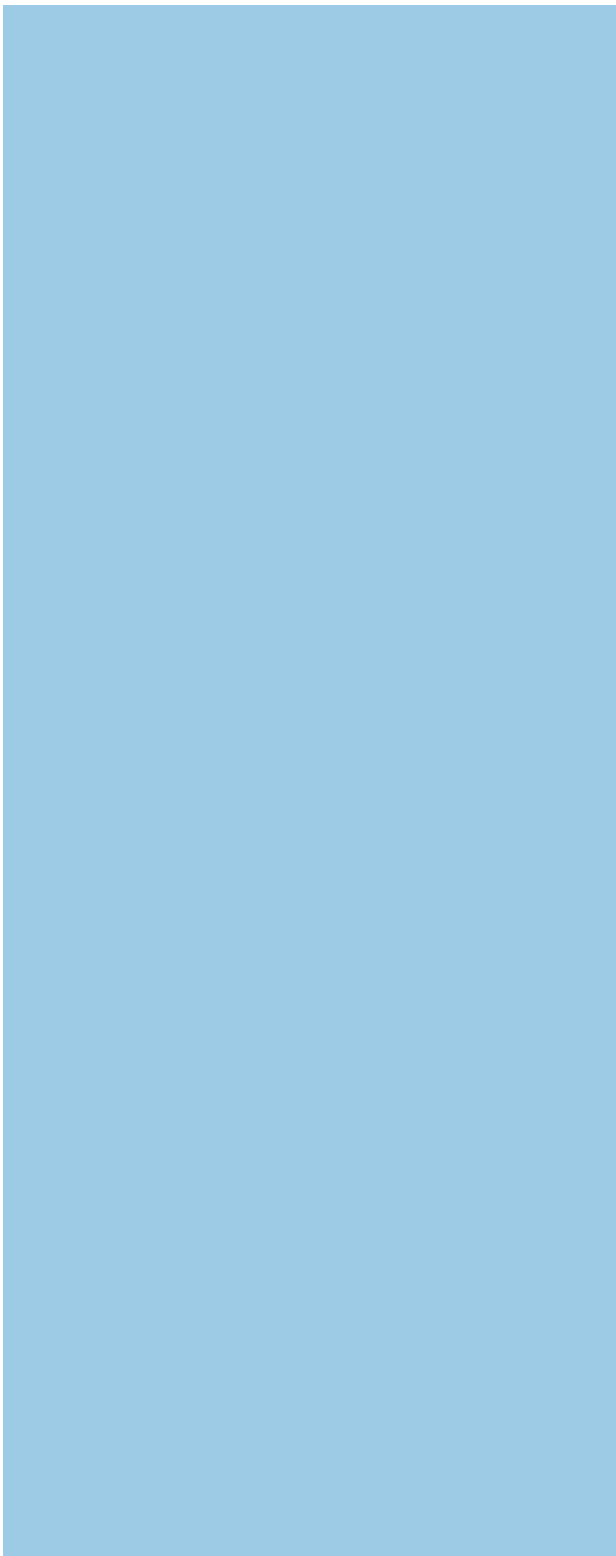
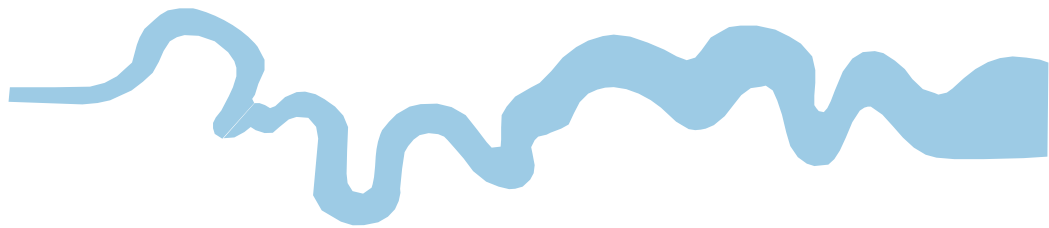
**Land Adjacent to 71 Daventry Road, Barby,
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Plates 1 - 2.**

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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





**Thames Valley Archaeological Services Ltd,
47-49 De Beauvoir Road, Reading,
Berkshire, RG1 5NR**

**Tel: 0118 9260552
Fax: 0118 9260553
Email: tvas@tvas.co.uk
Web: www.tvas.co.uk**