

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

ARCHAEOLOGICAL

S E R V I C E S

**Land at Hill Farm, Rothersthorpe,
Northamptonshire**

Geophysical Survey (Magnetic)

by Tim Dawson

Site Code: BRR 15/166

(SP 7000 5694)

Land at Hill Farm, Rothersthorpe, Northamptonshire

Geophysical Survey (Magnetic) Report

For Armour Heritage Ltd

by Tim Dawson

Thames Valley Archaeological Services Ltd

Site Code BRR 15/166

September 2015

Summary

Site name: Land at Hill Farm, Rothersthorpe, Northamptonshire

Grid reference: SP 7000 5694

Site activity: Magnetometer survey

Date and duration of project: 24th August - 8th September 2015

Project manager: Steve Ford

Site supervisor: Tim Dawson

Site code: BRR 15/166

Area of site: 12.47ha

Summary of results: Two weak positive linear anomalies were identified, however these most likely indicate the location of a previous field boundary that is shown crossing the field at this point on modern maps but which had been removed at some point prior to the survey. The majority of the field was subject to a large amount of magnetic noise, probably caused by metal refuse that was spread across the topsoil, and, additionally, the line of a modern service was identified in the south-western corner of the area.

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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Report edited/checked by: Steve Ford✓ 29.09.15 Steve Preston✓ 29.09.15

Land at Hill Farm, Rothersthorpe, Northamptonshire

A Geophysical Survey (Magnetic)

by Tim Dawson

Report 15/166

Introduction

This report documents the results of a geophysical survey (magnetic) carried out on a plot of land at Hill Farm, near Rothersthorpe, Northamptonshire (SP 7000 5694) (Fig. 1). The work was commissioned by Ms Sue Farr of Armour Heritage Ltd, Greystone Cottage, Trudoxhill, Frome, Somerset BA11 5DP.

Planning permission is to be sought from South Northamptonshire Council for the construction of a solar PV array. A geophysical survey was requested in order to ascertain the presence/absence and scale of any as yet unrecorded archaeological remains which may be present on the site. This is in accordance with the Department for Communities and Local Government's *National Planning Policy Framework* (NPPF 2012), and the Council's policies on archaeology. The fieldwork was undertaken by Kyle Beaverstock, Rebecca Constable, Ben Tebbit, Tim Dawson, Anna Ginger and Laurie Greenaway between 24th August and 8th September 2015 and the site code is BRR 15/166.

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

Location, topography and geology

The survey area consists of a field some 12.47ha in area on the western side of an unnamed lane *c.*1km west of the village of Rothersthorpe, Northamptonshire (Fig. 1). The historic centre of Northampton lies *c.*7km to the east with the River Nene some 3km to the north and the Grand Union Canal *c.*750m to the south-west. The site itself is roughly rectangular with the north-eastern corner removed by a carpet recycling facility (Fig. 2). It is bordered by hedgerows and mature trees on all sides except where the carpet recycling facility is demarked by an earth bund and line of newly-planted trees. At the time of survey the field had recently been harvested of its wheat crop with several piles of loose straw left lying on the ground (Pls 1–2). The eastern end of the field is a plateau at *c.*97m above Ordnance Datum, with the ground dropping down to *c.*84m at the western end. The underlying geology is recorded as Whitby Mudstone Formation across the majority of the field with bands of Marlstone Rock (limestone) and Dyrham Formation (siltstone and mudstone) towards the bottom of the slope on

the western edge of the field (BGS 1969). Conditions during the first days of the survey were very wet with heavy persistent rain but this soon dried up leaving overcast skies and rapidly drying firm ground.

Site history and archaeological background

A desk-based assessment has been produced detailing the site history and archaeological background (Armour Chelu 2015). In summary the study concluded that the immediate area of the site had only a limited amount of known archaeological features, consisting primarily of medieval ridge and furrow earthworks. The wider region, however contains several archaeological sites representing the later prehistoric, Roman and medieval periods, including the remains of an Iron Age to Roman settlement to the west of the site. The desk-based assessment concluded that the site lies within an area which has potential for further Iron Age to Roman settlement evidence as well as features relating to medieval and post-medieval agricultural practice.

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 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 -8.00 to 12.00 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 -2 intervals	Cancels 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 2.6.1 Brighton 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 magnetic plot of the survey area (Fig. 3) revealed only a very small number of anomalies which may represent features of potential archaeological interest (Fig. 4). These consisted of two short lengths of weak positive linear anomaly, probably indicating the presence of buried ditch-type features, which were noted towards the northern and southern edges of the field [Fig. 4: 1, 2]. The modern Ordnance Survey Explorer map (Fig. 1) shows a field boundary cutting across the current field on a north-south orientation and these anomalies probably represent sections of this. The majority of the field was subject to scattered magnetic noise with areas of greater density [3, 4], particularly in the region of the carpet recycling facility [3]. A wide range of metallic objects were noted in the topsoil across the whole field during the survey and it is likely that the magnetic noise is caused by these. The only other anomaly of note is the strong bipolar linear which cuts across the south-western corner of the field [5]. This type of signature usually denotes the presence of a buried modern service, such as a pipe or cable.

Conclusion

The geophysical survey of the land at Hill Farm was successfully undertaken although the results were largely negative. Only two weak positive linear anomalies were identified, however these most likely indicate the location of a previous field boundary that is shown crossing the field at this point on modern maps but which had been removed at some point prior to the survey. The majority of the field was subject to a large amount of magnetic noise, probably caused by metal refuse that was spread across the topsoil, and, additionally, the line of a modern service was identified in the south-western corner of the area. The magnetic noise and the strong

signature of the buried service may potentially have masked any weaker anomalies caused by buried archaeological features.

References

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

Instrument Type: Grad 601 (Magnetometer)
Units: nT
Survey corner coordinates (X/Y):
Northwest corner: 470295.34, 257100.3 m
Southeast corner: 470575.34, 256460.3 m
Direction of 1st Traverse: 172.63 deg
Collection Method: ZigZag
Sensors: 2 @ 1.00 m spacing.
Dummy Value: 2047.5

Dimensions

Composite Size (readings): 1120 x 640
Survey Size (meters): 280 m x 640 m
Grid Size: 20 m x 20 m
X Interval: 0.25 m
Y Interval: 1 m

Stats

Max: 97.44
Min: -100.00
Std Dev: 19.98
Mean: -0.28
Median: -0.36
Composite Area: 17.92 ha
Surveyed Area: 11.666 ha

Source Grids: 342

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 335 Col:11 Row:31 grids\341.xgd
 336 Col:12 Row:11 grids\316.xgd
 337 Col:12 Row:12 grids\318.xgd
 338 Col:12 Row:27 grids\334.xgd
 339 Col:12 Row:28 grids\336.xgd
 340 Col:12 Row:29 grids\338.xgd
 341 Col:12 Row:30 grids\340.xgd
 342 Col:12 Row:31 grids\342.xgd

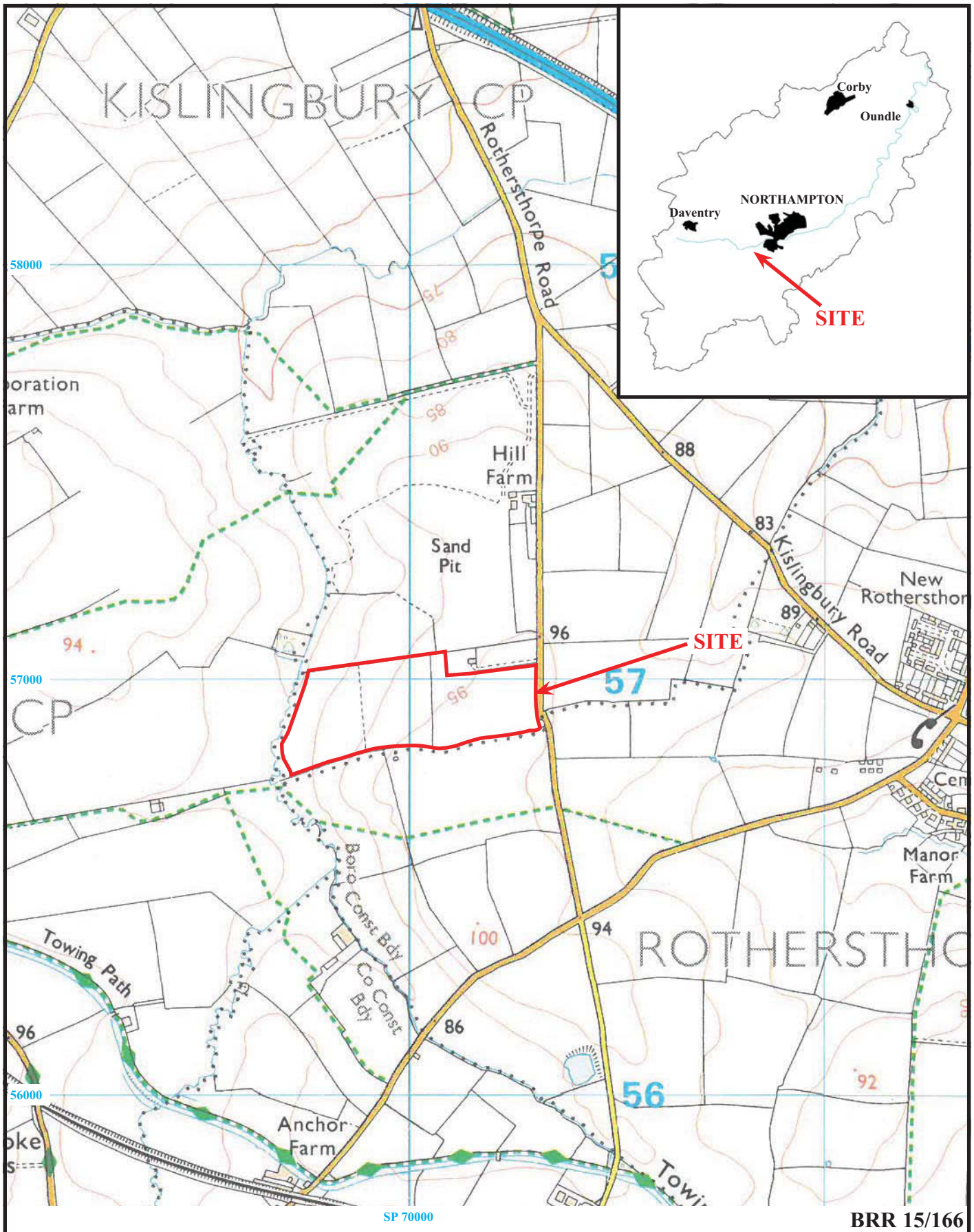
Processed data

Stats

Max: 12.00
 Min: -8.00
 Std Dev: 4.91
 Mean: 0.28
 Median: 0.03
 Composite Area: 17.92 ha
 Surveyed Area: 11.634 ha

Processes: 6

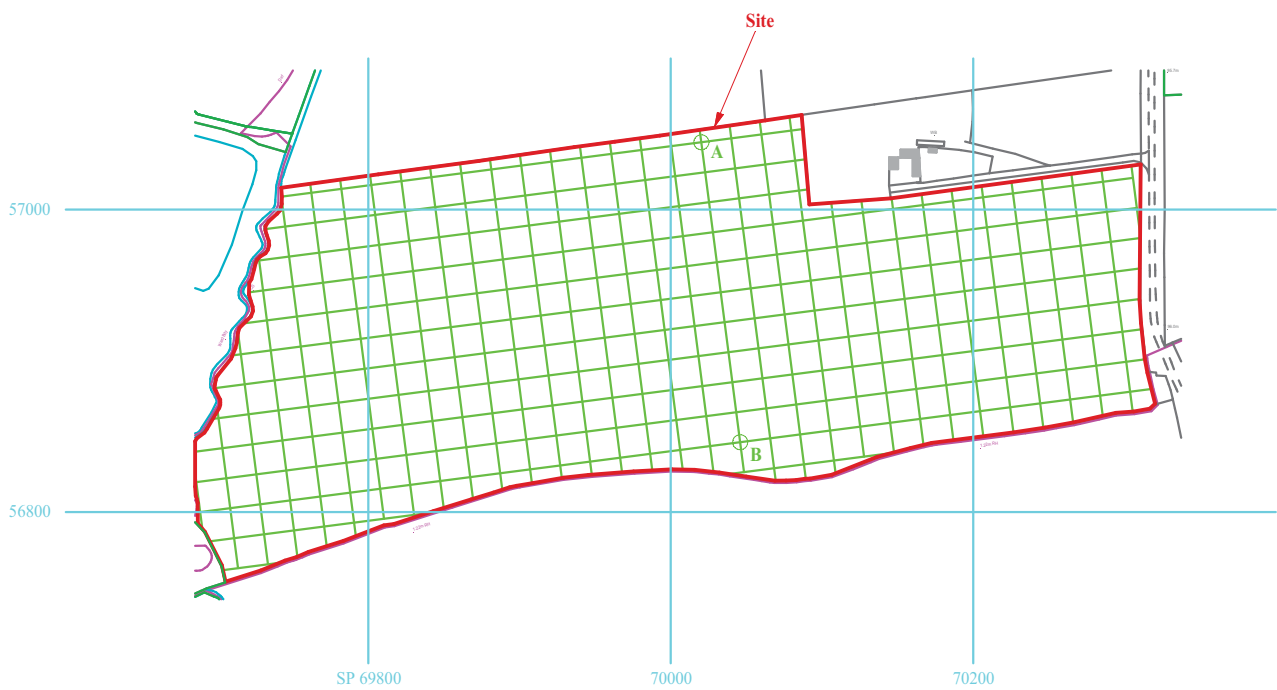
- 1 Base Layer
- 2 De Stagger: Grids: All Mode: Both By: -2 intervals
- 3 DeStripe Median Sensors: All
- 4 Despike Threshold: 1 Window size: 3x3
- 5 Interpolate: Y Doubled.
- 6 Clip from -8.00 to 12.00 nT



**Land at Hill Farm, Rothersthorpe,
Northamptonshire, 2015
Geophysical Survey (Magnetic)**

Figure 1. Location of site within Rothersthorpe and Northamptonshire.

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Ordnance Survey Licence 100025880



Georeferencing
 A: E 470020.22, N 257044.54
 B: E 470076.15, N 256844.12

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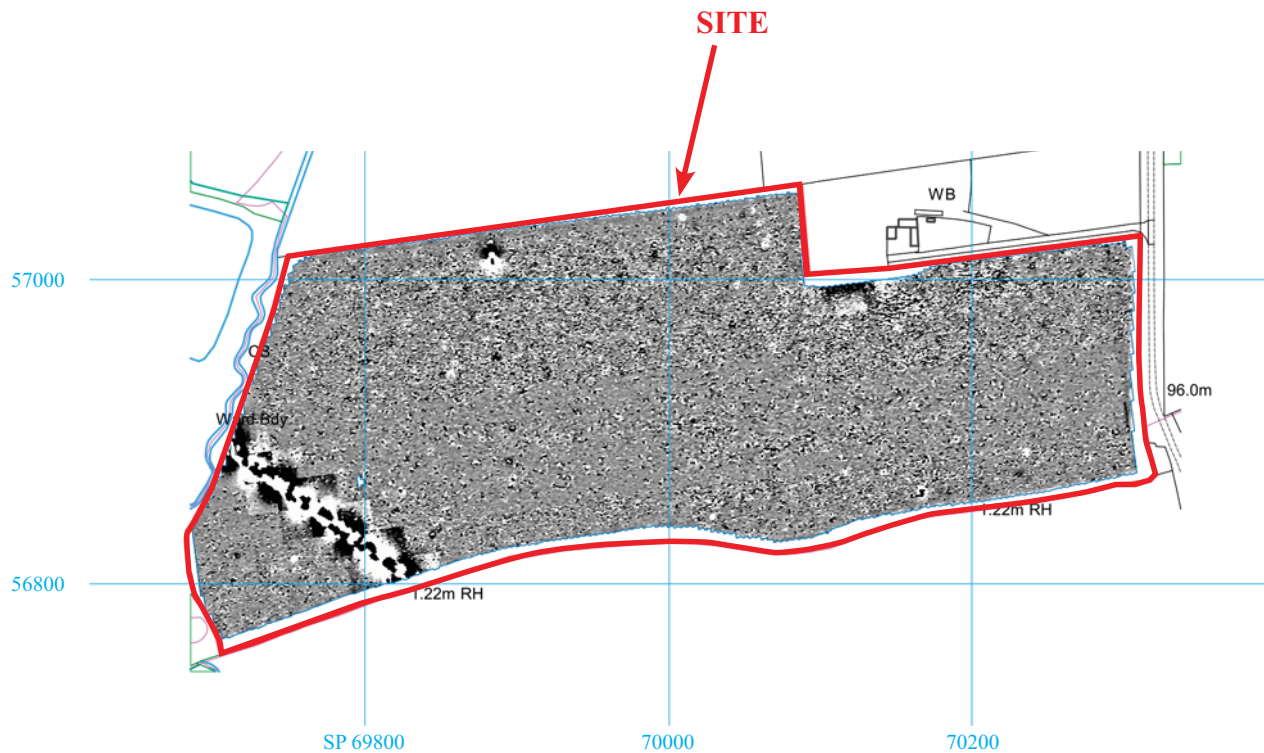


**Land at Hill Farm, Rothersthorpe,
 Northamptonshire, 2015
 Geophysical Survey (Magnetic)**

Figure 2. Survey grid layout.



THAMES VALLEY
 ARCHAEOLOGICAL
 SERVICES



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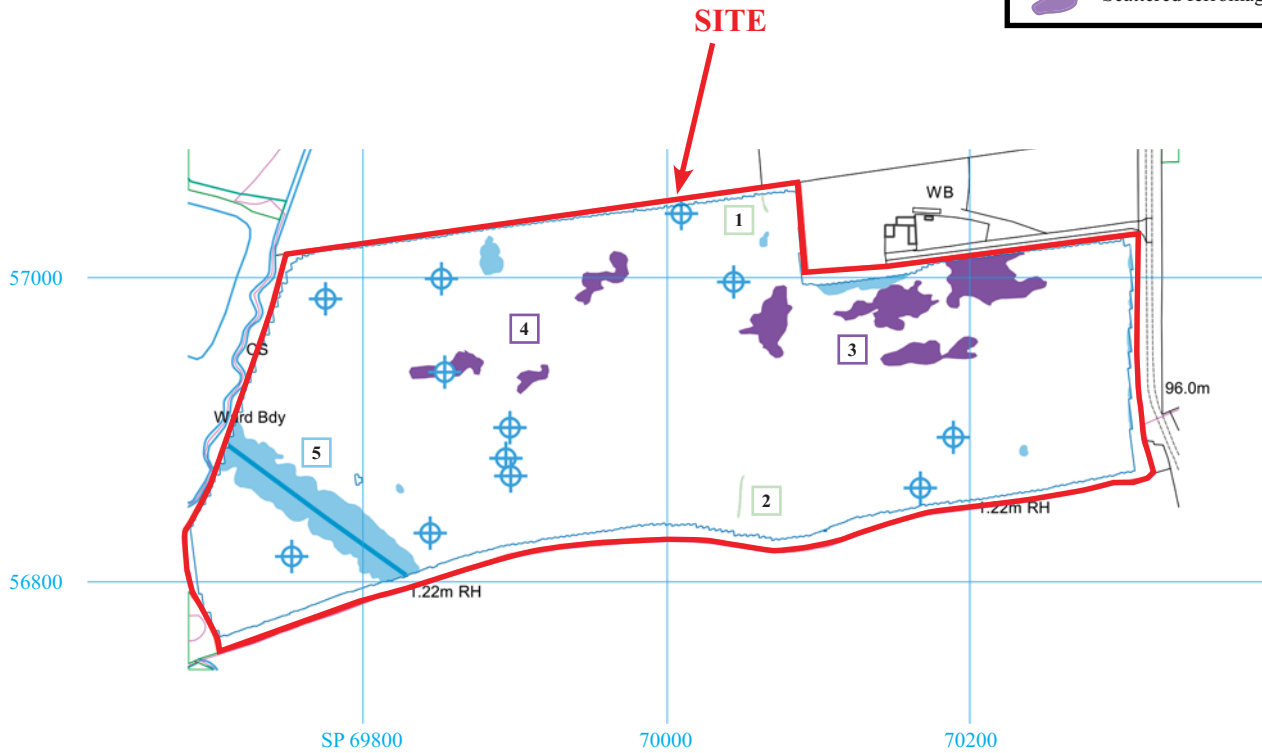
**Land at Hill Farm, Rothersthorpe,
Northamptonshire, 2015
Geophysical Survey (Magnetic)**

Figure 3. Plot of minimally processed gradiometer data.



Legend

-  Positive anomaly - possible cut feature (archaeology)
-  Weak positive anomaly - possible cut feature
-  Negative anomaly - possible earthwork (archaeology)
-  Positive anomaly - probably of geological origin
-  Positive anomaly - probably of agricultural origin
-  Ferrous spike - probable ferrous object
-  Magnetic disturbance caused by nearby metal objects/services
-  Scattered ferromagnetic debris



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**Land at Hill Farm, Rothersthorpe,
Northamptonshire, 2015
Geophysical Survey (Magnetic)**
Figure 4. Interpretation plot.



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Plate 1. Survey area, looking north-east towards the carpet recycling facility.



Plate 2. Survey area, looking west.

FHF 13/120

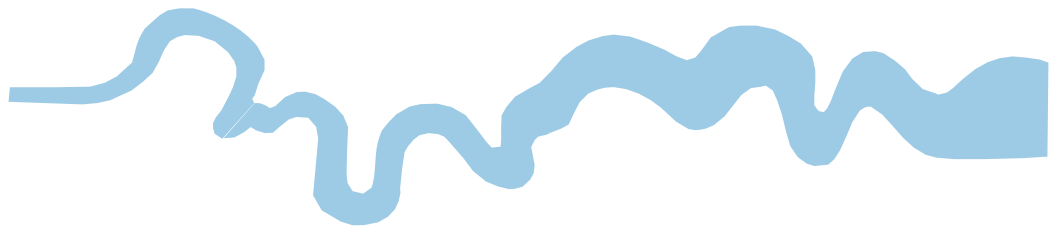
**Land at Hill Farm, Rothersthorpe,
Northamptonshire, 2015
Geophysical Survey (Magnetic)**
Plates 1 - 2.

THAMES VALLEY
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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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