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ARCHAEOLOGICAL

S E R V I C E S

**Land east of The Drive, Enstone,
Oxfordshire**

Geophysical Survey (Magnetic)

by Tim Dawson, Kyle Beaverstock and Lizzi Lewins

Site Code: DEO15/44

(SP 3774 2467)

Land east of The Drive, Enstone, Oxfordshire

Geophysical Survey (Magnetic) Report

For Mr Paul Baker

by Tim Dawson, Kyle Beaverstock

and Lizzi Lewins

Thames Valley Archaeological Services Ltd

Site Code DEO 15/44

May 2015

Summary

Site name: Land east of The Drive, Enstone, Oxfordshire

Grid reference: SP 3774 2467

Site activity: Magnetometer survey

Date and duration of project: 12th - 13th May 2015

Project manager: Steve Ford

Site supervisor: Lizzi Lewins

Site code: DEO 15/44

Area of site: 2.47ha (1.27ha available to survey)

Summary of results : A few magnetic anomalies were recorded during the geophysical survey, some of these linear anomalies may represent buried archaeological features.

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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| Andrew Munding✓ 28.05.15 |

Land east of The Drive, Enstone, Oxfordshire A Geophysical Survey (Magnetic)

by Tim Dawson, Kyle Beaverstock and Lizzi Lewins

Report 15/44b

Introduction

This report documents the results of a geophysical survey (magnetic) carried out on a plot of land east of The Drive, Enstone, Oxfordshire (SP 3774 2467) (Fig. 1). The work was commissioned by Mr Simon Joyce of Strutt & Parker LLP, 269 Banbury Road, Oxford, OX2 7LL, on behalf of Mr Paul Baker, The Wells, The Drive, Enstone, Oxfordshire, OX7 4NF.

An outline planning application is being prepared for submission to West Oxfordshire District Council for residential development on the site. An assessment of the archaeological potential of the land has been requested in order both to inform the planning process and to influence the design of the scheme so as to mitigate its potential effects on archaeological remains. The field investigation was carried out to a specification approved by Mr Hugh Coddington, Heritage Team Leader at Oxfordshire County Council. The fieldwork was undertaken by Rebecca Constable and Lizzi Lewins on 12th and 13th May 2015 and the site code is DEO 15/44.

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

Location, topography and geology

The site currently consists of open pastoral land with a stable block and accompanying yard in the south-western corner, all covering an area of around 2.47ha. The site lies to the east of The Drive and is accessed from the Bicester Road (B4030) to the north. There is housing on the western side of The Drive and three houses stand north of the site either side of the public footpath. The site is bounded to the south by the River Glyme and to the east by an unnamed tributary stream. Beyond the river and stream are pastoral and arable fields. There is evidence of previous agriculture in the form of ridge and furrow on the site, mostly on a NNW–SSE alignment. The site lies at a height of approximately 125m above Ordnance Datum, situated at the base of a hill with a pronounced slope down to the south and east, towards the two water courses. The underlying geology of the two little valleys is complex, and the site appears to lie in an area that incorporates elements of Middle Lias clays, silts and siltstones; marlstone rock bed; Upper Lias clay; Clypeus grit; and perhaps Chipping Norton limestone bedrock (BGS 1968).

Site history and archaeological background

The desk-based assessment (Ruttle 2015) for the site concluded the area has little known prehistoric or Roman activity but has a nearby church and village dated to the medieval period. Very few archaeological investigations have taken place in the environs of the proposed development. Most previously recorded sites in the study area are field spots or listed buildings.

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. A grid plan was drawn up to cover the area available to survey which excluded a large area to the east as this area consisted of wetland. Also, buildings in the south-western corner, hedges lines along the northern boundaries as well as a pond in the south-eastern slightly reduced the area available to survey.

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 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 |
|---|--|
| e.g. 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. |
| Search & Replace: from: ±30 nT to: ±1000 nT with: dummy | Removes extreme values resulting from magnetic interference caused by near-by ferromagnetic objects. |
| Range match (area: top 90, left 0, bottom 149, right 359) to top edge | Equalises the range of values between areas surveyed by different operatives, correcting for differences in setup. |
| De-stagger: all grids, both by -1 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

A range of magnetic anomalies were recorded across the survey area (Fig. 4). These were primarily caused by agricultural activity and modern services however some are possibly archaeological in origin (Fig. 5). The magnetic anomalies of possible archaeological origin are recognisable as both positive and negative variations in the site's general magnetic field. The positive anomalies usually represent buried cut features such as ditches or pits whereas negative anomalies are indicative of earthen banks.

The most significant area of interest is near the southern boundary of the site. Here, a positive anomaly **[Fig. 5: 1]** was detected, this linear measured *c.* 27.5m long and aligned east to west, on the southern side of this appears to be a negative linear anomaly **[3]** measuring *c.* 26.27m in length and aligned north-west to south-east. Together, these may represent the remains of a possible field system although the modern agricultural activity may have desorbed or be masking the extent of these anomalies. To the north of these in the south-west of the site a third linear anomaly **[2]** was detected, this weaker positive anomaly was aligned south-west to north-east and measured 29.4m long. A large area of interference near the south-western edge of the site **[4]** was most likely caused by an electrical pylon.

Conclusion

The geophysical survey of the site at The Drive, Enstone was successfully undertaken and identified a few magnetic anomalies which may represent buried archaeological features. These appear to be in the southern and western area of the site. Their layout does suggest the remains of field systems of possible archaeological interest. The survey was undertaken in as much of the site as was accessible however, standing buildings in the south-western corner, hedges lines along the northern boundaries as well as a pond in the south-eastern areas of

the site slightly reduced the survey area. Also, a playground in the south-western corner as well as an electrical pylon near the eastern boundary have the potential to mask others which may indicate the presence of potential archaeological features.

References

- BGS, 1968, *British Geological Survey*, 1:50,000, Sheet 218, Solid and Drift Edition, Keyworth
- English Heritage, 2008, *Geophysical Survey in Archaeological Field Evaluation*, English Heritage, Portsmouth (2nd edn)
- CI/A, 2002, *The Use of Geophysical Techniques in Archaeological Evaluation*, IFA Paper No. 6, Reading
- CI/A, 2011, *Standard and Guidance: for archaeological geophysical survey*, Reading
- CI/A, 2014, *Standard and Guidance: for archaeological geophysical survey*, Reading
- Ruttle, E, 2015, 'Land east of The Drive, Enstone, Oxfordshire: An archaeological desk-based assessment', Thames Valley Archaeological Services report 15/44, Reading

Appendix 1. Survey and data information

Programme:

Name: TerraSurveyor
Version: 3.0.25.0

Raw data

Survey corner coordinates (X/Y):
Northwest corner: 437581.94, 224607.11 m
Southeast corner: 437781.94, 224467.11 m
Direction of 1st Traverse: 25.71 deg
Collection Method: ZigZag
Sensors: 2 @ 1.00 m spacing.
Dummy Value: 2047.5

Dimensions

Composite Size (readings): 800 x 140
Survey Size (meters): 200 m x 140 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: 16.88
Mean: 0.31
Median: 1.03
Composite Area: 2.8 ha
Surveyed Area: 1.2665 ha

Source Grids: 48

1 Col:0 Row:0 grids\47.xgd
2 Col:0 Row:1 grids\48.xgd
3 Col:1 Row:0 grids\44.xgd
4 Col:1 Row:1 grids\45.xgd
5 Col:1 Row:2 grids\46.xgd
6 Col:2 Row:0 grids\39.xgd
7 Col:2 Row:1 grids\40.xgd
8 Col:2 Row:2 grids\41.xgd
9 Col:2 Row:3 grids\42.xgd
10 Col:2 Row:4 grids\43.xgd
11 Col:3 Row:0 grids\34.xgd
12 Col:3 Row:1 grids\35.xgd
13 Col:3 Row:2 grids\36.xgd
14 Col:3 Row:3 grids\37.xgd
15 Col:3 Row:4 grids\38.xgd
16 Col:4 Row:0 grids\27.xgd
17 Col:4 Row:1 grids\28.xgd
18 Col:4 Row:2 grids\29.xgd
19 Col:4 Row:3 grids\30.xgd
20 Col:4 Row:4 grids\31.xgd
21 Col:4 Row:5 grids\32.xgd
22 Col:4 Row:6 grids\33.xgd
23 Col:5 Row:0 grids\20.xgd
24 Col:5 Row:1 grids\21.xgd
25 Col:5 Row:2 grids\22.xgd
26 Col:5 Row:3 grids\23.xgd
27 Col:5 Row:4 grids\24.xgd
28 Col:5 Row:5 grids\25.xgd
29 Col:5 Row:6 grids\26.xgd
30 Col:6 Row:1 grids\14.xgd
31 Col:6 Row:2 grids\15.xgd
32 Col:6 Row:3 grids\16.xgd
33 Col:6 Row:4 grids\17.xgd
34 Col:6 Row:5 grids\18.xgd
35 Col:6 Row:6 grids\19.xgd
36 Col:7 Row:1 grids\09.xgd
37 Col:7 Row:2 grids\10.xgd
38 Col:7 Row:3 grids\11.xgd
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41 Col:8 Row:1 grids\05.xgd

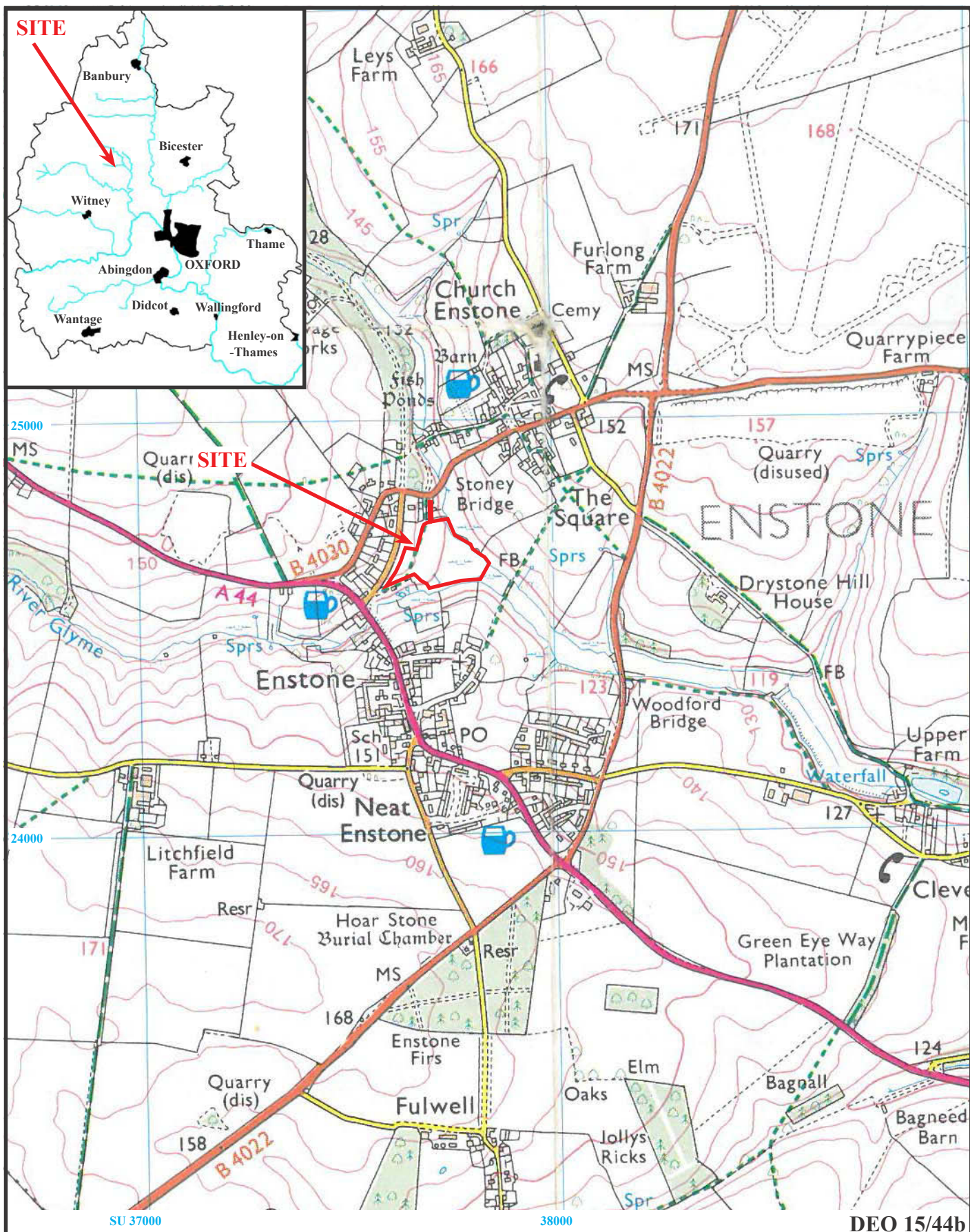
42 Col:8 Row:2 grids\06.xgd
43 Col:8 Row:3 grids\07.xgd
44 Col:8 Row:4 grids\08.xgd
45 Col:9 Row:1 grids\01.xgd
46 Col:9 Row:2 grids\02.xgd
47 Col:9 Row:3 grids\03.xgd
48 Col:9 Row:4 grids\04.xgd

Processed data

Stats
Max: 2.20
Min: -1.80
Std Dev: 1.27
Mean: 0.04
Median: 0.01

Processes: 6

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

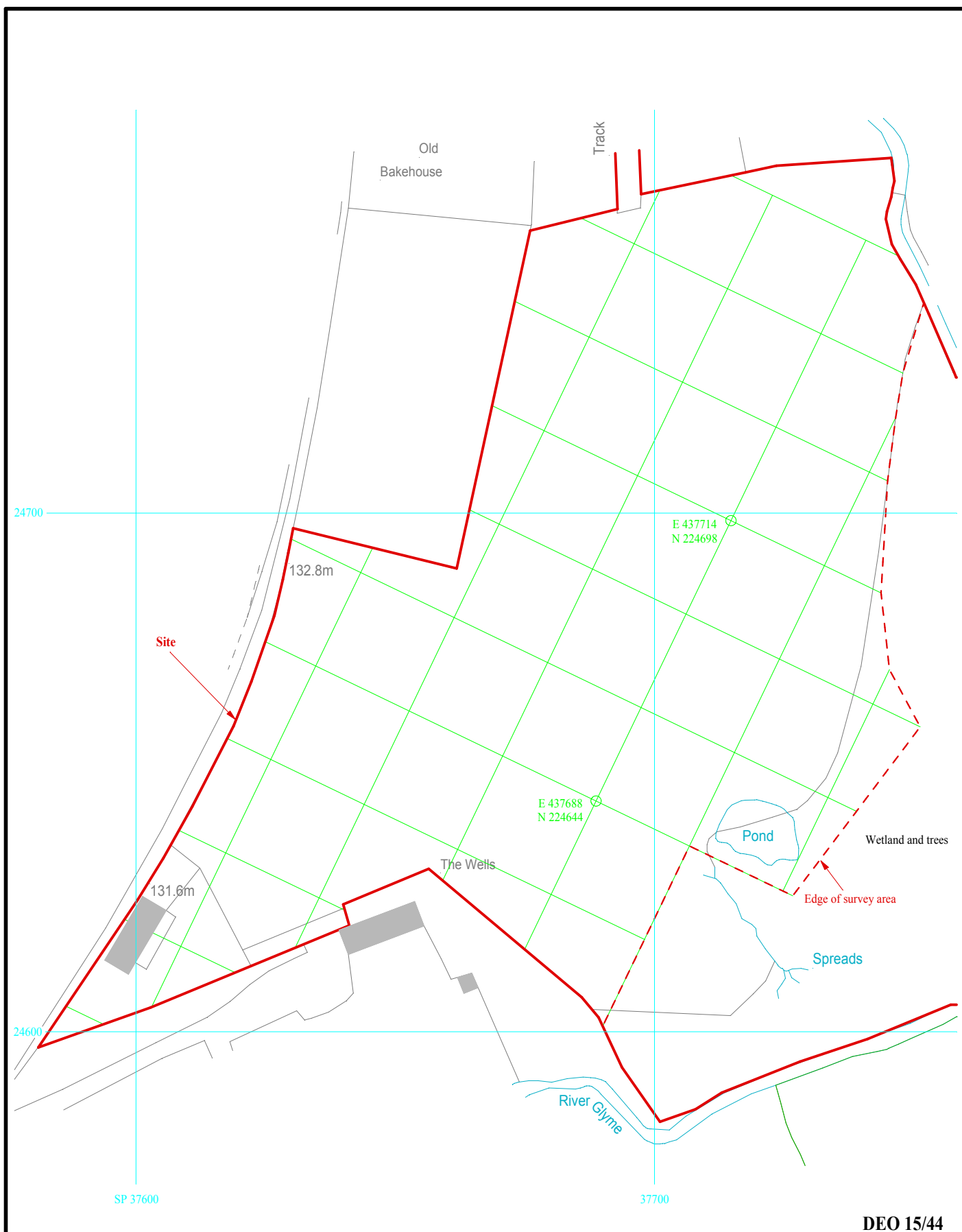


**Land east of The Drive, Enstone,
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Figure 1. Location of site within Enstone and Oxfordshire

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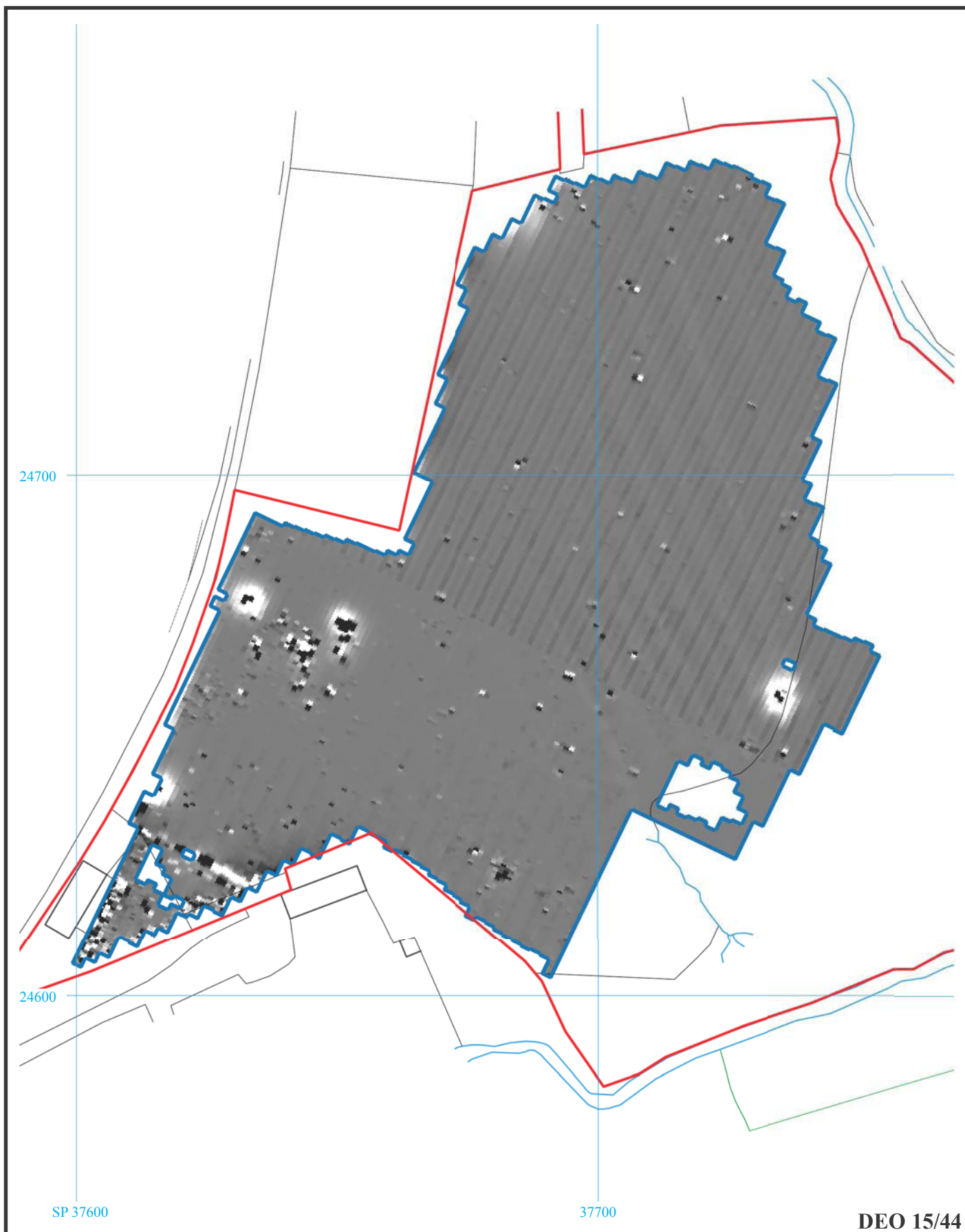


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Figure 2. Survey grid layout.

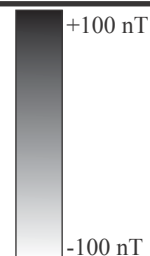


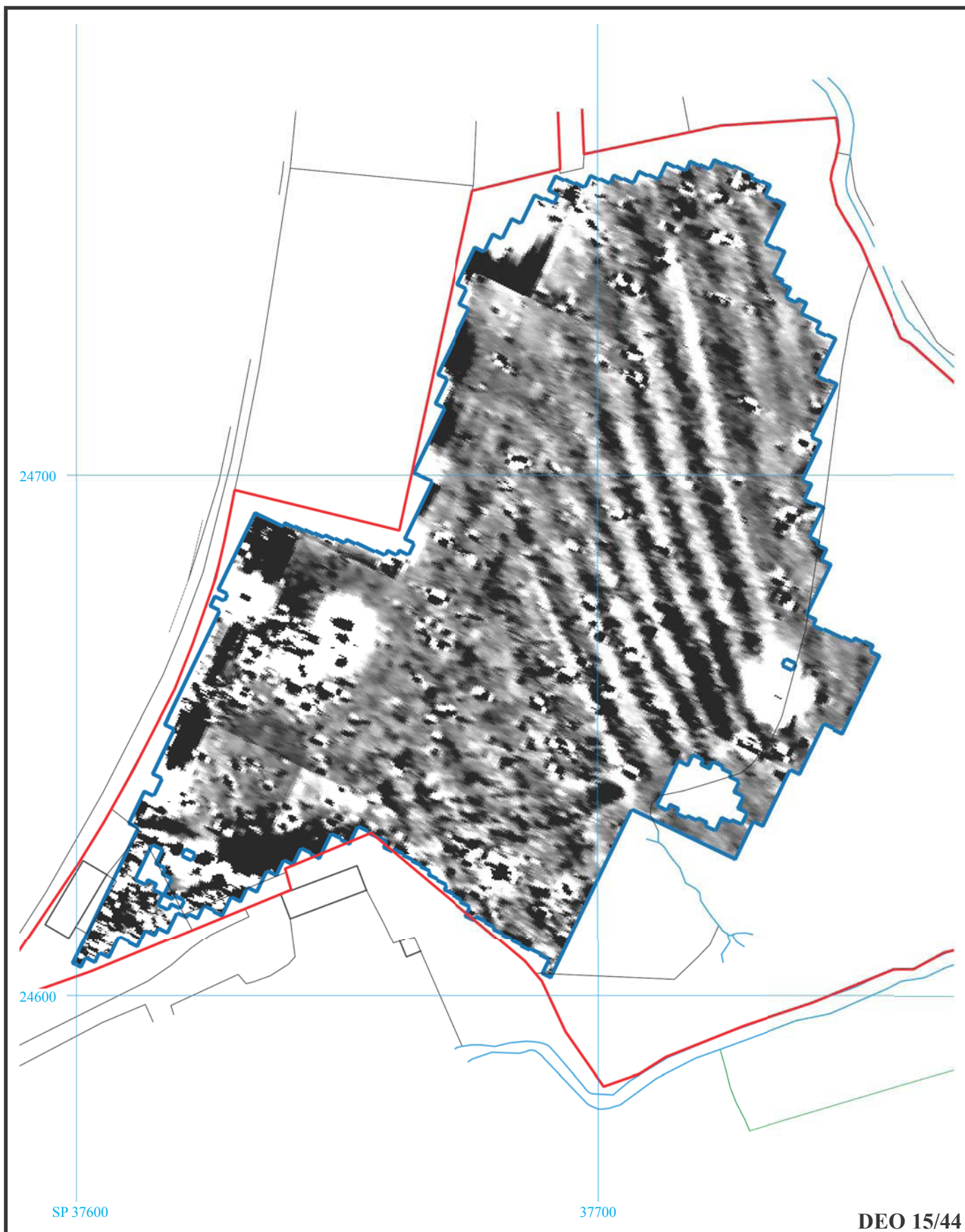
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Figure 3. Plot of raw gradiometer data.

0m 50m

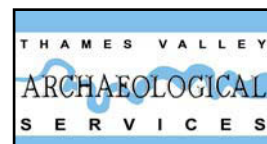
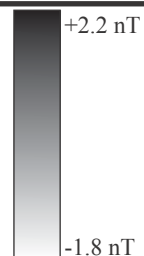




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Figure 4. Plot of minimally processed gradiometer data.

0m 50m



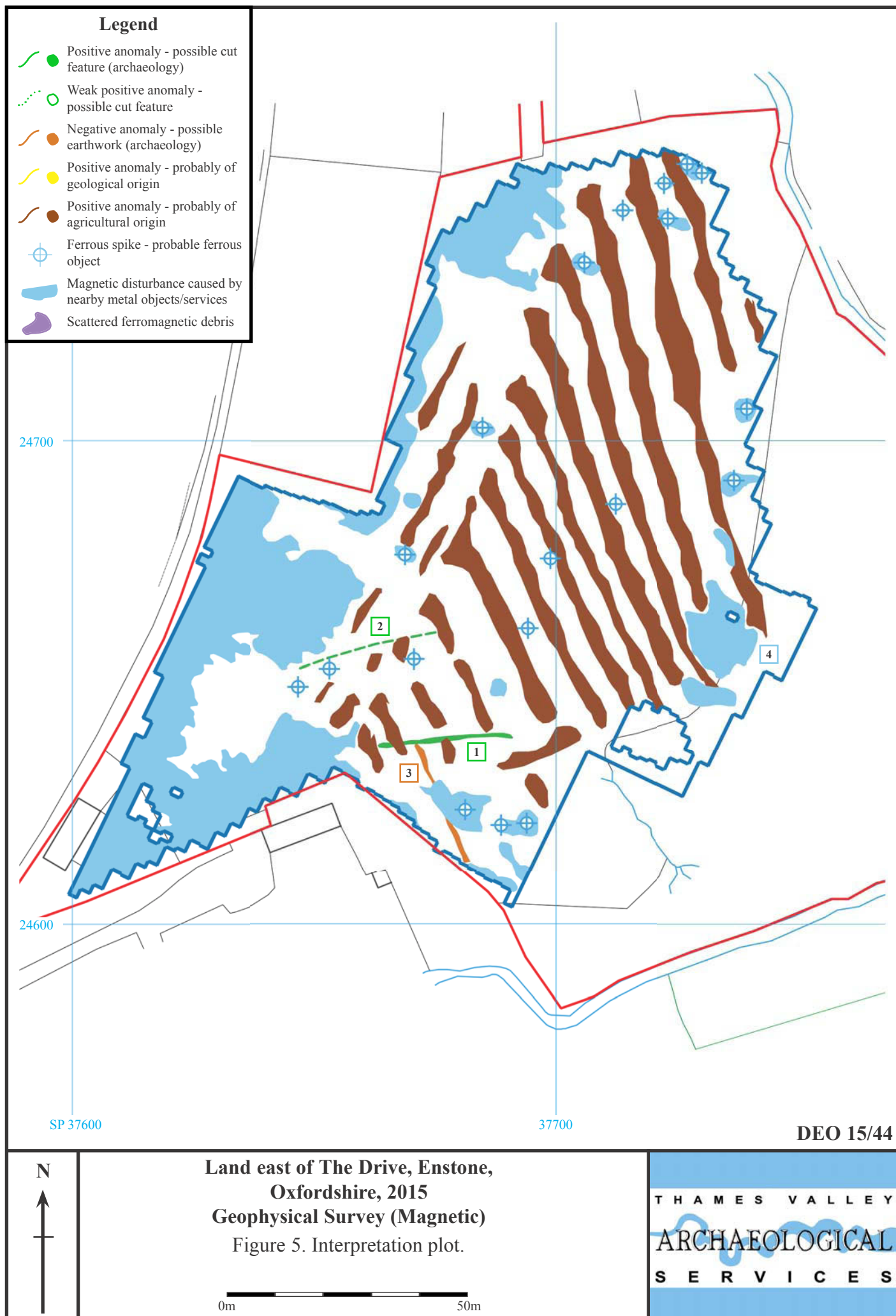




Plate 1. The eastern side of the site, looking south with the area of wetland and trees to the east.



Plate 2. The western side of the site, looking north-east.

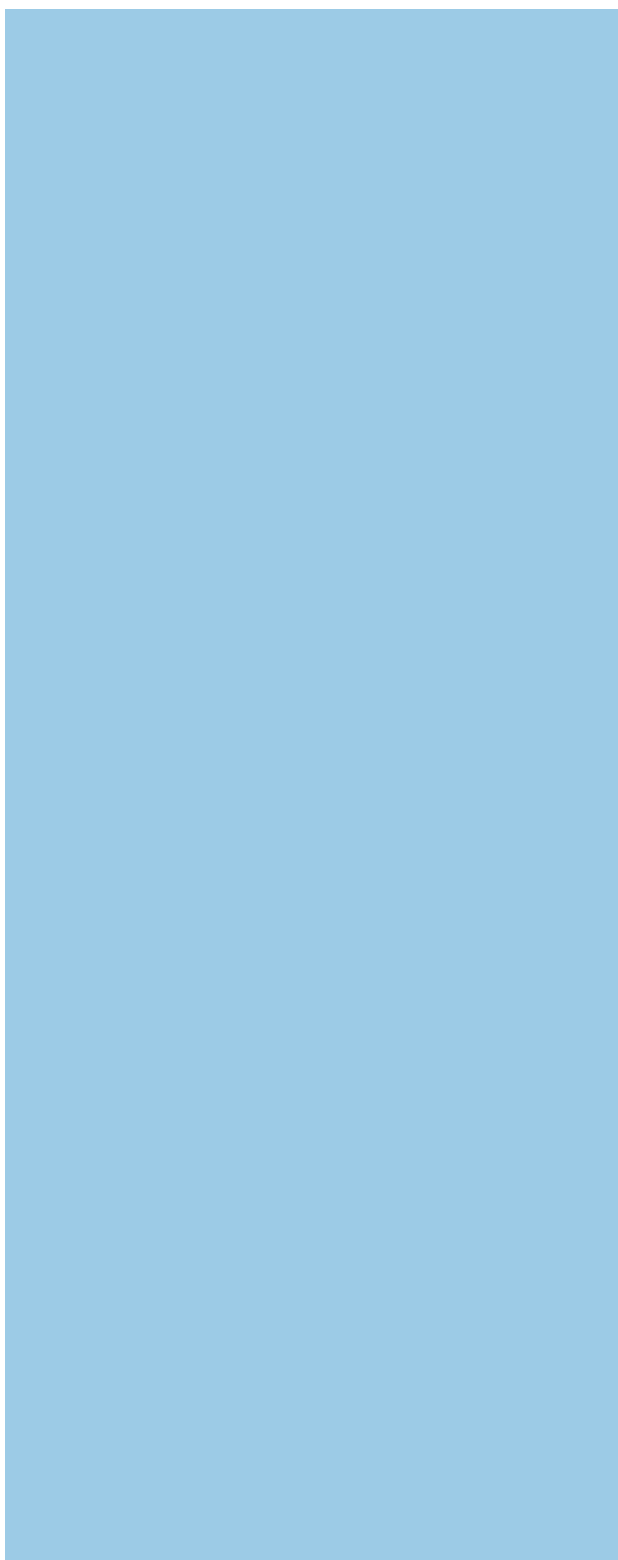
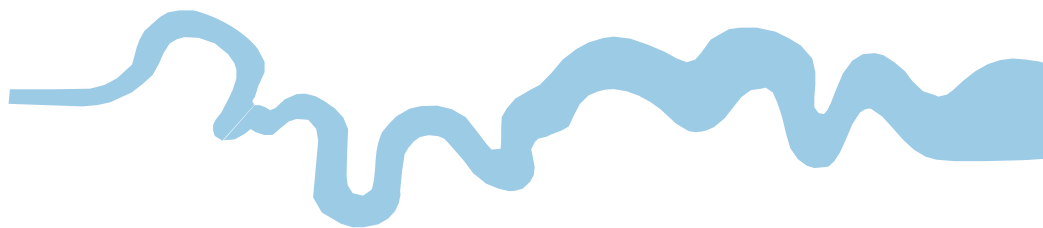
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**Land east of The Drive, Enstone,
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Plates 1 - 2.

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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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