

**T H A M E S      V A L L E Y**

**ARCHAEOLOGICAL**

**S E R V I C E S**

**Land off High Street,  
Lechlade, Gloucestershire**

**Geophysical Survey (Magnetic)**

**by Tim Dawson**

**Site Code: HLG15/37**

**(SU 2176 9951)**

# **Land off High Street, Lechlade, Gloucestershire**

## **Geophysical Survey (Magnetic) Report**

**For Mr C Harris**

by Tim Dawson

Thames Valley Archaeological Services Ltd

Site Code HLG 15/37

**March 2015**

## Summary

**Site name:** Land off High Street, Lechlade, Gloucestershire

**Grid reference:** SU 2176 9951

**Site activity:** Magnetometer survey

**Date and duration of project:** 23<sup>rd</sup> February 2015

**Project manager:** Steve Ford

**Site supervisor:** Tim Dawson

**Site code:** HLG 15/37

**Area of site:** 0.97ha

**Summary of results:** The survey identified several magnetic anomalies although these appear to represent the ridge and furrow farming system present on the site rather than any features of possible archaeological origin.

**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✓ 11.03.15 |
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| Andrew Munding✓ 11.03.15 |
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# Land off High Street, Lechlade, Gloucestershire A Geophysical Survey (Magnetic)

by Tim Dawson

**Report 15/37**

## **Introduction**

This report documents the results of a geophysical survey (magnetic) carried out on a plot of land on the southern side of High Street, Lechlade, Gloucestershire (SU 2176 9951) (Fig. 1). The work was commissioned by Mr Colin Harris, Pennyswick Farm, Buscot, Faringdon, Oxfordshire SN7 8DP.

Planning consent is to be sought from Cotswold District Council to construct a new community swimming pool, car park and small residential development. As a consequence of the possibility for archaeological deposits on the site which may be damaged or destroyed by development, phased evaluation has been proposed comprising geophysical survey followed by trial trenching. 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 Charles Parry, Senior Archaeological Officer at Gloucestershire County Council. The fieldwork was undertaken by Tim Dawson and Nick Dawson on 23<sup>rd</sup> February 2015 and the site code is HLG 15/37.

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 to the south of the High Street on the south-eastern margins of Lechlade-on-Thames, a town in the south-eastern corner of Gloucestershire (Fig. 1). The river Thames flows south-eastwards some 200m to the south of the survey area. The site itself covers an area of *c.*0.97ha at the western end of a larger field of pasture. It is bordered to the north and west by iron post-and-rail fencing and to the south by a public footpath (Fig. 2). The site slopes downhill from 74.9m above Ordnance Datum (aOD) in the north-western corner to 73.4m aOD at its south-eastern extent. There is a dip in the north-western corner to allow for a metal gate which connects the field to the High Street to the north with an area of scalpins to the south to provide a solid access way. Earthworks associated with medieval and post-medieval ridge-and-furrow farming are visible in the ground surface across the entire field. They are all on an approximate north-south alignment and measure *c.*0.15m from base of furrow to top of ridge. The underlying geology is recorded as Northmoor (first terrace) sand and gravel

for the majority of the site with a band of Oxford Clay just along the western boundary (BGS 1974). The conditions during the survey were mixed with heavy sleet showers at the beginning of the survey giving way to bright winter sunshine later (Pl. 1-2).

## **Site history and archaeological background**

The archaeological potential of the site derives from its location within the archaeologically rich upper Thames Valley with a wide range of sites and finds recorded from aerial photography and mineral extraction (Booth *et al.* 2007; Lambrick and Robinson 2009, RCHME 2013). Extensive excavations have taken place to the west of the town and elsewhere (e.g. Boyle *et al.* 1998). Lechlade itself has Saxon origins and is also documented in Domesday Book of AD1086 (Williams and Martin 2002) with its borough status being attained by AD1235 (Douthwaite and Devine 2007).

## **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 survey grids were laid out covering the proposed survey area with no obstruction.

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<sup>-9</sup> 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.

| <b>Process</b>  | <b>Effect</b>  |
|---|--|
| e.g. Clip from -0.80 to 1.20 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.                                     |
| 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**

Several magnetic anomalies were identified spread evenly across the survey area (Fig. 3). A series of broad positive anomalies run parallel to one another at a distance of *c.*20m on an approximate north-south orientation [Fig. 4: 1]. These indicate the presence of buried cut features, which, in this case, correspond directly to the furrow portions of the ridge-and-furrow earthworks which characterise the field. An area of scattered strong positive/negative magnetic readings *c.*10m inside the site's western border [2] was caused by the mixed scalpins and hardcore which had been laid in the patch of soft ground in order to form a firm access route to the field. The northern and southern edges of the survey area are strongly affected by the close proximity of iron fencing with these boundaries causing strong magnetic disturbance in these locations. These may have a masking affect on any weaker anomalies caused by buried archaeological features. A series of magnetic spikes were recorded across the survey area which are most likely the result of discrete ferromagnetic objects, which could have been derived during ploughing.

## **Conclusion**

The geophysical survey of the proposed development area at High Street, Lechlade was successfully undertaken although it did not identify any magnetic anomalies that are likely to indicate the presence of buried archaeological features. The most significant anomalies were those caused by the furrow portions of the ridge-and-furrow farming system, the earthworks of which were visible in the landscape.

## References

- BGS, 1974, *British Geological Survey*, 1:50,000, Sheet 252, Solid and Drift Edition, Keyworth
- Booth, P, Dodd, A, Robinson, M and Smith, A, 2007, *The Thames through Time: The Archaeology of the Gravel Terraces of the Upper and Middle Thames: The early historical period AD1–1000*, Oxford Archaeology Thames Valley Landscapes Monogr **27**, Oxford
- Boyle, A, Jennings, D, Miles, D and Palmer, S, 1998, *The Anglo-Saxon Cemetery at Butler's Field, Lechlade, Gloucestershire; vol 1: Prehistoric and Roman activity and Anglo-Saxon Grave Catalogue*, Oxford Archaeol Thames Valley Landscapes Monogr **10**, Oxford
- Douthwaite A and Devine, V, 2007, Lechlade, Gloucestershire Historic Towns Survey, Gloucestershire County Council Archaeology Service, Gloucester
- 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, 2014, *Standard and Guidance: for archaeological geophysical survey*, Reading
- Lambrick, G, Robinson, M and Allen, T, 2009, *The Thames through Time: The Archaeology of the Gravel Terraces of the Upper and Middle Thames: The Thames Valley in Later Prehistory: 1500BC–AD50*, Oxford Archaeol Thames Valley Landscapes Monogr **29**, Oxford
- NPPF, 2012, *National Planning Policy Framework*, Dept Communities and Local Government, London
- RCHME, 2013, *The Thames Valley Project: a report for the National Mapping Programme*, London
- Williams, A and Martin, G H, 2002, *Domesday Book, a complete translation*, London



## Appendix 1. Survey and data information

### Programme:

Name: TerraSurveyor  
Version: 3.0.25.0

### Raw data

Instrument Type: Grad 601 (Magnetometer)  
Units: nT  
Direction of 1st Traverse: 272.9197 deg  
Collection Method: ZigZag  
Sensors: 2 @ 1.00 m spacing.  
Dummy Value: 2047.5

### Dimensions

Composite Size (readings): 640 x 140  
Survey Size (meters): 160 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: 13.67  
Mean: -0.95  
Median: 0.77  
Composite Area: 2.24 ha  
Surveyed Area: 0.9127 ha

### Source Grids: 33

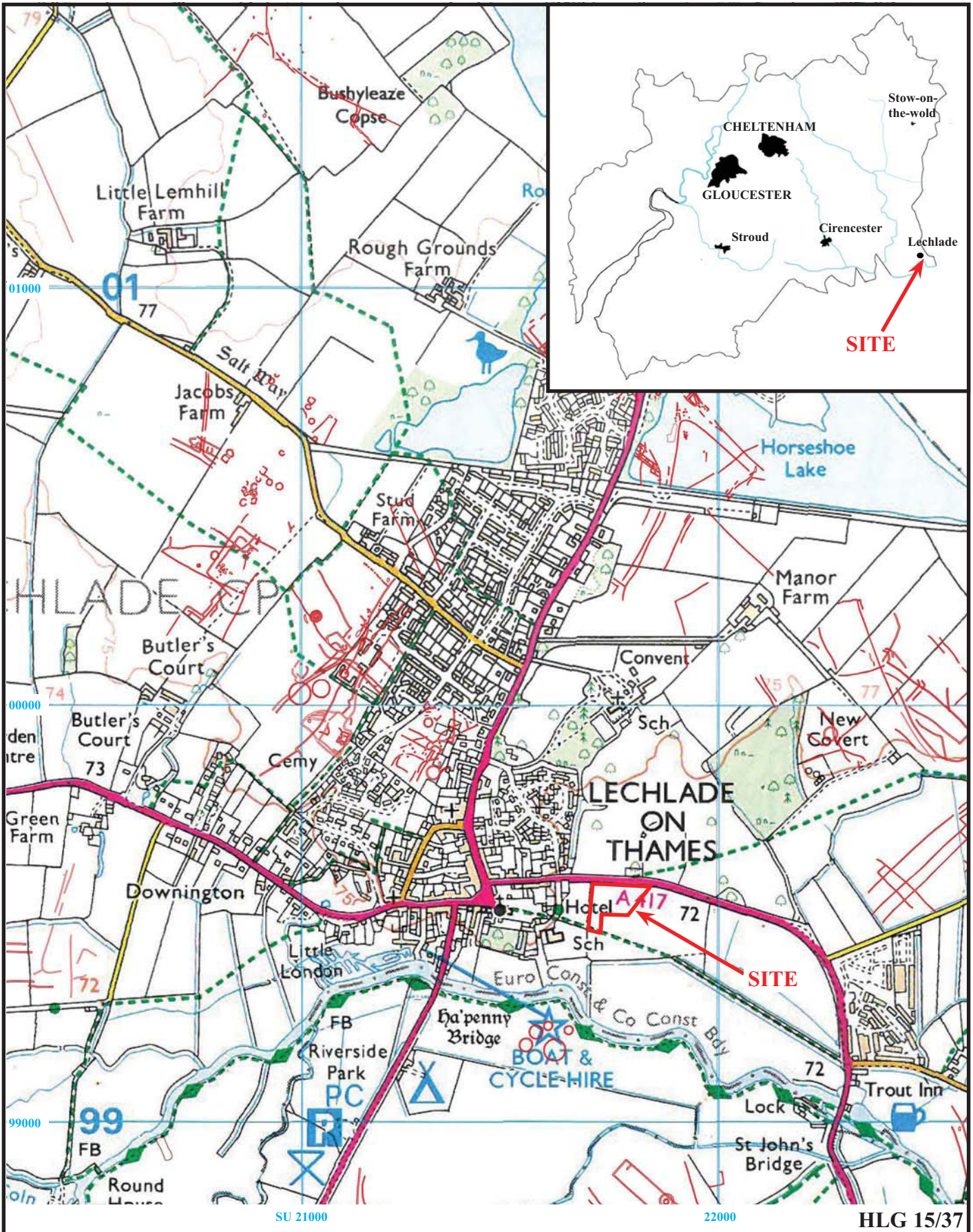
- 1 Col:0 Row:5 grids\01.xgd
- 2 Col:0 Row:6 grids\02.xgd
- 3 Col:1 Row:4 grids\03.xgd
- 4 Col:1 Row:5 grids\04.xgd
- 5 Col:1 Row:6 grids\05.xgd
- 6 Col:2 Row:3 grids\06.xgd
- 7 Col:2 Row:4 grids\07.xgd
- 8 Col:2 Row:5 grids\08.xgd
- 9 Col:2 Row:6 grids\09.xgd
- 10 Col:3 Row:3 grids\10.xgd
- 11 Col:3 Row:4 grids\11.xgd
- 12 Col:3 Row:5 grids\12.xgd
- 13 Col:3 Row:6 grids\13.xgd
- 14 Col:4 Row:3 grids\14.xgd
- 15 Col:4 Row:4 grids\15.xgd
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- 17 Col:4 Row:6 grids\17.xgd
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- 19 Col:5 Row:4 grids\19.xgd
- 20 Col:5 Row:5 grids\20.xgd
- 21 Col:5 Row:6 grids\21.xgd
- 22 Col:6 Row:0 grids\22.xgd
- 23 Col:6 Row:1 grids\23.xgd
- 24 Col:6 Row:2 grids\24.xgd
- 25 Col:6 Row:3 grids\25.xgd
- 26 Col:6 Row:4 grids\26.xgd
- 27 Col:6 Row:5 grids\27.xgd
- 28 Col:6 Row:6 grids\28.xgd
- 29 Col:7 Row:1 grids\29.xgd
- 30 Col:7 Row:2 grids\30.xgd
- 31 Col:7 Row:3 grids\31.xgd
- 32 Col:7 Row:4 grids\32.xgd
- 33 Col:7 Row:5 grids\33.xgd

### Processed data

Stats  
Max: 1.20  
Min: -0.80  
Std Dev: 0.55  
Mean: 0.05  
Median: -0.01

### Processes: 8

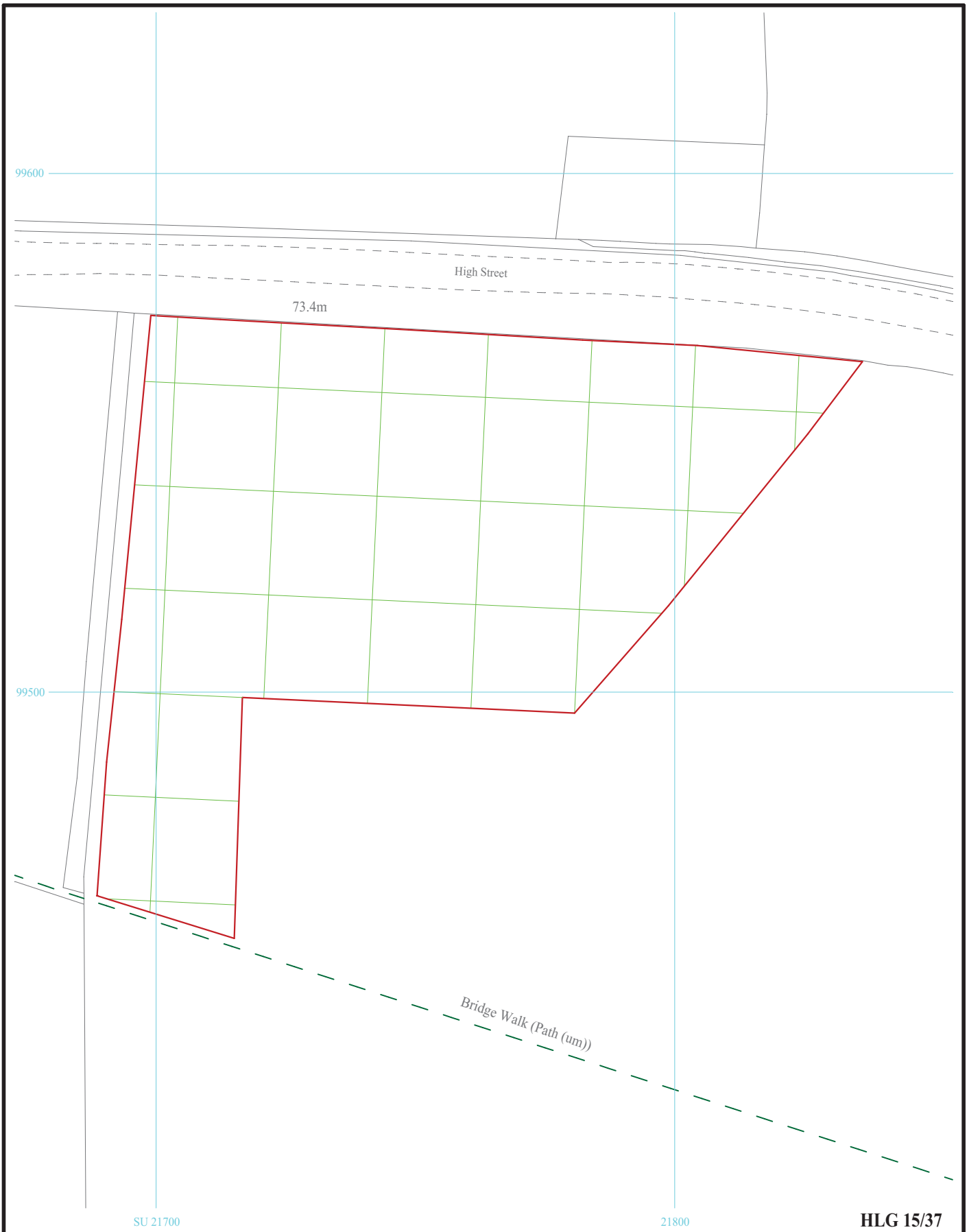
- 1 Base Layer
- 2 De Stagger: Grids: All Mode: Both By: -3 intervals
- 3 Search & Replace From: 30 To: 1000 With: Dummy
- 4 Search & Replace From: -1000 To: -30 With: Dummy
- 5 DeStripe Median Sensors: All
- 6 Despike Threshold: 1 Window size: 3x3
- 7 Interpolate: Y Doubled.
- 8 Clip from -0.80 to 1.20 nT



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Figure 1. Location of site within Lechlade and Gloucestershire, showing plotted cropmarks (after NMP).

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Ordnance Survey Licence 100025880



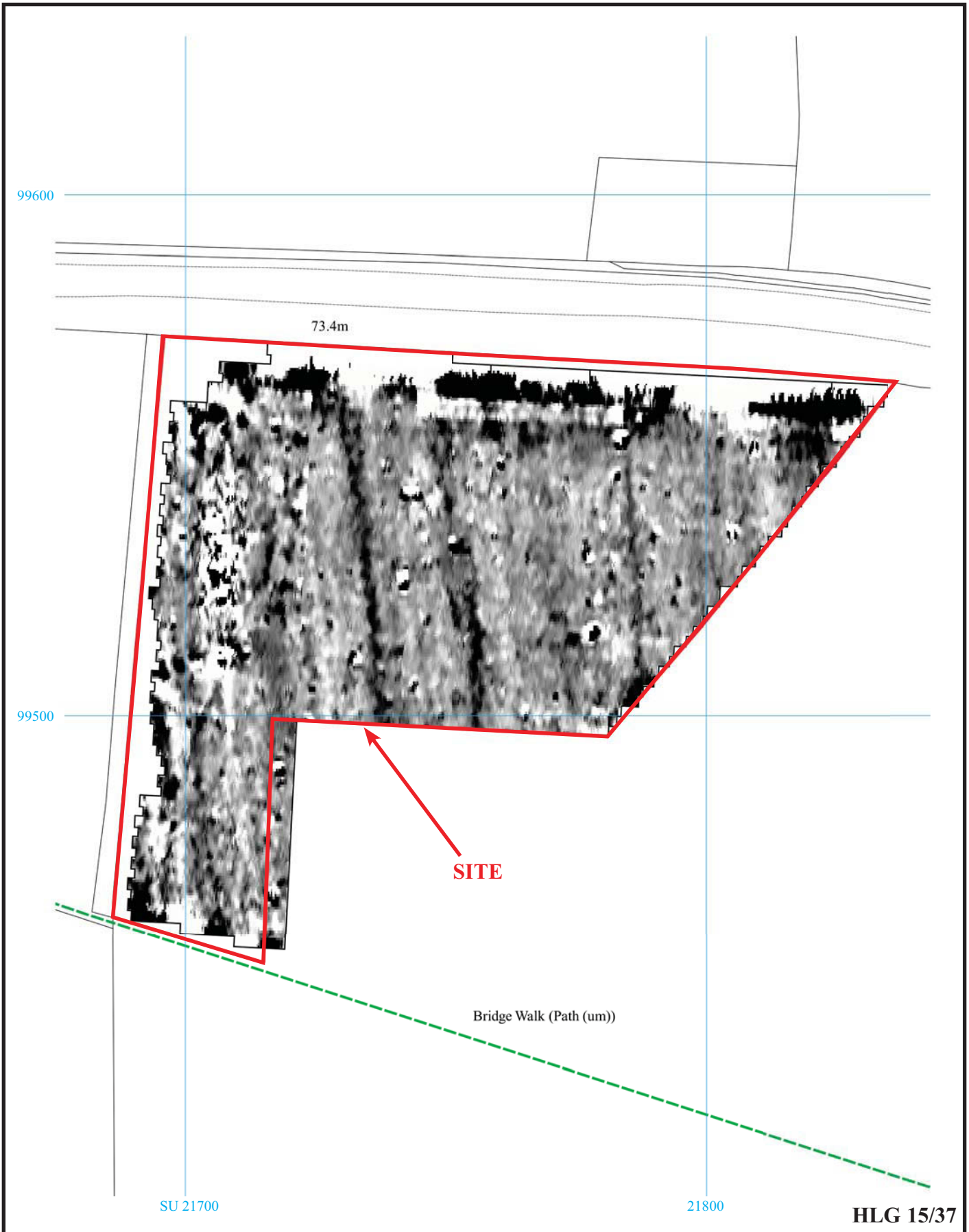
HLG 15/37

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Figure 2. Survey grid layout.



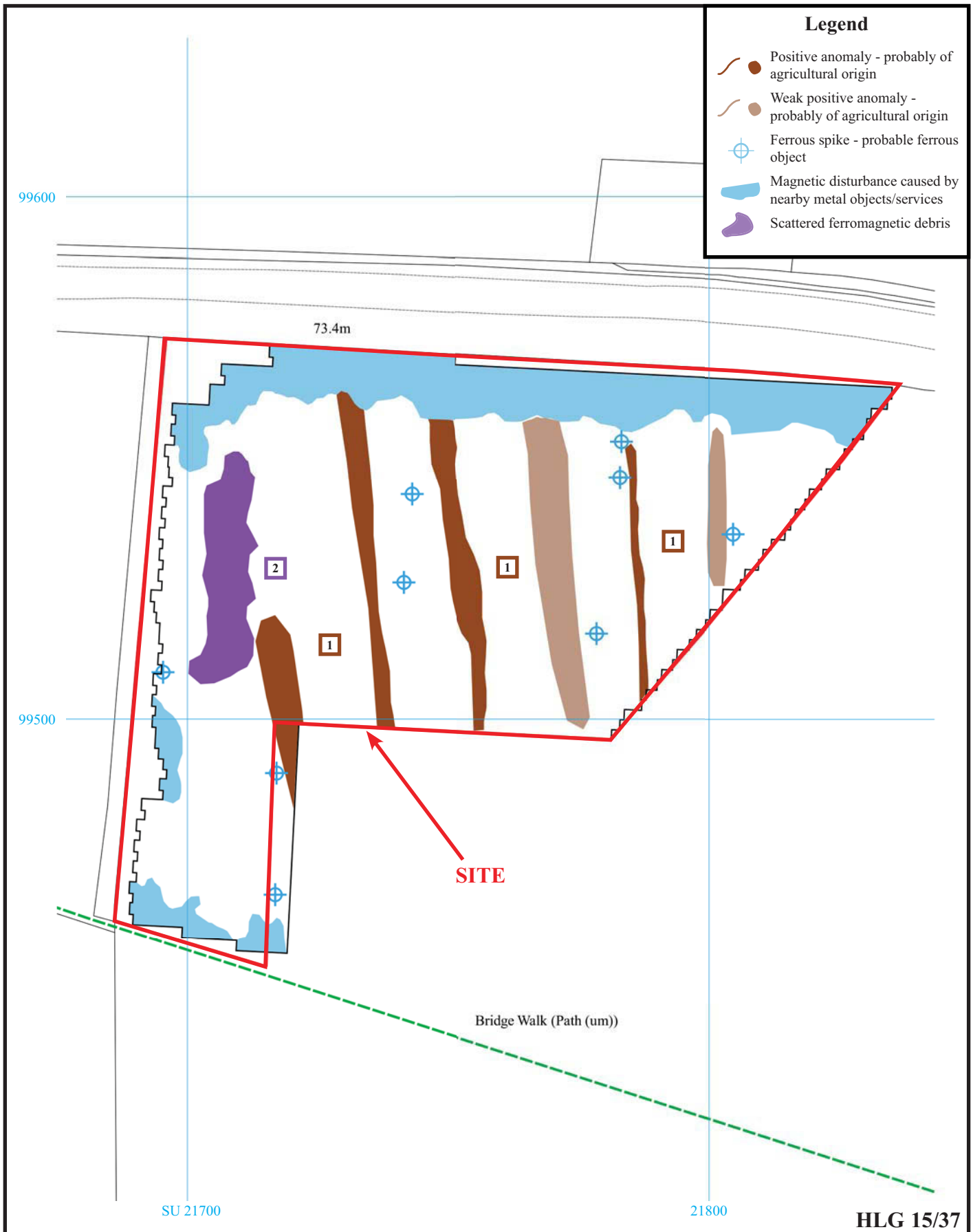
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Figure 3. Plot of minimally processed gradiometer data.





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Figure 4. Interpretation plot.





Plate 1. General view of the site, looking west towards Lechlade.



Plate 2. General view of the site, looking north-east.

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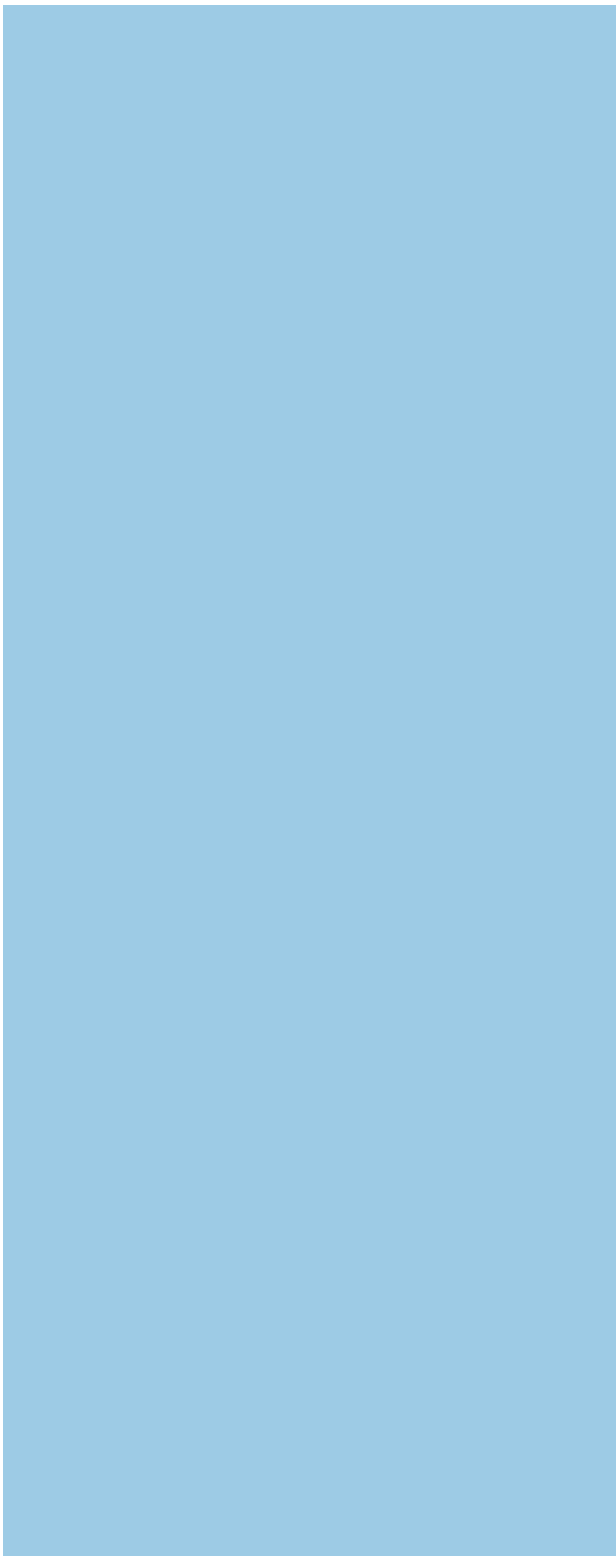
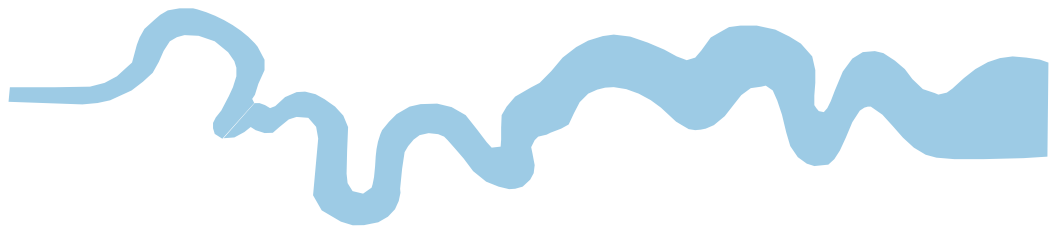
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Plates 1 - 2.

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## TIME CHART

|                            | <b>Calendar Years</b> |
|----------------------------|-----------------------|
| Modern _____               | AD 1901               |
| Victorian _____            | AD 1837               |
| Post Medieval _____        | AD 1500               |
| Medieval _____             | AD 1066               |
| Saxon _____                | AD 410                |
| Roman _____                | AD 43                 |
| Iron Age _____             | BC/AD<br>750 BC       |
| <br>                       |                       |
| Bronze Age: Late -----     | 1300 BC               |
| Bronze Age: Middle -----   | 1700 BC               |
| Bronze Age: Early -----    | 2100 BC               |
| <br>                       |                       |
| Neolithic: Late .....      | 3300 BC               |
| Neolithic: Early .....     | 4300 BC               |
| <br>                       |                       |
| Mesolithic: Late .....     | 6000 BC               |
| Mesolithic: Early .....    | 10000 BC              |
| <br>                       |                       |
| 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](mailto:tvas@tvas.co.uk)  
Web: [www.tvas.co.uk](http://www.tvas.co.uk)**