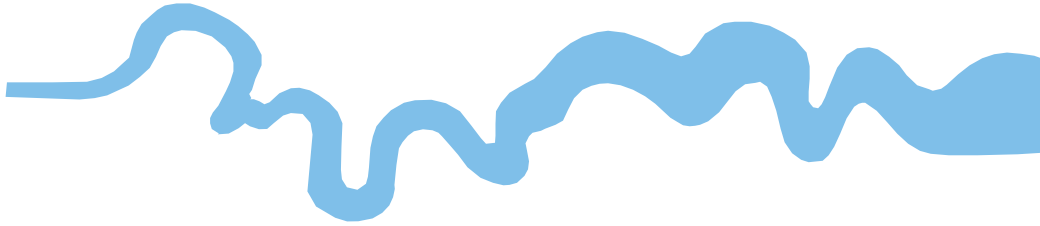


T V A S



EAST MIDLANDS

**Land off Bagworth Road, Barlestone,
Leicestershire**

Geophysical Survey (Magnetic)

by Kyle Beaverstock

Site Code BRB 20/215

(SK 4300 0601)

Land off Bagworth Road, Barlestone, Leicestershire

Geophysical Survey (Magnetic) Report

For Land Allocation Ltd

By Kyle Beaverstock

Thames Valley Archaeological Services Ltd

Site Code BRB 20/215

January 2021

Summary

Site name: Land at Bagworth Road, Barlestone, Leicestershire

Grid reference: SK 4300 0601

Site activity: Magnetometer survey

Date and duration of project: 5th of January 2021

Project coordinator: Tim Dawson

Site supervisor: Kyle Beaverstock

Site code: BRB20/215

Area of site: 2.2ha

Summary of results: No geophysical anomalies suggesting presence of buried features of an archaeological nature were discovered by the geophysical survey.

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: Tim Dawson✓ 18.1.21

Land off Bagworth Road, Barlestone, Leicestershire A Geophysical Survey (Magnetic)

by Kyle Beaverstock

Report 20/215

Introduction

This report documents the results of a geophysical survey (magnetic) carried out at Bagworth Road, Barlestone, Leicestershire (SK 4300 0601) (Fig. 1). The work was commissioned by Lanpro Services Ltd, Brettingham House, 98 Pottergate, Norwich, NR2 1EQ, on behalf of Land Allocation Ltd.

Planning permission has been sought for the development of the site for residential use and a geophysical survey has been requested in order to inform the application. This is in accordance with the *National Planning Policy Framework* (NPPF 2019), and the County's policies on archaeology. The fieldwork was undertaken by Kyle Beaverstock on the 5th of January 2020 and the site code is BRB20/215.

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 north-eastern edge of Barlestone, a large village 15km west of Leicester and 11km north of Hinkley (Fig.). This irregularly-shaped parcel of land is relatively flat and sits at a height of *c.*140m above Ordinance Datum. It is surrounded by hedgerows and bounded by Bagworth Road to the north and west and fields to the south and east. The land is currently in use as horse paddocks and has been subdivided using post and wire fencing and objects such as troughs and feeders are scattered about the area. The north-western subdivision contains a large pond while the south-western one includes a cluster of farm buildings. The underlying geology is recorded primarily as Oadby Member diamicton overlying Gunthorpe Member mudstone with an area of glaciofluvial deposits replacing the diamicton in the southern tip of the site (BGS 2021).

Methodology

Sample interval

Data collection involved the traversing of the survey area along straight and parallel lines using two cart-mounted Bartington Grad601-2 fluxgate gradiometers. Even coverage was achieved with the use of regularly spaced markers at the ends of traverses and the real-time positional trace plot. Readings were taken at 0.25m

intervals along traverses 1m apart, providing an appropriate methodology balancing cost and time with resolution. Traverses were walked at an alternating zig-zag southwest to northeast orientation across the survey area. There were a number of obstructions including buildings, fencing and debris, the north-western paddock could not be surveyed due to the presence of horses. Ground conditions were wet but the weather was dry.

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 European Archaeological Council (EAC 2015) and the Chartered Institute *for* Archaeologists (2002, 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 two dual sensor Bartington Instruments Grad 601-2 fluxgate gradiometers mounted upon a Bartington non-magnetic cart. A two-wheeled lightweight structure pushed by hand, the cart consisted a bank of four vertically-mounted Bartington Grad601-2 magnetic sensor tubes at 1m apart and a Trimble Geo 7x centimetre edition GPS. Readings were collected by two Bartington Grad601-2 loggers and collated using MLgrad601 software on a Linx 12x64 tablet running Windows 10 mounted at the rear of the cart. 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.

The Trimble Geo7x centimetre edition GPS system with centimetre real-time accuracy was used to tie the cart traverses 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 -12.38 to 12.43 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	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. 2) with the processed data then presented as a second figure (Fig. 3), followed by a third plan to present the abstraction and interpretation of the magnetic anomalies (Fig. 4). Anomalies are shown as colour-coded lines, points and polygons.

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 2.18.15 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 geophysical survey returned a clean dataset which showed no indications of any anomalies which might be related to archaeological features. There were however a few anomalies indicating the presence of modern services including a bipolar linear anomaly running north-east to south-west along the western boundary and in

the south-west of the survey area. The high amplitude of these anomalies suggest that these are either caused by ferrous materials in the field boundary or a buried pipeline.

Conclusion

No magnetic anomalies which suggest the presence of buried archaeological features were identified by the geophysical survey.

References

- BGS, 2021, *Geology of Britain Viewer*, 1:50,000, <http://mapapps.bgs.ac.uk/geologyofbritain/home.html>
(checked 18/1/21)
- CI/A, 2014, 'Standard and Guidance for archaeological geophysical survey', Reading
- EAC, 2015, *EAC Guidelines for the use of Geophysics in Archaeology: Questions to Ask and Points to Consider*, EAC Guidelines 2, Namur
- IFA, 2002, 'The Use of Geophysical Techniques in Archaeological Evaluation', IFA Paper No. 6, Reading
- NPPF, 2019, *National Planning Policy Framework (revised)*, Ministry for Housing, Communities and Local Government, London

Appendix 1. Survey and data information

Programme:

Name: TerraSurveyor
Version: 3.0.25.0

Raw data

Filename: Barlestone RAW.xcp
Instrument Type: MLgrad Import
Units:
UTM Zone: 30
Survey corner coordinates (X/Y):
Northwest corner: 442959.514556825, 306157.106655664 m
Southeast corner: 443144.764556825, 305964.316655664 m
Direction of 1st Traverse: 90 deg
Collection Method: Parallel
Sensors: 2 @ 1 m spacing.
Dummy Value: 32702

Dimensions

Survey Size (meters): 185 m x 193 m
X&Y Interval: 0.13 m
Source GPS Points: Active: 47215, Recorded: 47215

Stats

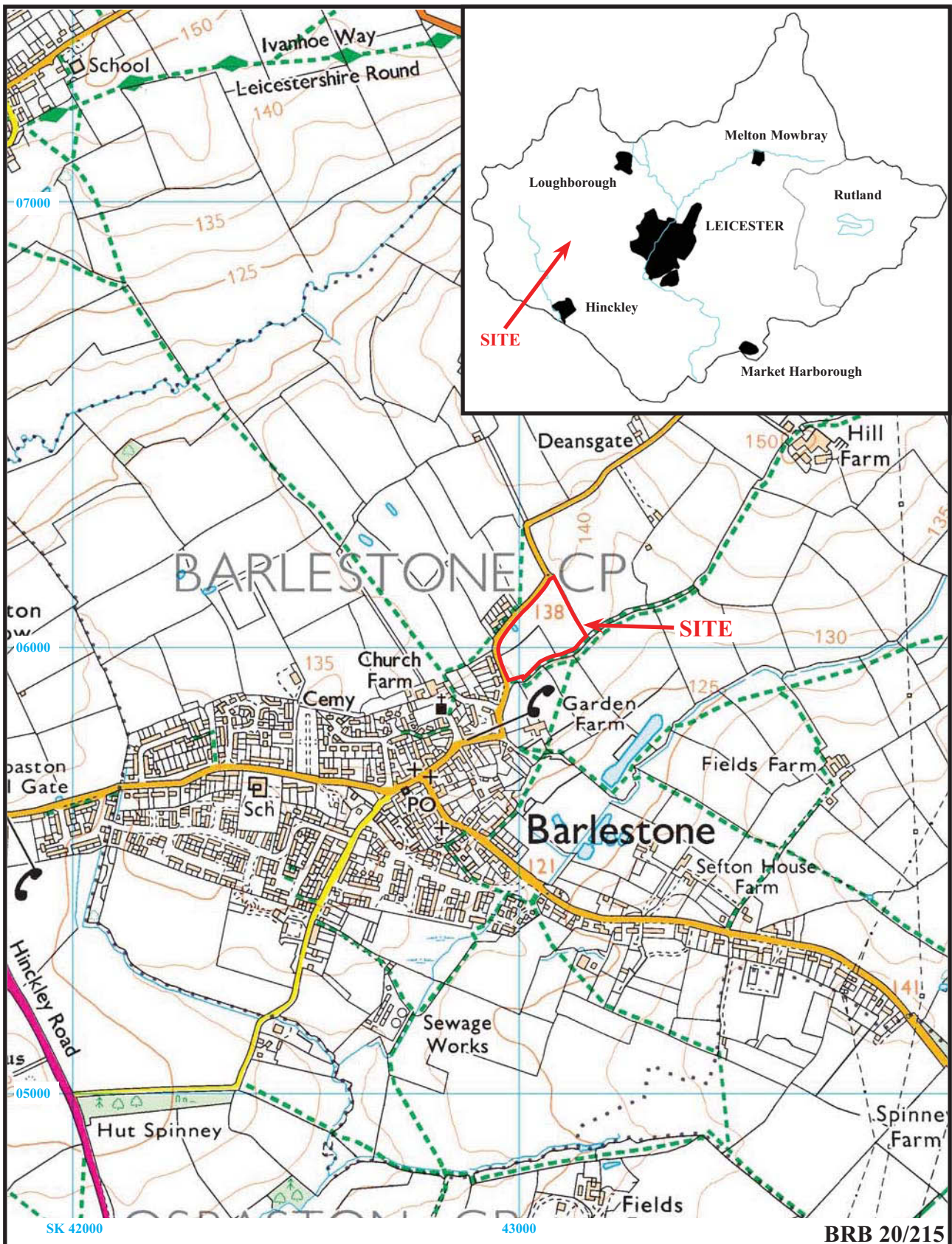
Max: 109.44
Min: -107.92
Std Dev: 10.90
Mean: -0.20
Median: 0.01
Composite Area: 3.5714 ha
Surveyed Area: 1.4788 ha

Processed data

Filename: Barlestone.xcp
Stats
Max: 12.43
Min: -12.38
Std Dev: 3.24
Mean: -0.09
Median: 0.01
Composite Area: 3.5714 ha
Surveyed Area: 1.4788 ha

GPS based Proce4

- 1 Base Layer.
- 2 Unit Conversion Layer (Lat/Long to UTM).
- 3 DeStripe Median Traverse:
- 4 Clip at 1.00 SD



**Land off Bagworth Road, Barlestone
Leicestershire, 2021**

Geophysical Survey (Magnetic)

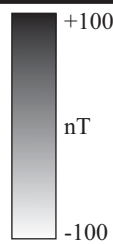
Figure 1. Location of site within Barlestone and Leicestershire.

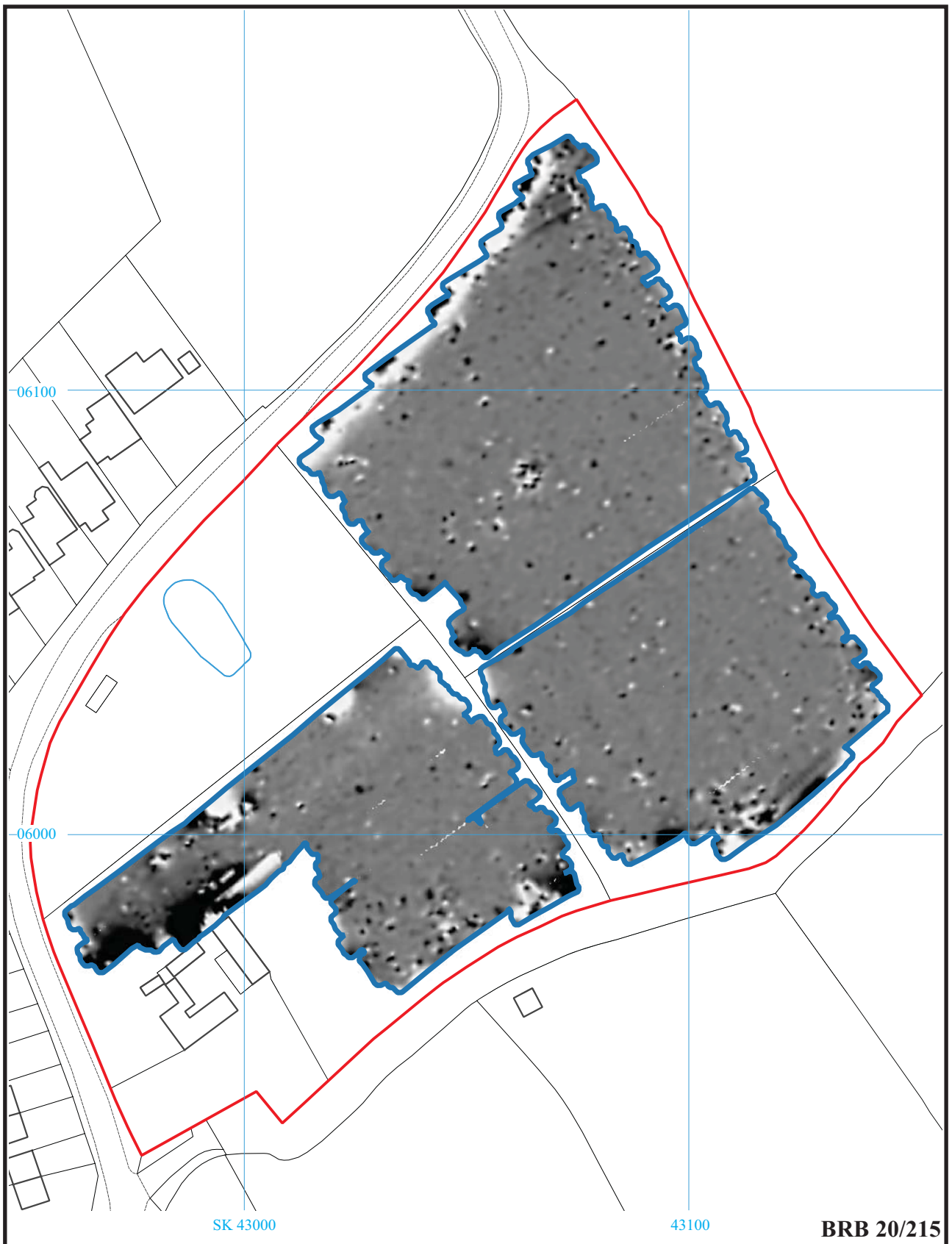
Reproduced under licence from Ordnance Survey Explorer Digital mapping at 1:12500
Crown Copyright reserved



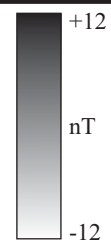


**Land off Bagworth Road, Barlestone
Leicestershire, 2021
Geophysical Survey (Magnetic)**
Figure 2. Plot of raw gradiometer data.





**Land off Bagworth Road, Barlestone
Leicestershire, 2021**
Geophysical Survey (Magnetic)
 Figure 3. Plot of processed gradiometer data.



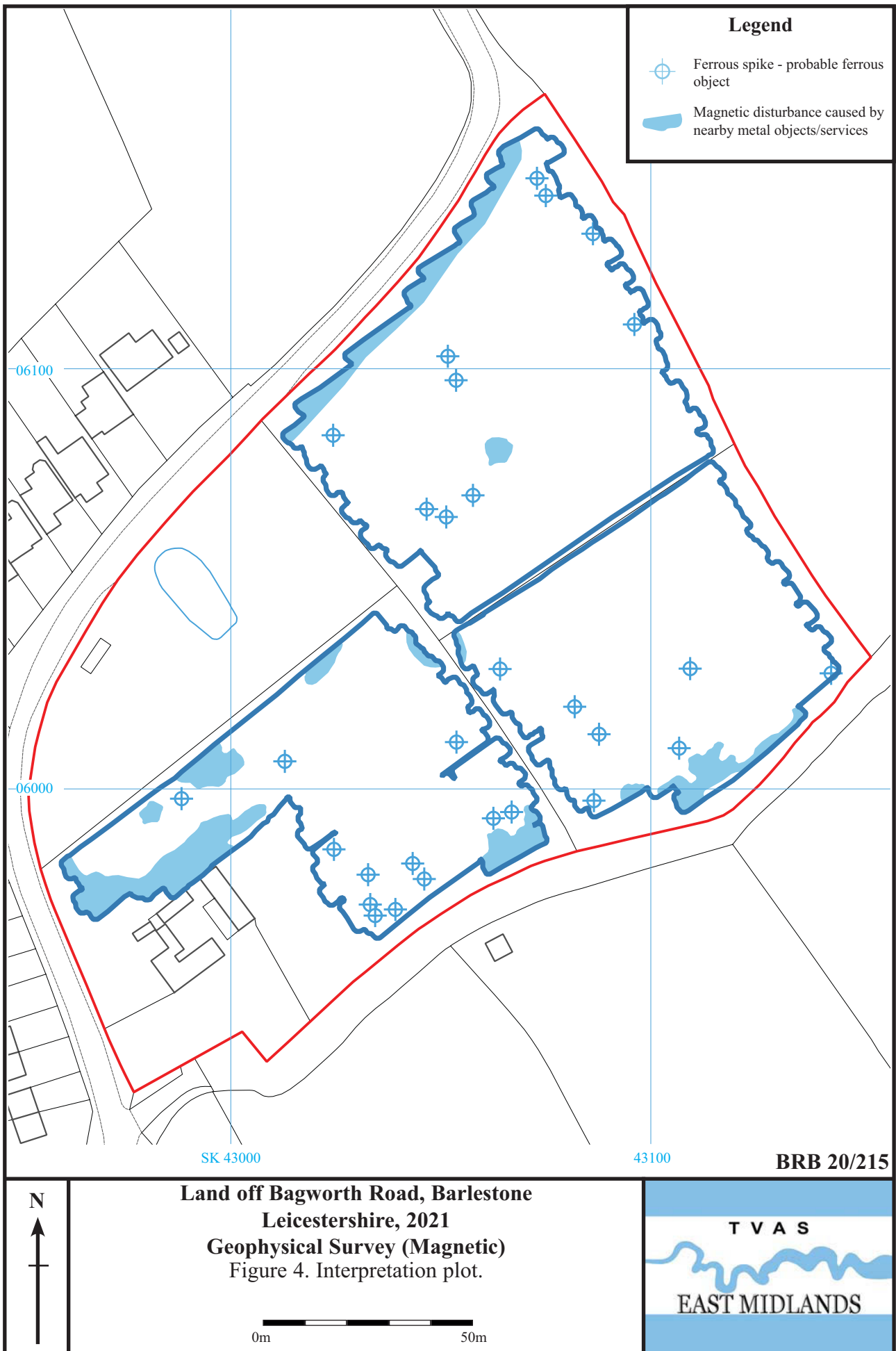




Plate 1. South-eastern paddock looking north.



Plate 2. Southern area of the site looking north-west.



Plate 3. North-western paddock looking north.



Plate 4. North-eastern paddock looking east.

BRB 20/215

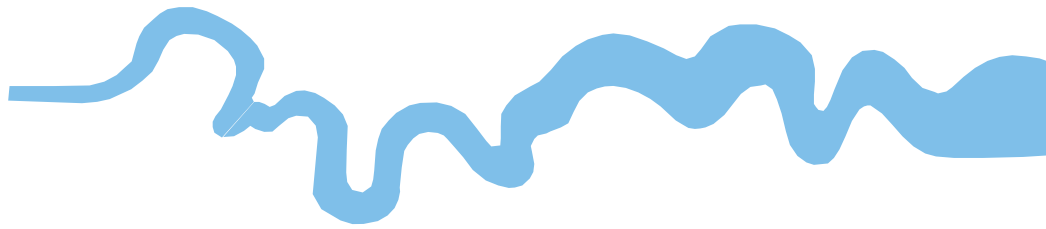
**Land off Bagworth Road, Barlestone
Leicestershire, 2021
Geophysical Survey (Magnetic)
Plates 1 to 4.**



TIME CHART

	Calendar Years
Modern _____	AD 1901
Victorian _____	AD 1837
Post Medieval _____	AD 1500
Medieval _____	AD 1066
Saxon _____	AD 410
Roman _____	AD 43 AD 0 BC
Iron Age _____	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





**TVAS (East Midlands),
4 Bentley Court, Wellingborough
Northamptonshire, NN8 4BQ**

**Tel: 01933 277 377
Email: eastmidlands@tvas.co.uk
Web: www.tvas.co.uk/eastmidlands**

*Offices in:
Reading, Brighton, Taunton and Stoke-on-Trent*