

**ARCHAEOLOGICAL EVALUATION REPORT:
GEOPHYSICAL SURVEY BY MAGNETOMETRY
ON LAND OFF LEICESTER ROAD, LUTTERWORTH, LEICESTERSHIRE**

NGR: SP 5474 8604
AAL Site Code: LUTT 13
Oasis Number: allenarc1-149268



Report prepared for Landmark Planning Ltd

By
Allen Archaeology Limited
Report Number AAL2013040

May 2013



Allenarchaeology



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Element	Name	Date
Report prepared by:	Robert Evershed BSc (Hons)	29/04/2013
Illustrations prepared by:	Robert Evershed BSC (Hons)	30/04/2013
Report edited by:	Mark Allen MIfA BSC (Hons)	01/05/2013
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Cover image: General working shot during the site survey, looking northeast

Executive Summary

- A geophysical survey by magnetometer was undertaken by Allen Archaeology Limited for Landmark Planning Limited, on behalf of Hillbase Limited, on land off Leicester Road in Lutterworth to support a future planning application for a residential development.
- A preceding desk-based assessment identified significant evidence for prehistoric and Roman activity in the vicinity of the site. The current site is situated 1.5km to the north of the historic core of Lutterworth.
- The site conditions proved receptive to geophysical surveying, despite which the survey identified very few geophysical anomalies of potential archaeological significance across the site, specifically remains relating to medieval ridge and furrow agriculture. On the basis of the survey, it is considered that the archaeological potential of the site is negligible and there is no justification for further archaeological investigations on the site.

1.0 Introduction

- 1.1 Allen Archaeology Limited was commissioned by Landmark Planning Limited, on behalf of Hillbase Limited to undertake a geophysical survey by magnetometer on land off Leicester Road in Lutterworth, Leicestershire to support a planning application for a residential development.
- 1.2 The site works and reporting conform to current national guidelines, as set out in '*Geophysical Survey in Archaeological Field Evaluation*' (English Heritage 2008), '*The Use of Geophysical Techniques in Archaeological Evaluations*' (IFA Paper 6) and the Institute for Archaeologists '*Standard and guidance for archaeological geophysical survey*' (IfA 2011).
- 1.3 The site is archaeologically sensitive, lying in an area of archaeological interest and potential.

2.0 Site Location and Description

- 2.1 Lutterworth is located approximately 19km to the south of Leicester and 11km north of Rugby, in the administrative district of Harborough District Council (Figure 1). The proposed development site itself (hereafter referred to as 'the site') is located c.1.5km north of the centre of Lutterworth and to the east of Leicester Road, centred on NGR SP 5474 8604 (Figure 2). The site is bordered by hedgerows beyond which are agricultural fields to the north, industrial units to the south, Leicester Road to the west and the M1 motorway to the east.
- 2.2 The bedrock geology comprises Blue Lias Formation and Charmouth Mudstone Formation, overlain by glacial till (<http://mapapps.bgs.ac.uk/geologyofbritain/home.html>). The site is generally flat and lies at c.132m OD.

3.0 Planning Background

- 3.1 It is proposed to submit a planning application for a residential development on the site in due course. As a first stage of investigation an archaeological desk-based assessment was undertaken (AAL 2013). This identified a moderate archaeological potential for the site, and in order to provide information to further characterise the archaeological resource, the client has opted to commission an archaeological evaluation by geophysical survey. The geophysical survey is the first, non-intrusive stage of that investigation, intended to inform the nature and extent of any further intrusive investigations that may be required to further characterise the archaeological resource.
- 3.2 The approach adopted is consistent with the recommendations of the National Planning Policy Framework (NPPF), with the particular chapter of relevance being '*Chapter 12: Conserving and enhancing the historic environment*' (Department for Communities and Local Government 2012).

4.0 Archaeological and Historical Background

- 4.1 A preceding desk-based assessment identified the site as being of archaeological interest (AAL 2013), particularly for the prehistoric and Roman periods, with numerous scatters of prehistoric lithic material identified in the vicinity of the site, as well as cut features of Bronze

Age date to the west of the site. Significant quantities of Roman pottery have also been recorded nearby, and the line of a Roman road may either follow Leicester Road on the western site boundary or pass through the site itself.

- 4.2 The site is well beyond the historic core of Lutterworth or the neighbouring village of Bitteswell, and the presence of faint traces of ridge and furrow on the site suggests it was agricultural land in the medieval period, persisting through to the present day.

5.0 Methodology

- 5.0.1 The geophysical survey consisted of a detailed gradiometer survey of the entirety of the proposed development area that was available for survey, totalling approximately 3 hectares.
- 5.0.2 The fieldwork was carried out by a team of two experienced geophysicists from AAL over a period of two working days, Thursday 25th April and Friday 26th April 2013. The site was divided into 30m by 30m grids, established on site with reference to local fixed boundaries and accurately tied into the National Grid with Ordnance Survey base mapping.
- 5.0.3 The survey was undertaken using a Bartington Grad601-2 Dual Fluxgate Gradiometer with an onboard automatic DL601 data logger. This instrument is a highly stable magnetometer which utilises two vertically aligned fluxgates, one positioned 1m above the other. This arrangement is then duplicated and separated by a 1m cross bar. The 1m vertical spacing of the fluxgates provides for deeper anomaly detection capabilities than 0.5m spaced fluxgates. The dual arrangement allows for rapid assessment of the archaeological potential of the site. Data storage from the two fluxgate pairs is automatically combined into one file and stored using the onboard data logger.
- 5.0.4 Data collection was undertaken in a zigzag traverse pattern, using a sample interval of 0.25m and a traverse interval of 1m.
- 5.0.5 The fieldwork and reporting were carried out in accordance with the procedures in 'Geophysical Survey in Archaeological Field Evaluations' (English Heritage 2008) and 'The Use of Geophysical Techniques in Archaeological Evaluations: IfA Paper 6' (Gaffney et al. 2002)

5.1 Summary of Survey Parameters

5.1.1 Fluxgate Magnetometer

Instrument:	Bartington Grad601-2 Dual Fluxgate Gradiometer
Sample interval:	0.25m
Traverse interval:	1.00m
Traverse separation:	1.00m
Traverse method:	Zigzag
Resolution:	0.1 nT
Processing software:	Terrasurveyor 3.0.20
Surface conditions:	Pasture
Area surveyed:	3 ha
Date surveyed:	Thursday 25 th and Friday 26 th April 2013
Surveyor:	Robert Evershed

Survey assistant: Maria Piirainen
Data interpretation: Robert Evershed and Mark Allen

5.2 Data Collection and Processing

5.2.1 The grids were marked out using tapes from the southwest corner of the site, measuring from known fixed boundaries within each of the surveyed fields and tied into the National Grid with Ordnance Survey base mapping. The collection of magnetic data using a north – south traverse pattern is preferable for a magnetic survey, as enhancements to the magnetic field caused by buried features is mapped increasingly stronger the closer the traverse direction can get to a magnetic north – south direction (Breiner 1999). On this occasion magnetic data was collected on the north – south alignment due to the orientation of the survey grids. Data was collected by making successive parallel traverses across each grid in a zigzag pattern.

5.2.2 The data collected from the survey has been analysed using the current version of Terrasurveyor 3.0.20. The resulting data set plots are presented with positive nT/m values and high resistance as black and negative nT/m values and low resistance as white.

The data sets have been subjected to processing using the following filters:

- De-stripe (also known as Zero Mean Traverse or ZMT)
- Clipping

5.2.3 The de-stripe process is used to equalise underlying differences between grids or traverses. Differences are most often caused by directional effects inherent to magnetic surveying instruments, instrument drift, instrument orientation (for example off-axis surveying or heading errors) and delays between surveying adjacent grids. The de-stripe process is used with care however as it can sometimes have an adverse effect on linear features that run parallel to the orientation of the process.

5.2.4 The clipping process is used to remove extreme data point values which can mask fine detail in the data set. Excluding these values allows the details to show through.

5.2.5 Plots of the data are presented in processed linear greyscale (smoothed) with any corrections to the measured values or filtering processes noted, and as separate simplified graphical interpretations of the main anomalies detected.

6.0 Magnetometer Survey Results (Figures 3 – 6)

- 6.1 For the purposes of interpreting the anomalies, the survey data has been processed to the values of -3 to 3 nT/m (Figure 4). This enhances faint anomalies that may otherwise not be noted in the data; however it also includes all ferrous and other magnetically enhanced material within the study area, making the resulting greyscale image particularly 'noisy'. The survey results revealed a number of anomalies across the data set, and these are discussed in turn and noted as single digit numbers in square brackets.
- 6.2 Immediately noticeable in the data set are the broadly parallel positive magnetic anomalies [1], running approximately east – west across the western part of the site. These almost certainly represent part of the former ridge and furrow activity on the site and produce magnetic readings of 1 – 6nT/m.
- 6.3 Three small positive magnetic anomalies [2], [3] and [4] produce readings of 2 – 5nT/m, 3 – 12nT/m and 1 – 8nT/m respectively. This could represent soil-filled hollows, pits or former ponds, although the location of [3] at the edge of the field indicates that it may simply be dumping of highly magnetic material, and could therefore be of modern origin.
- 6.4 Across the site there are three different areas of magnetic noise [5], [6] and [7]. The magnetic noise running mostly along the northern boundary of the site, [5], is likely the result of accumulation of modern waste and detritus. This produced magnetic readings of -4 – 3nT/m. Reinforced concrete posts running in a line north to south at the eastern end of the site are responsible for magnetic noise [6]. These posts produced readings of between -3000 and 3000nT/m. The magnetic readings for [7] are between 2 and 30nT/m, increasing as the distance to the southern border is reduced. This magnetic noise is possibly the result of a power cable running close to the southern border of the site, or may reflect disturbance caused by the large industrial buildings adjacent to the site.
- 6.5 A number of dipolar responses with some examples highlighted as yellow circles [8], were detected across the survey area. These are likely to be associated with ferrous waste or highly fired material within the ploughsoil.

7.0 Discussion and Conclusions

- 7.1 The site conditions generally proved receptive to geophysical surveying, although some interference was noted along the south and east sides of the site. Limited evidence for archaeological activity was identified across the study area, comprising a small area of anomalies representing ridge and furrow recorded in the western half of the site.
- 7.2 It was noted that there was no evidence for the postulated Roman road running north – south through the site. This may suggest that the road follows the line of Lutterworth Road to the west, although it is possible that the road was little more than a track or hollow way that has either been truncated or destroyed by later activity such as medieval or modern ploughing or was not visible in the survey data.

8.0 Effectiveness of Methodology

8.1 The non-intrusive evaluation methodology employed was particularly appropriate to the scale and nature of the site to be surveyed. Magnetometry surveying was the prospection technique best suited to the identification of archaeological remains on the site. Other techniques would have required justification and may have proved too time consuming or cost-prohibitive.

9.0 Acknowledgements

9.1 Allen Archaeology would like to thank Landmark Planning Limited, and their client Hillbase Limited for this commission.

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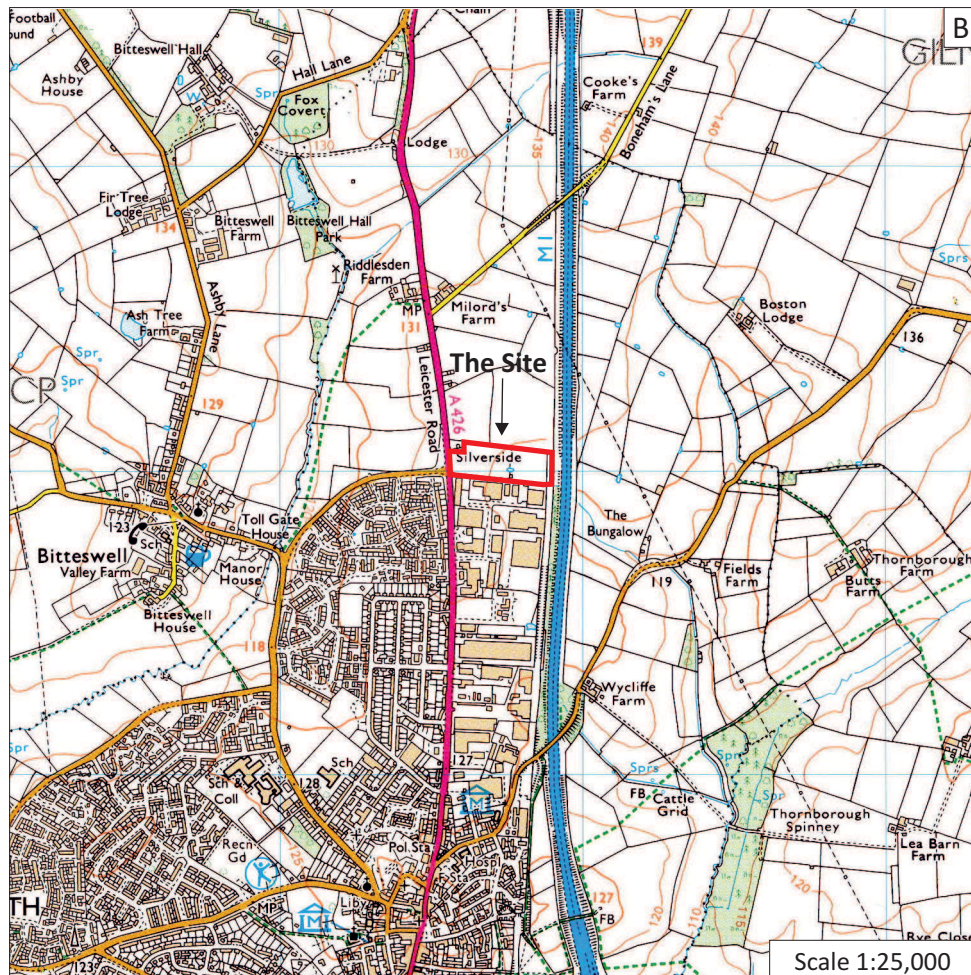
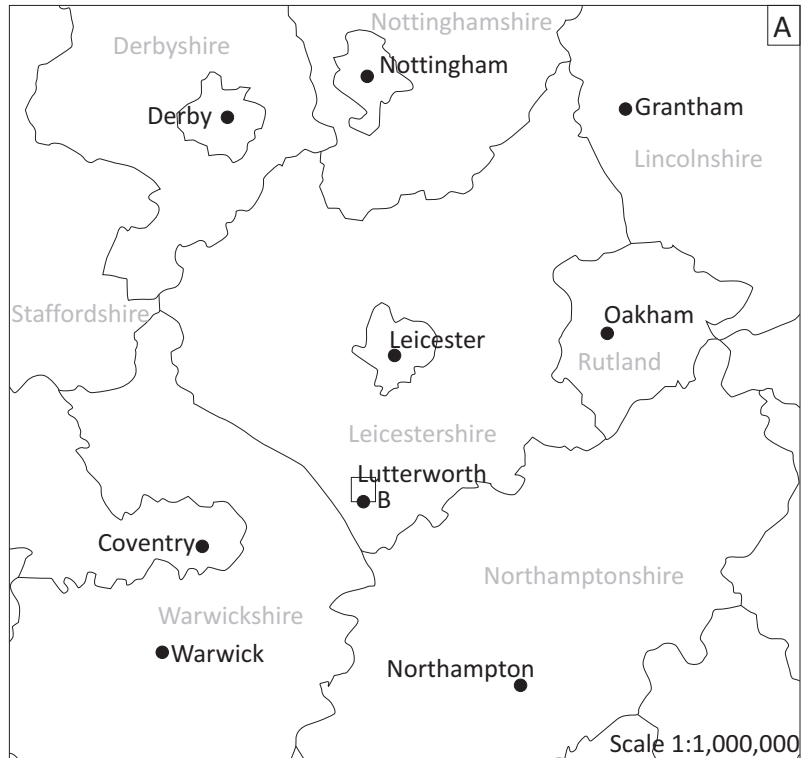
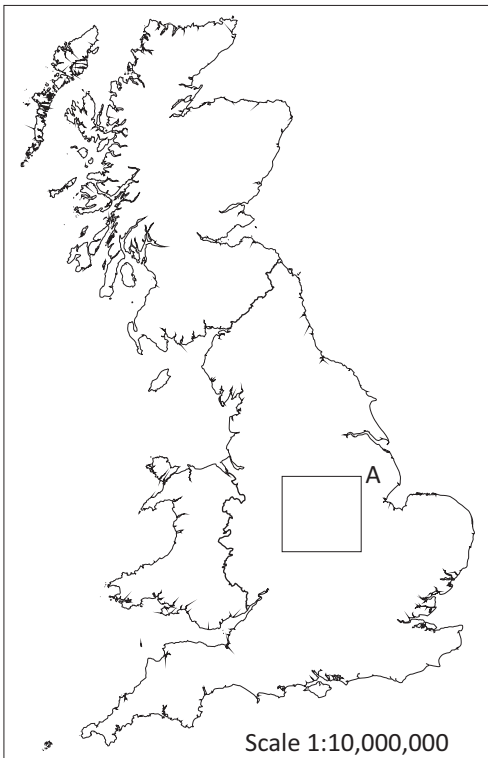
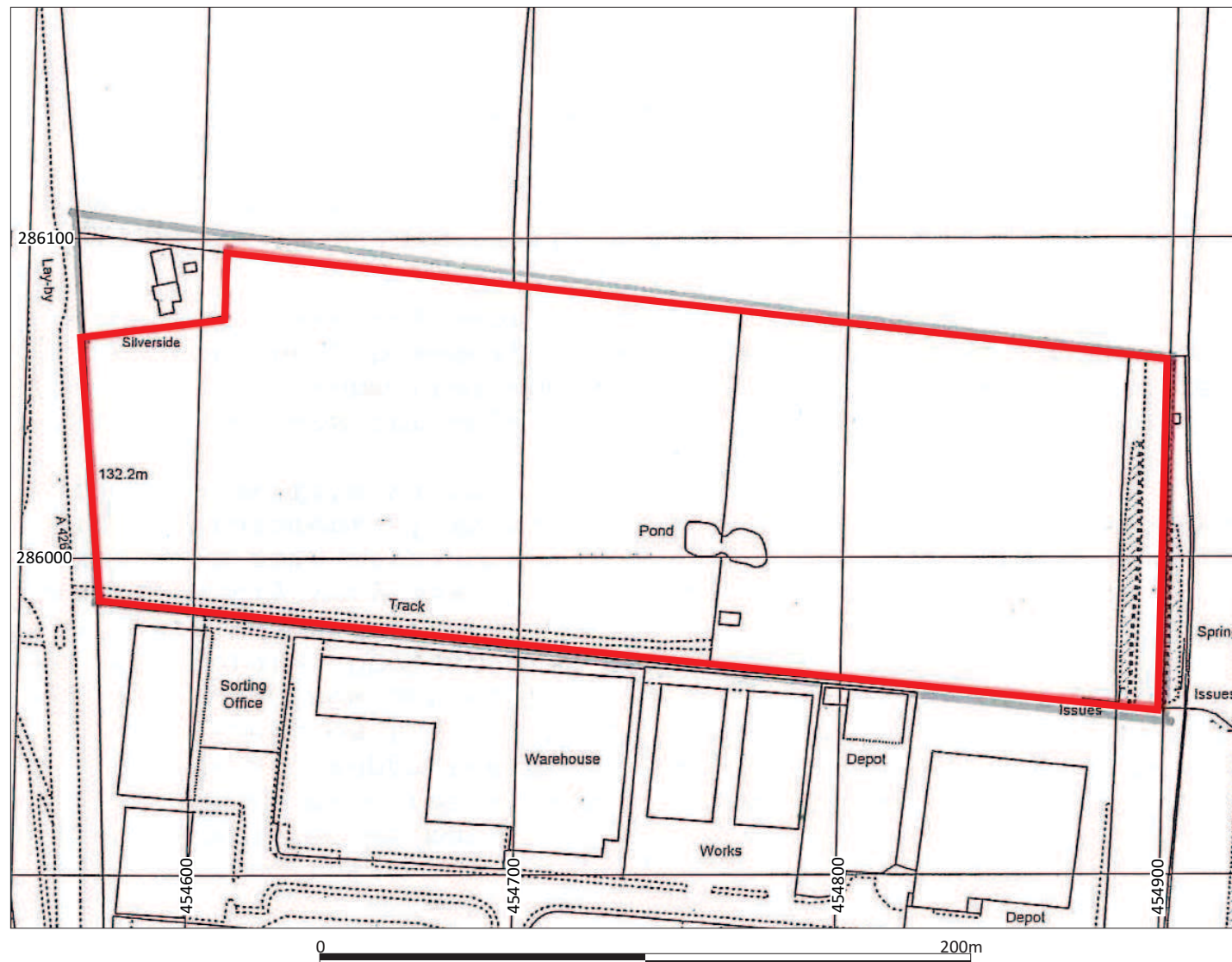


Figure 1: Site location with proposed development area in red
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Site Code	LUTT 13
Scales	1:10,000,000 1:1,000,000 1:25,000 @ A4
Drawn by	R Evershed
Date	29/04/13

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Key

Site Location

Site Code	LUTT 13
Scale	1:2,000 @ A4
Drawn by	R Evershed
Date	29/04/13

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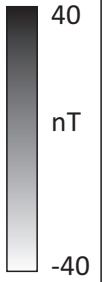
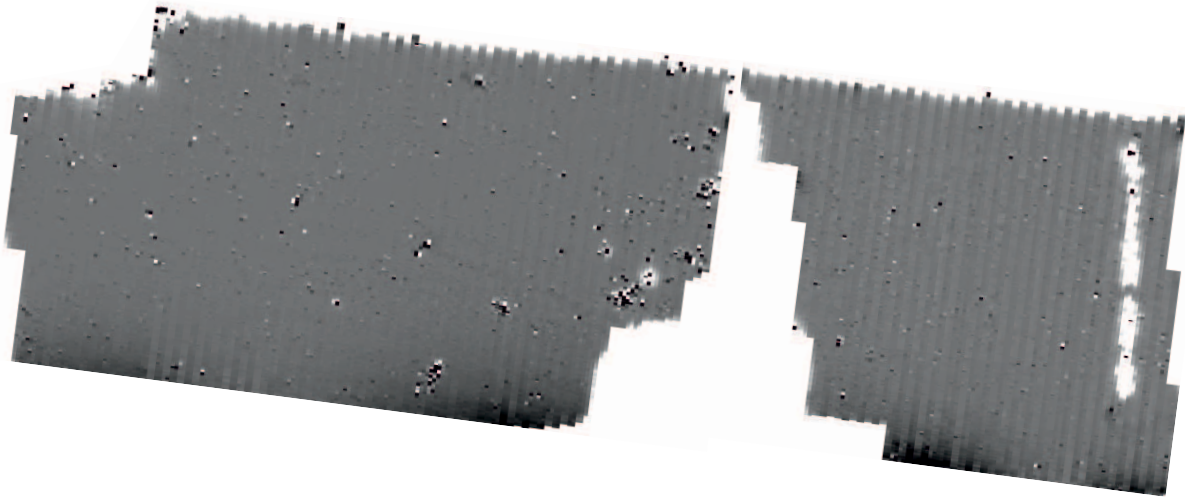
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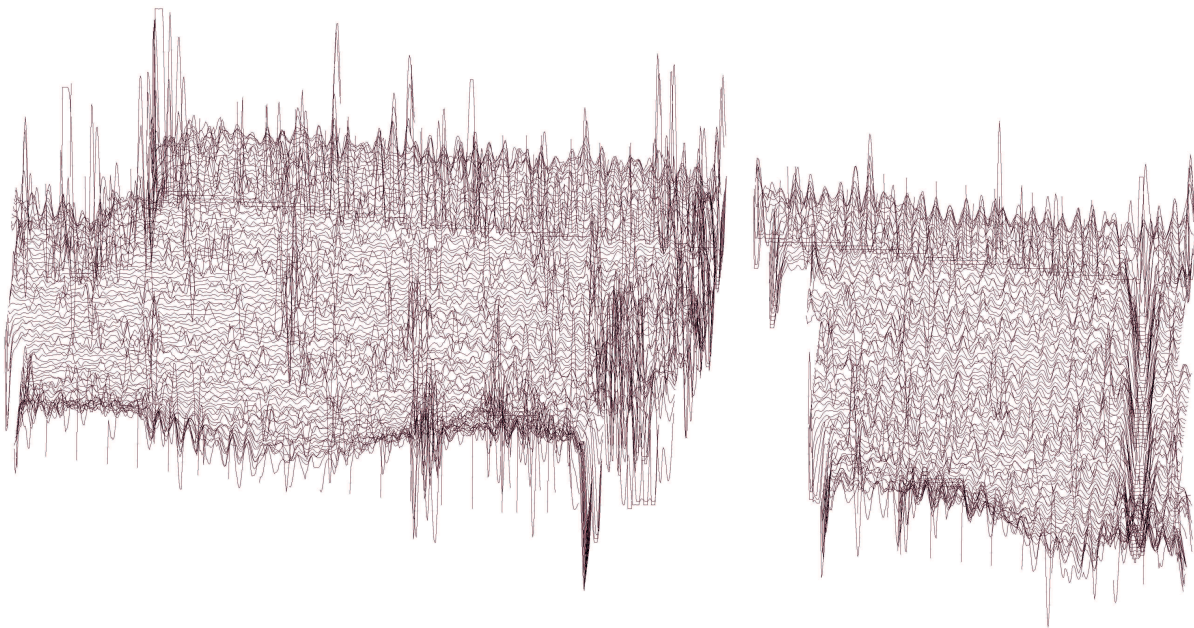
Figure 2: Site location at scale 1:2,000, with the site outlined in red



Raw data (clipped to +/- 40 nT)



Trace Plot (ZMT and clipped to +/- 25nT)



25nT



Site Code	LUTT 13
Scale	1:2,000 @A4
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Date	29/04/13

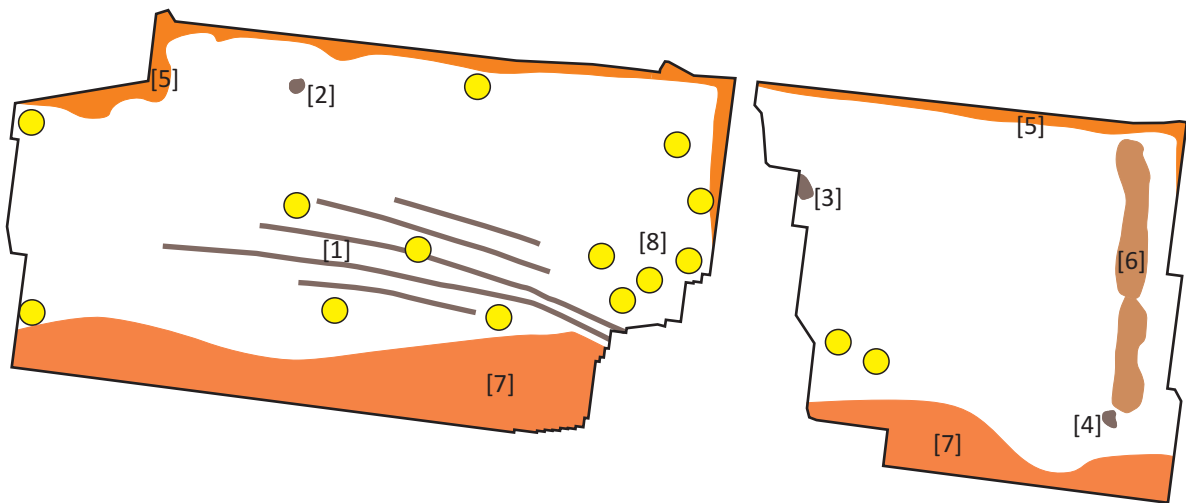
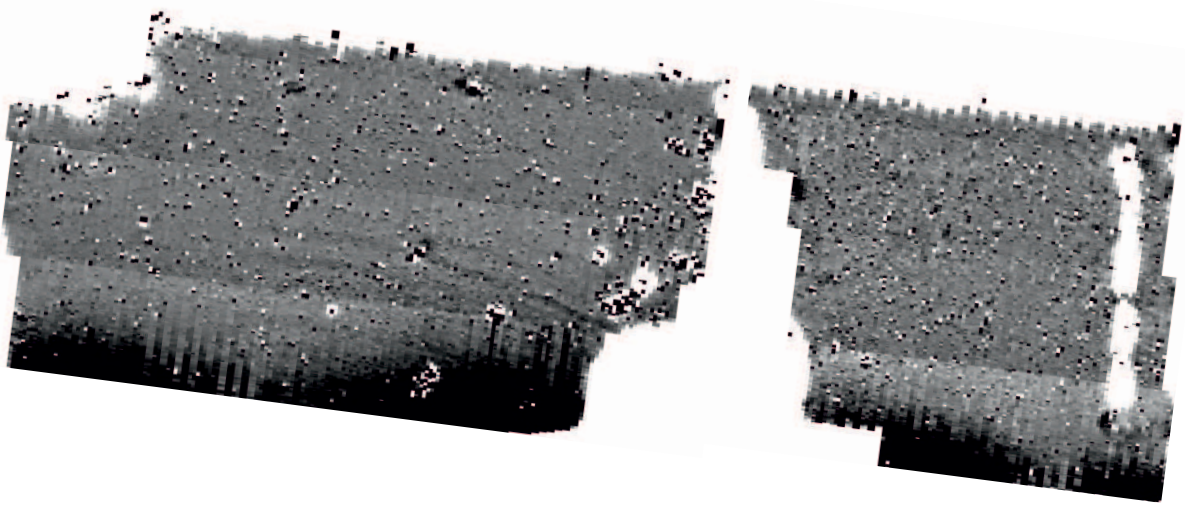
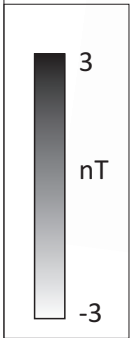
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Figure 3: Greyscale raw data and processed trace plot, both at scale 1:2,000



Positive magnetic anomaly



Area of magnetic noise



Area of magnetic noise



Examples* of individual dipolar responses
Indicative of ferrous or highly fired material
*smaller responses omitted for clarity



Area of magnetic noise

Site Code	LUTT 13
Scale	1:2,000 @A4
Drawn by	Robert Evershed
Date	29/04/13

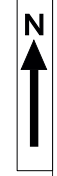
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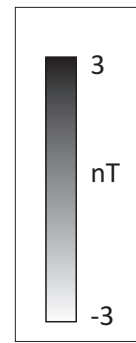
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Figure 4: Processed greyscale plot of survey area with interpretation, at scale 1:2,000



Key

Site Location



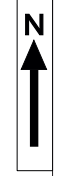
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Figure 5: Processed greyscale plot located in real space, at scale 1:2,000



Key

- Site Location
- Positive magnetic anomaly
- Area of magnetic noise
- Area of magnetic noise
- Area of magnetic noise
- Examples* of individual dipolar responses
Indicative of ferrous or highly fired material
*smaller responses omitted for clarity

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Figure 6: Interpretative plot in real space, at scale 1:2,000



Allen Archaeology Limited
Website: www.allenarchaeology.co.uk

Company Registered in England and Wales No: 6935529

Lincoln
Unit 1C
Branston Business Park
Lincoln Road
Branston
Lincolnshire LN4 1NT

Birmingham
Arion Business Centre
Harriet House
118 High Street
Birmingham
B23 6BG

Cambridge
Wellington House
East Road
Cambridge
CB1 1BH

Southampton
International House
Southampton International Business Park
George Curl Way
Southampton
SO18 2RZ

Tel/Fax: +44 (0) 1522 794400
Email: info@allenarchaeology.co.uk

Tel/Fax: +44 (0) 800 610 2545
Email: birmingham@allenarchaeology.co.uk

Tel/Fax: +44 (0) 800 610 2550
Email: cambridge@allenarchaeology.co.uk

Tel: +44 (0) 800 610 2555
Email: southampton@allenarchaeology.co.uk