

Project name: Coventry Road, Burbage, Leicestershire

Client:

**University of Leicester Archaeological Services** 

Job ref: **J9999** 

June 2016

## **GEOPHYSICAL SURVEY REPORT**

Project name:	Job ref:
Coventry Road, Burbage,	J9999
Leicestershire	
Client:	
University of Leicester	
Archaeological Services	
Survey date:	Report date:
7th June 2016	June 2016
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Job ref: J9999 Date: June 2016

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## 1 SUMMARY OF RESULTS

A detailed gradiometry survey was conducted over approximately 0.3 hectares of grassland. No features of archaeological origin have been identified, despite the potential for both prehistoric and Romano-British remains. All of the features identified are modern and include a former fence line, areas of magnetic disturbance and magnetic spikes which are likely to be modern rubbish.

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## **2 INTRODUCTION**

## 2.1 Background synopsis

Stratascan were commissioned to undertake a geophysical survey of an area outlined for development. This survey forms part of an archaeological investigation being undertaken by University of Leicester Archaeological Services.

## 2.2 Site Details

NGR / Postcode	SP 438 919 / LE10 2JD	
Location	The site is located south of Coventry Road, Burbage. Open agricultural land forms the eastern and southern boundaries of the site with residential housing to the north and west.	
HER/SMR	Leicestershire and Rutland	
District	Hinckley and Bosworth	
Parish	Burbage Civil Parish	
Topography	Mostly flat	
Current Land Use	Pasture	
Weather Conditions	Clear, dry	
Soils	The overlying soils are known as Flint which are typical stagnogleyic argillic brown earths. These consist of fine loamy over clayey soils (Soil Survey of England and Wales, Sheet 3 Midland and Western England).	
Geology	The underlying geology comprises mudstone of Mercia Mudstone Group. Superficial deposits of Dunsmore Gravel – sand and gravel are recorded across the site (British Geological Survey website).	

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Study Area	c. 0.3 hectares
Survey Methods	Detailed magnetic survey (gradiometry)
	Burbage is thought to have medieval origins, with the medieval settlement core (MLE2848) deduced from historic mapping. Records dating to 1355 mention a watermill and a windmill in the village. Finds of c. 12 <sup>th</sup> century pottery and medieval roof tiles (MLE19843) were recovered during archaeological work at Moat House, north-east of the site.
	The remains of Roman agricultural features (MLE18736) have been identified to the south-east of the site through excavations in 2010 and 2012. The features included ditches, gullies and post holes and are thought to represent a Roman agricultural site. Further trial trenching in 2014 recorded various ditches, a post hole and a possible roundhouse gully to the west of Workhouse Lane (MLE21696). These features are thought to be an extension of the Roman site (MLE18736) to the west. Roman finds west of Whitehouse Farm, south of the site, (MLE2846) indicate a possible occupational site and included 12 Roman coins and two brooches. An undated ditch, north-west of Whitehouse Farm (MLE20670) is thought to mark the edge of the Roman field system and occupation to the west (MLE18736).
Archaeology	A search of Leicestershire and Rutland Historic Environment Record (HER) (Leicestershire County Council, 2016) identifies a number of prehistoric, Roman and medieval remains within a 1km radius of the site.  Archaeological work in 2000 and 2002 recovered a total of 56 worked flints from the area around Canberra Way (MLE21173), south-west of the site, while further worked flints have been recovered at Britannia Road (MLE18737) to the south-east of the study area. A sherd of Iron Age pottery (MLE6498) was recovered from Brockhurst Avenue, west of the site.

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## 2.3 Aims and objectives

To locate and characterise any anomalies of possible archaeological interest within the study area.

## 3 METHODS, PROCESSING & PRESENTATION

## 3.1 Standards & Guidance

This report and all fieldwork have been conducted in accordance with the latest guidance documents issued by Historic England (2008) and the Chartered Institute for Archaeologists (2002 & 2014).

Stratascan Ltd are a Registered Organisation with the CIfA and are committed to upholding its policies and standards.

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## 3.2 Survey methods

Due to the moderate potential for prehistoric and Roman remains, detailed magnetic survey was used as an efficient and effective method of locating archaeological anomalies.

More information regarding this technique is included in Appendix A.

## 3.3 **Processing**

The following schedule shows the basic processing carried out on the data used in this report:

- 1. Destripe
- 2. Destagger

## 3.4 Presentation of results and interpretation

The presentation of the data for each site involves a plot of the minimally processed data as a greyscale plot and a colour plot showing extreme magnetic values. Magnetic anomalies have been identified and plotted onto the 'Interpretation of Anomalies' drawing.

When interpreting the results several factors are taken into consideration, including the nature of archaeological features being investigated and the local conditions at the site (geology, pedology, topography etc.). Anomalies are categorised by their potential origin. Where responses can be related to very specific known features documented in other sources, this is done (for example: Abbey Wall, Roman Road). For the generic categories levels of confidence are indicated, for example: probable, or possible archaeology. The former is used for a confident interpretation, based on anomaly definition and/or other corroborative data such as cropmarks. Poor anomaly definition, a lack of clear patterns to the responses and an absence of other supporting data reduces confidence, hence the classification "possible".

## **RESULTS**

The detailed magnetic gradiometer survey conducted at Burbage has not identified any anomalies that have been characterised as being either of a probable or possible archaeological origin. The following refers to numerical labels on the interpretation plots.

#### Probable Archaeology 4.1

No probable archaeology has been identified within the survey area.

#### 4.2 Possible Archaeology

No possible archaeology has been identified within the survey area.

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#### 4.3 Medieval/Post-Medieval Agriculture

No evidence of medieval or post-medieval agriculture has been identified within the survey area.

#### **Other Anomalies** 4.4

A strong bipolar linear anomaly [1] running across the north of the area is likely to be related to a former fence line, not visible on any historic mapping or aerial photographs. The response is similar to that of an underground pipe or cable, and as such caution should be taken if this area undergoes excavation. A strong, discrete area of magnetic debris [2] in the north is of uncertain origin, though the strength of the response means it is likely to be modern in origin. Areas of magnetic disturbance [3] are related to substantial nearby ferrous metal objects, such as fences. Smaller ferrous anomalies, or 'magnetic spikes' [4] are indicative of ferrous metal objects and are likely to be modern rubbish.

#### **DATA APPRAISAL & CONFIDENCE ASSESSMENT** 5

Mudstone geologies, combined with superficial deposits of sand and gravel, can provide variable results for magnetic survey. The data across the site is relatively noisy, with disturbance from ferrous metal objects and magnetic spikes. It is theoretically possible that the areas of magnetic disturbance are masking weaker archaeological anomalies, though there is no specific evidence to suggest this is happening. In areas not affected by the disturbance there is no evidence for any archaeological anomalies on the site. It is likely that any archaeological anomalies on the site, should they be present, would have been detected.

#### **CONCLUSION** 6

The survey at Burbage has not identified any features of probable or possible archaeological origin, despite the potential for prehistoric and Roman remains. All of the features detected are modern in origin. An area of strong magnetic disturbance is of uncertain origin, though the strength of the response suggests that it is modern. The remaining features include a probable former fence line, disturbance from nearby ferrous metal objects and magnetic spikes which are likely to be modern rubbish.

## 7 REFERENCES

British Geological Survey, n.d., website: (http://www.bgs.ac.uk/opengeoscience/home.html?Accordion1=1#maps) Geology of Britain viewer. [Accessed 24/06/2016]

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Leicestershire County Council, 2016. *Leicestershire and Rutland Historic Environment Record [online]* Available through: <a href="www.heritagegateway.org.uk">www.heritagegateway.org.uk</a> [Accessed 24/06/2016]

Soil Survey of England and Wales, 1983. Soils of England and Wales, Sheet 3 Midland and Western England

## **Appendix A - Technical Information: Magnetometer Survey Method**

## **Grid Positioning**

For hand held gradiometers the location of the survey grids has been plotted together with the referencing information. Grids were set out using a Trimble R8 Real Time Kinematic (RTK) VRS Now GNSS GPS system.

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An RTK GPS (Real-time Kinematic Global Positioning System) can locate a point on the ground to a far greater accuracy than a standard GPS unit. A standard GPS suffers from errors created by satellite orbit errors, clock errors and atmospheric interference, resulting in an accuracy of 5m-10m. An RTK system uses a single base station receiver and a number of mobile units. The base station re-broadcasts the phase of the carrier it measured, and the mobile units compare their own phase measurements with those they received from the base station. This results in an accuracy of around 0.01m.

Technique	Instrument	Traverse Interval	Sample Interval
Magnetometer	Bartington Grad 601-2	1m	0.25m

## Instrumentation: Bartington Grad601-2

Bartington instruments operate in a gradiometer configuration which comprises fluxgate sensors mounted vertically, set 1.0m apart. The fluxgate gradiometer suppresses any diurnal or regional effects. The instruments are carried, or cart mounted, with the bottom sensor approximately 0.1-0.3m from the ground surface. At each survey station, the difference in the magnetic field between the two fluxgates is measured in nanoTesla (nT). The sensitivity of the instrument can be adjusted; for most archaeological surveys the most sensitive range (0.1nT) is used. Generally, features up to 1m deep may be detected by this method, though strongly magnetic objects may be visible at greater depths. The Bartington instrument can collect two lines of data per traverse with gradiometer units mounted laterally with a separation of 1.0m.

The readings are logged consecutively into the data logger which in turn is daily down-loaded into a portable computer whilst on site. At the end of each site survey, data is transferred to the office for processing and presentation.

### **Data Processing**

Zero Mean Traverse Step Correction (Destagger) This process sets the background mean of each traverse within each grid to zero. The operation removes striping effects and edge discontinuities over the whole of the data set. When gradiometer data are collected in 'zig-zag' fashion, stepping errors can sometimes arise. These occur because of a slight difference in the speed of walking on the forward and reverse traverses. The result is a staggered effect in the data, which is particularly noticeable on linear anomalies. This process corrects these errors.

## Display

Greyscale/
Colourscale Plot

This format divides a given range of readings into a set number of classes. Each class is represented by a specific shade of grey, the intensity increasing with value. All values above the given range are allocated the same shade (maximum intensity); similarly all values below the given range are represented by the minimum intensity shade. Similar plots can be produced in colour, either using a wide range of colours or by selecting two or three colours to represent positive and negative values. The assigned range (plotting levels) can be adjusted to emphasise different anomalies in the data-set.

## **Interpretation Categories**

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In certain circumstances (usually when there is corroborative evidence from desk based or excavation data) very specific interpretations can be assigned to magnetic anomalies (for example, *Roman Road, Wall,* etc.) and where appropriate, such interpretations will be applied. The list below outlines the generic categories commonly used in the interpretation of the results.

Archaeology/Probable This term is used when the form, nature and pattern of the response are clearly or very Archaeology probably archaeological and /or if corroborative evidence is available. These anomalies,

whilst considered anthropogenic, could be of any age.

Possible Archaeology These anomalies exhibit either weak signal strength and / or poor definition, or form

incomplete archaeological patterns, thereby reducing the level of confidence in the interpretation. Although the archaeological interpretation is favoured, they may be the result of variable soil depth, plough damage or even aliasing as a result of data collection

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orientation.

Industrial / Strong magnetic anomalies that, due to their shape and form or the context in which they Burnt-Fired are found, suggest the presence of kilns, ovens, corn dryers, metal- working areas or

are found, suggest the presence of kilns, ovens, corn dryers, metal- working areas or hearths. It should be noted that in many instances modern ferrous material can produce

similar magnetic anomalies.

Former Field Boundary Anomalies that correspond to former boundaries indicated on historic mapping, or which

(probable & possible) are clearly a continuation of existing land divisions. Possible denotes less confidence where the anomaly may not be shown on historic mapping but nevertheless the anomaly

displays all the characteristics of a field boundary.

Ridge & Furrow Parallel linear anomalies whose broad spacing suggests ridge and furrow cultivation. In

some cases the response may be the result of more recent agricultural activity.

Agriculture Parallel linear anomalies or trends with a narrower spacing, sometimes aligned with

(ploughing) existing boundaries, indicating more recent cultivation regimes.

Land Drain Weakly magnetic linear anomalies, quite often appearing in series forming parallel and

herringbone patterns. Smaller drains will often lead and empty into larger diameter pipes and which in turn usually lead to local streams and ponds. These are indicative of clay fired

land drains.

Natural These responses form clear patterns in geographical zones where natural variations are

known to produce significant magnetic distortions.

Magnetic Disturbance Broad zones of strong dipolar anomalies, commonly found in places where modern

ferrous or fired materials (e.g. brick rubble) are present. They are presumed to be modern.

Service Magnetically strong anomalies usually forming linear features indicative of ferrous

pipes/cables. Sometimes other materials (e.g. pvc) cause weaker magnetic responses and

can be identified from their uniform linearity crossing large expanses.

Ferrous This type of response is associated with ferrous material and may result from small items

in the topsoil, larger buried objects such as pipes, or above ground features such as fence lines or pylons. Ferrous responses are usually regarded as modern. Individual burnt

stones, fired bricks or igneous rocks can produce responses similar to ferrous material.

Uncertain Origin Anomalies which stand out from the background magnetic variation, yet whose form and

lack of patterning gives little clue as to their origin. Often the characteristics and distribution of the responses straddle the categories of *Possible Archaeology* and *Possible Natural* or (in the case of linear responses) *Possible Archaeology* and *Possible Agriculture*;

occasionally they are simply of an unusual form.

Where appropriate some anomalies will be further classified according to their form (positive or negative) and relative strength and coherence (trend: weak and poorly defined).

## **Appendix B - Technical Information: Magnetic Theory**

Detailed magnetic survey can be used to effectively define areas of past human activity by mapping spatial variation and contrast in the magnetic properties of soil, subsoil and bedrock. Although the changes in the magnetic field resulting from differing features in the soil are usually weak, changes as small as 0.2 nanoTeslas (nT) in an overall field strength of 48,000nT, can be accurately detected.

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Weakly magnetic iron minerals are always present within the soil and areas of enhancement relate to increases in *magnetic susceptibility* and permanently magnetised *thermoremanent* material.

Magnetic susceptibility relates to the induced magnetism of a material when in the presence of a magnetic field. This magnetism can be considered as effectively permanent as it exists within the Earth's magnetic field. Magnetic susceptibility can become enhanced due to burning and complex biological or fermentation processes.

Thermoremanence is a permanent magnetism acquired by iron minerals that, after heating to a specific temperature known as the Curie Point, are effectively demagnetised followed by re-magnetisation by the Earth's magnetic field on cooling. Thermoremanent archaeological features can include hearths and kilns and material such as brick and tile may be magnetised through the same process.

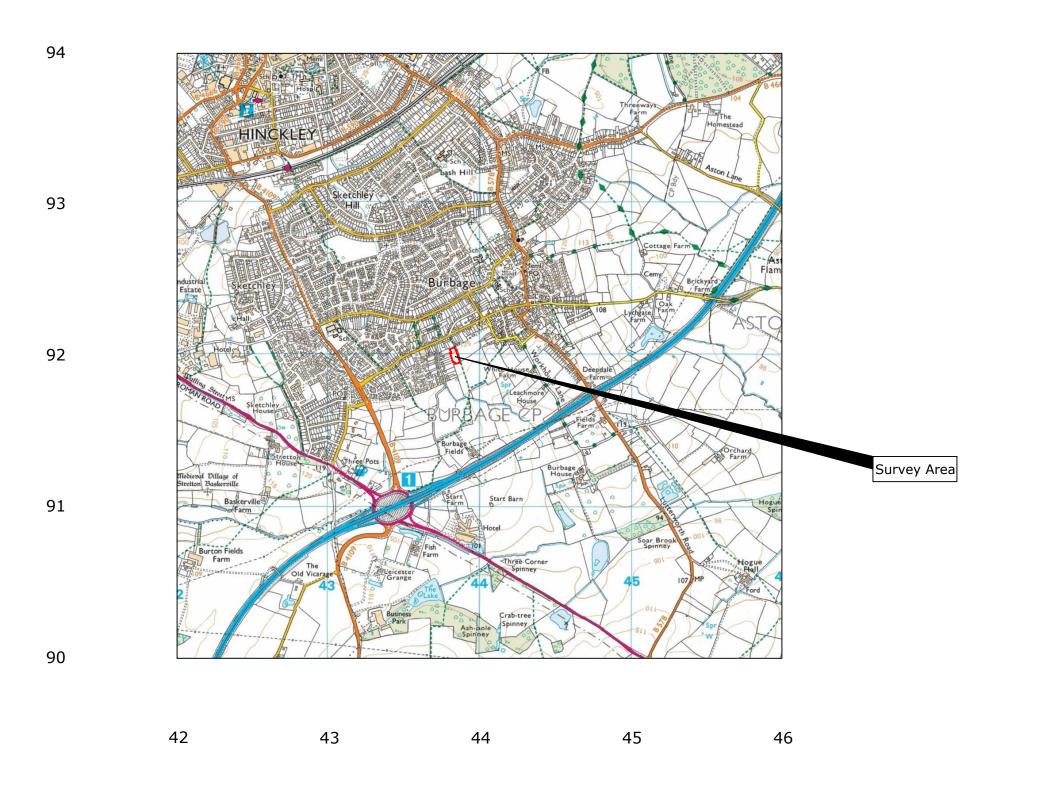
Silting and deliberate infilling of ditches and pits with magnetically enhanced soil creates a relative contrast against the much lower levels of magnetism within the subsoil into which the feature is cut. Systematic mapping of magnetic anomalies will produce linear and discrete areas of enhancement allowing assessment and characterisation of subsurface features. Material such as subsoil and non-magnetic bedrock used to create former earthworks and walls may be mapped as areas of lower enhancement compared to surrounding soils.

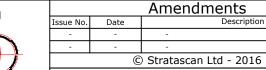
Magnetic survey is carried out using a fluxgate gradiometer which is a passive instrument consisting of two sensors mounted vertically 1m apart. The instrument is carried about 30cm above the ground surface and the top sensor measures the Earth's magnetic field whilst the lower sensor measures the same field but is also more affected by any localised buried field. The difference between the two sensors will relate to the strength of a magnetic field created by a buried feature, if no field is present the difference will be close to zero as the magnetic field measured by both sensors will be the same.

Factors affecting the magnetic survey may include soil type, local geology, previous human activity, disturbance from modern services etc.

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OS 100km square = SP







Site centred on NGR

SP 438 919

Client UNIVERSITY OF LEICESTER ARCHAEOLOGICAL SERVICES

Project Title Job No. 9999 COVENTRY ROAD, BURBAGE, LEICESTERSHIRE

Subject

LOCATION PLAN OF SURVEY AREA



AND ENGINEERING

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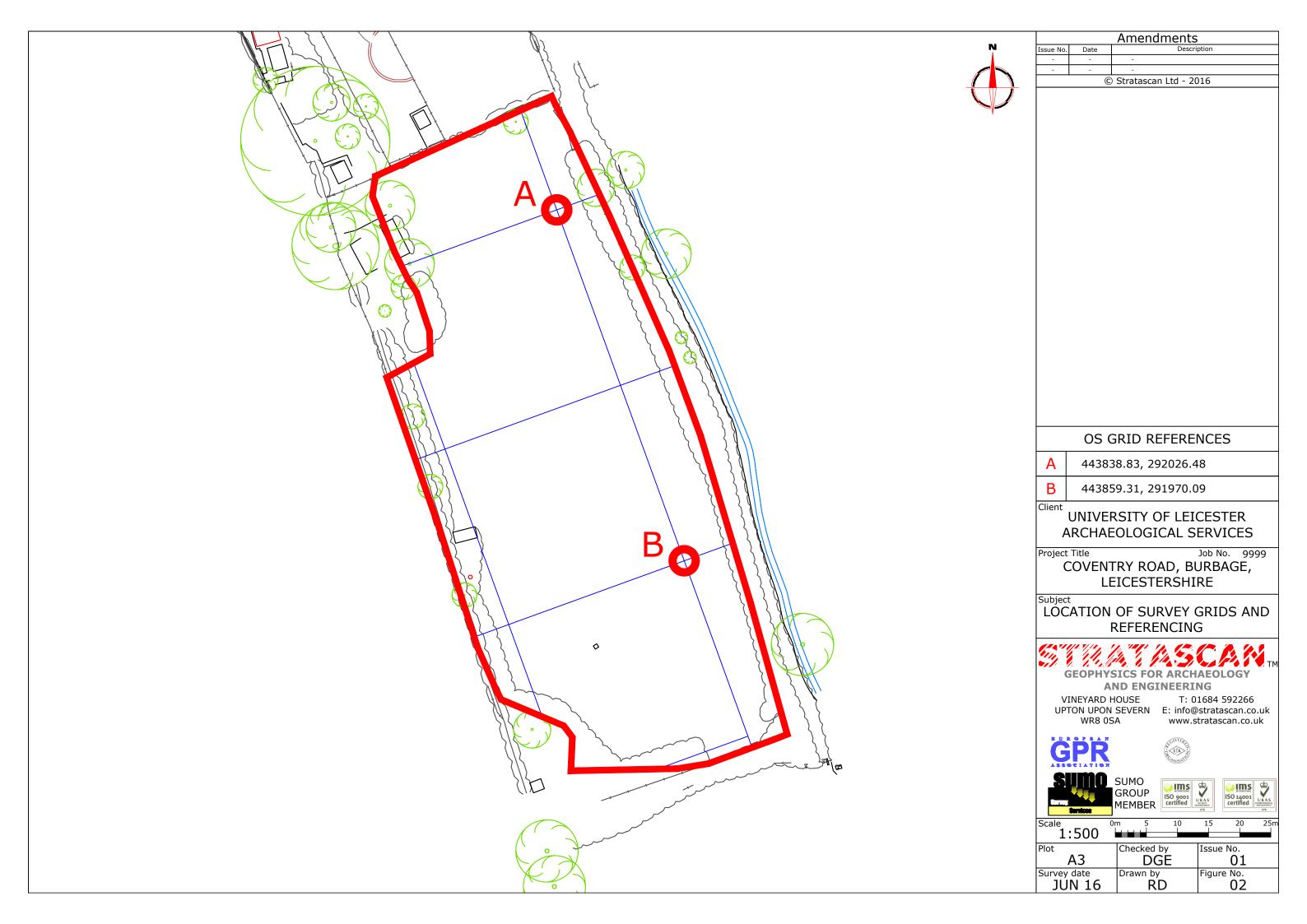


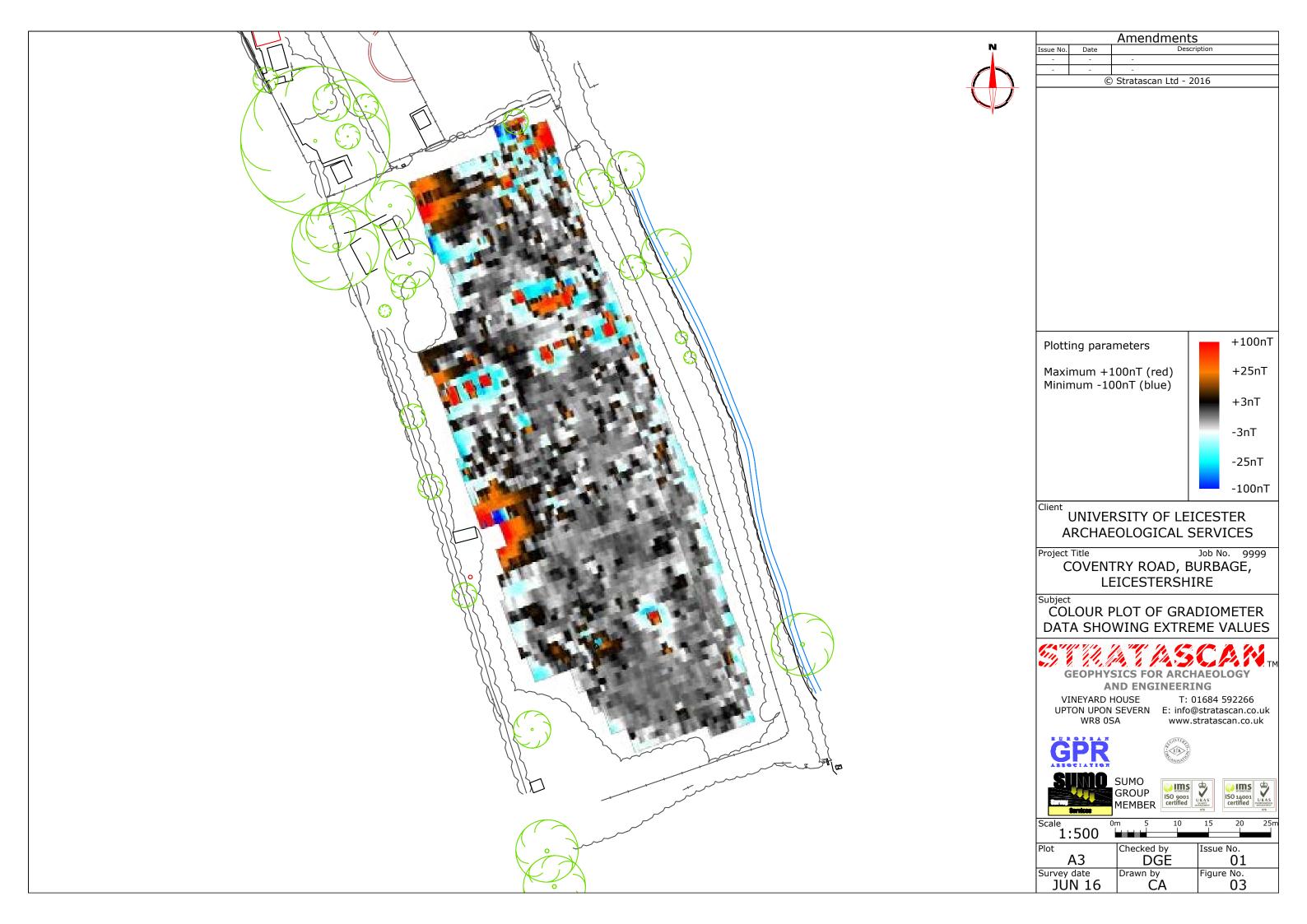
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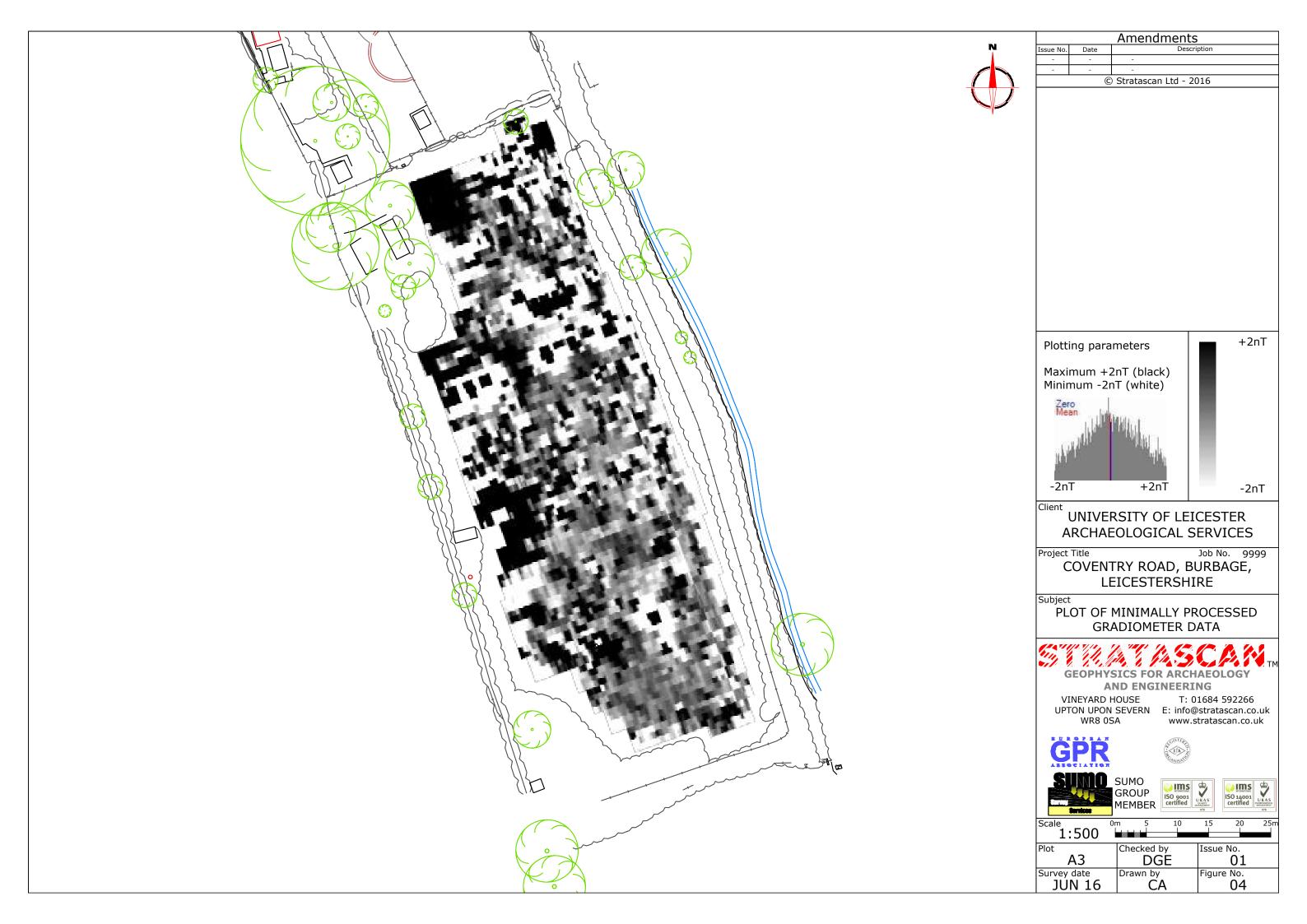


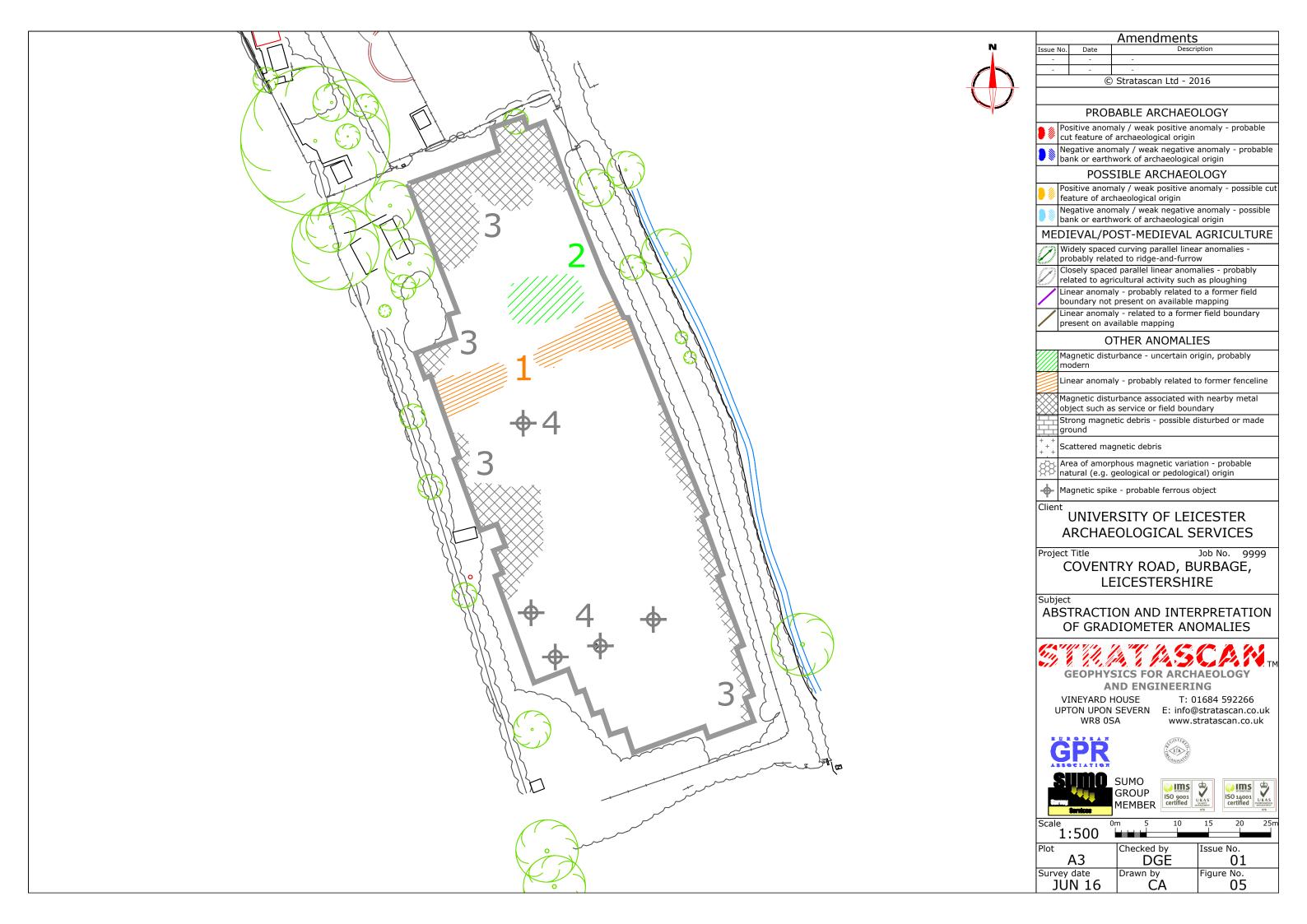
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