

GEOPHYSICAL SURVEY REPORT

Land at South Farm, Wickwar, South Gloucestershire

Client

The Environmental Dimension Partnership Ltd

For

Bloor Homes

Survey Report

12869

OASIS Ref. No.

sumogeop1-516393

Date

09 June 2023



Survey Report 12869: Land at South Farm, Wickwar, South Gloucestershire

Survey dates 30 – 31 May 2023

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Report Date 09 June 2023

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3 SURVEY TECHNIQUE

- 3.1 Detailed magnetic survey (magnetometry) was chosen as the most efficient and effective method of locating the type of archaeological anomalies which might be expected at this site. All survey techniques followed the guidance set out by CIFA (2014, updated 2020), Historic England (2008), and the European Archaeology Council (EAC) (2016).

Bartington Grad 601-2	Traverse Interval 1.0m	Sample Interval 0.25m
Bartington Cart System	Traverse Interval 1.0m	Sample Interval 0.125m

The only processes performed on data are the following unless specifically stated otherwise:

Zero Mean Traverse	This process sets the background mean of each traverse within each grid to zero. The operation removes instrument striping effects and edge discontinuities over the whole of the data set.
Step Correction (De-stagger)	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.

4 SUMMARY OF RESULTS

- 4.1 A magnetometer survey of 7.5 hectares of land at South Farm, Wickwar, South Gloucestershire has not recorded any magnetic responses that could be interpreted as being of archaeological interest. Responses of uncertain origin are visible in the data which are likely to have been caused by a combination of natural and agricultural processes. Three former field boundaries are visible in the survey along with a zone of magnetic disturbance associated with an infilled former pond.

5 INTRODUCTION

- 5.1 **SUMO Geophysics Ltd** were commissioned to undertake a geophysical survey of an area outlined for development. This survey forms part of an archaeological investigation being undertaken by **The Environmental Dimension Partnership Ltd** on behalf of **Bloor Homes**.

5.2 Site Details

NGR / Postcode	ST 723 874 / GL12 8NR
Location	The site is to the south of Wickwar village in Gloucestershire. It is approximately 20km north-east of Bristol, 21km south-west of Stroud, and 23km north of Bath. The survey area is bounded to the east by the B4060 and by Frith Road to the south.
HER	South Gloucestershire HER
OASIS Ref. No.	sumogeop1-516393
District	South Gloucestershire
Parish	Wickwar Civil Parish
Topography	Flat
Land Use	Pasture / arable agriculture
Geology (BGS 2023)	Bedrock: Black Rock Limestone Subgroup – Limestone Avon Group - Mudstone and limestone, interbedded Langport Member and Wilmcote Limestone Member - Limestone and mudstone, interbedded. Westbury Formation and Cotham Member - Mudstone None recorded
	Superficial:
Soils (CU 2023)	Soilscape 18: Slowly Permeable seasonably wet, slightly acidic but base-rich loamy and clayey soils.
Survey Methods	Magnetometer survey (fluxgate gradiometer)
Study Area	7.5 ha

5.3 **Archaeological Background** (EDP 2021)

- 5.3.1 The site does not contain any designated heritage assets, such as scheduled monuments, listed buildings and registered parks and gardens, nor is it a part of any wider designation such as a world heritage site, registered battlefield or conservation area that would constrain its development. The site has been agricultural land since at least the post-medieval period. There is a low potential for buried remains dating from the Prehistoric and Roman periods. These are most likely to consist of remains related to past agricultural practices, but there is a low possibility for more significant remains related to prehistoric ritual or funerary activity related to a possible long barrow located some 1.5km west of the survey area. A high potential is identified for remains related to agricultural activity during the medieval, post-medieval and modern periods.

5.4 ***Aims and Objectives***

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

6 **RESULTS**

- 6.1 *The survey has been divided into four survey areas (Areas 1-4). The tall vegetation in Area 4 rendered that field unsurveyable.*

6.2 ***Probable / Possible Archaeology***

- 6.2.1 No magnetic responses have been recorded that could be interpreted as being of definite archaeological interest.

6.3 ***Uncertain***

- 6.3.1 Weak curvilinear and linear trends, discrete anomalies and a zone of increased magnetic response have been detected in the survey which have been assigned to the category of uncertain. They generally lack the defined morphology of anomalies that would ordinarily be interpreted as being of archaeological interest. They are likely to have been caused by a combination of underlying natural variations or agricultural processes. The discrete anomalies may be due to deeply buried ferrous debris.

6.4 ***Former Field Boundary – Corroborated / Conjectural***

- 6.4.1 A linear anomaly in Area 1 and a curvilinear response in Area 2 are visible in the data which correspond to the location of former field boundaries that are recorded on 1882 Ordnance Survey mapping (see Figure 06).
- 6.4.2 In Area 2 a linear response which has a similar magnetic signature to corroborated former field boundaries (see 6.4.1) has been identified but it does not correspond to any field boundaries on historic mapping. Consequently, it has been categorised as a conjectural former field boundary.

6.5 ***Natural / Geological / Pedological***

- 6.5.1 A band of increase response is visible in the west of Area 3 which is amorphous and generally weak, it is likely to have been caused by variations in the underlying geology.

6.6 ***Ferrous / Magnetic Disturbance***

- 6.6.1 Small zones of magnetic disturbance have been detected in Areas 2 and 3 which are likely to be due to spreads of debris associated with modern agricultural processes. A former pond is recorded on historic mapping (see Figure 06) and corresponds with one of the zones of disturbance; the infilling of this pond is likely to have caused the response.
- 6.6.2 Ferrous responses close to boundaries are due to adjacent fences and gates. Smaller scale ferrous anomalies ("iron spikes") are present throughout the data and are characteristic of small pieces of ferrous debris (or brick / tile / igneous rocks) in the topsoil; they are commonly assigned a modern origin. Only the most prominent of these are highlighted on the interpretation diagram.

7 DATA APPRAISAL & CONFIDENCE ASSESSMENT

- 7.1 Historic England guidelines (EH 2008) Table 4 states that the typical magnetic response on the local soils / geology is variable. There is no *a priori* reason why archaeological features would not have been detected.

8 CONCLUSION

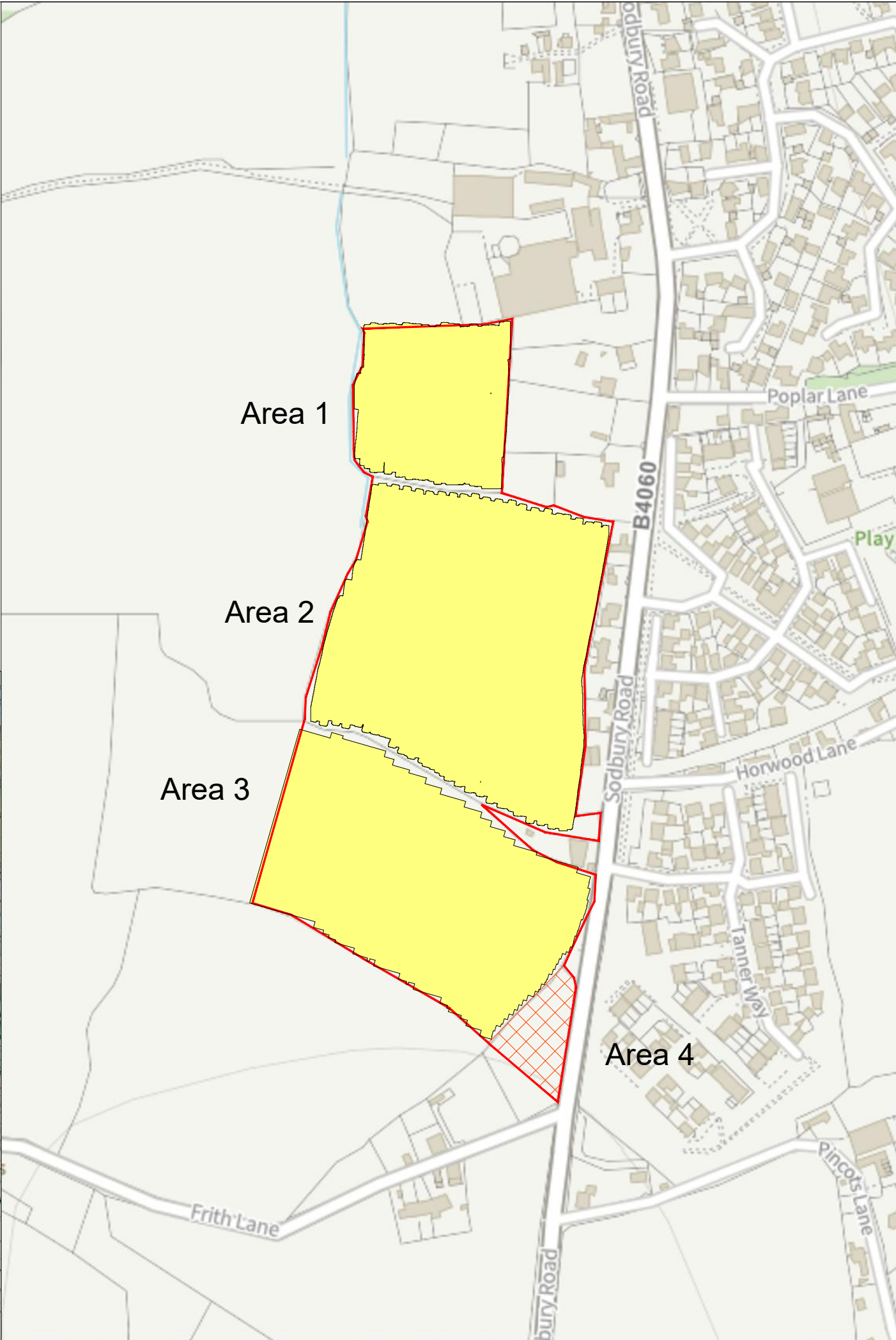
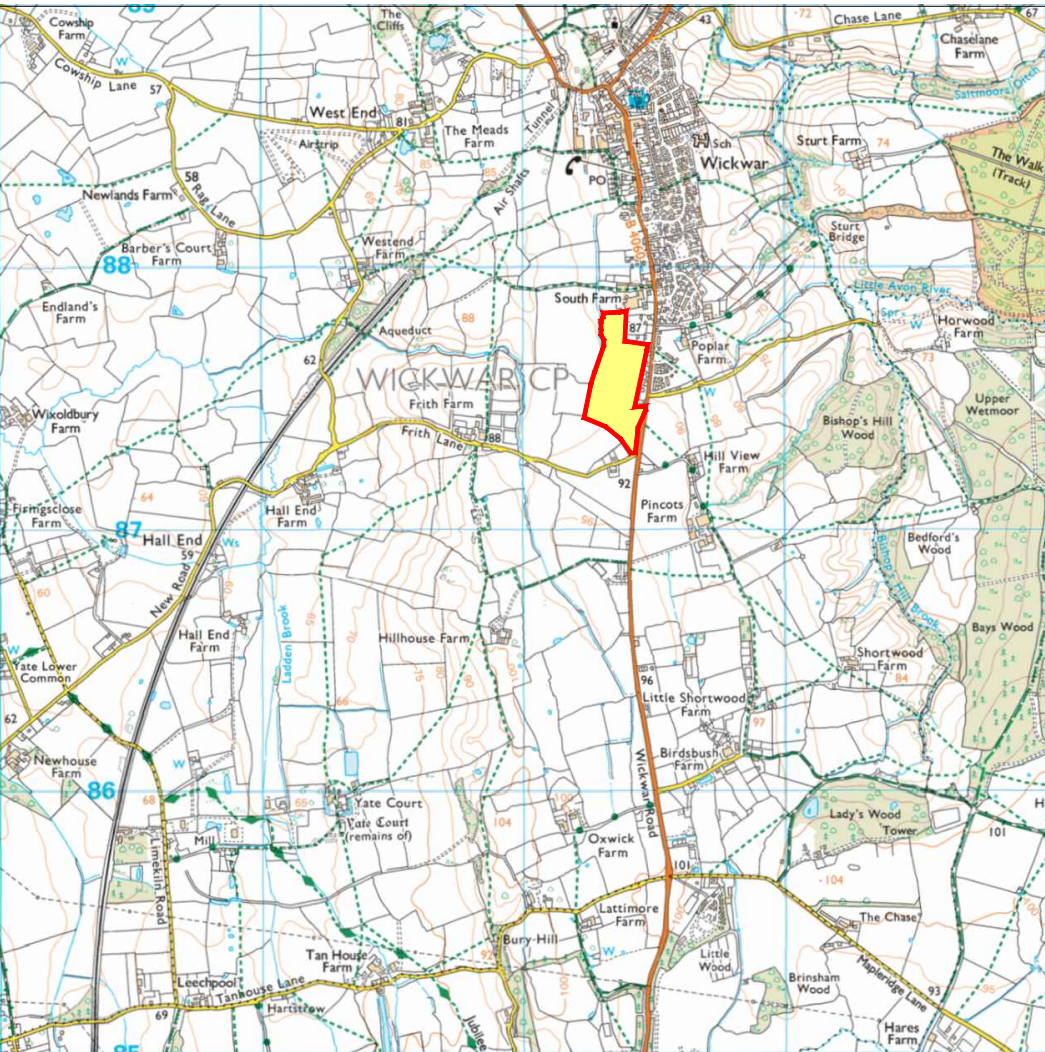
- 8.1 No magnetic responses have been recorded that could be interpreted as being of definite archaeological interest. Curvilinear and linear trends, discrete anomalies and a zone of increased magnetic response have been assigned to the category of uncertain; they are likely to be due to natural and agricultural processes. Three former field boundaries have been plotted in the survey and a zone of magnetic disturbance associated with an infilled former pond is also visible.

9 REFERENCES



- BGS 2022 British Geological Survey, Geology of Britain viewer [accessed 08/06/2023] *website:* (<http://www.bgs.ac.uk/opengeoscience/home.html?Accordion1=1#maps>)
- ClfA 2014 *Standard and Guidance for Archaeological Geophysical Survey*. Amended 2020.
Amended ClfA Guidance note. Chartered Institute for Archaeologists, Reading
2020 https://www.archaeologists.net/sites/default/files/ClfAS%26GGeophysics_3.pdf
- CU 2022 The Soils Guide. Available: www.landis.org.uk. Cranfield University, UK. [accessed 06/06/2023] *website:* <http://mapapps2.bgs.ac.uk/ukso/home.html>
- EAC 2016 *EAC Guidelines for the Use of Geophysics in Archaeology*, European Archaeological Council, Guidelines 2.
- EDP 2021 *Land at South Farm, Wickwar, South Gloucestershire Archaeological and Heritage Baseline Assessment*. The Environmental Dimension Partnership Ltd, Cheltenham
- EH 2008 *Geophysical Survey in Archaeological Field Evaluation*. English Heritage, Swindon (now withdrawn, but used for evaluating suitability of soil types)

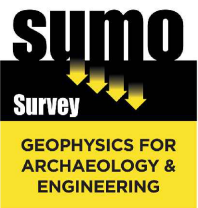
10 ARCHIVE

- 10.1 The minimally processed data, data images, XY traces and a copy of this report are stored in **SUMO Geophysics Ltd.**'s digital archive, on an internal RAID configured NAS drive in the Midlands Office. These data are also backed up to the Cloud for off-site storage.
- 10.2 The Grey Literature will be archived with OASIS and the relevant HER within a period of 12 months.

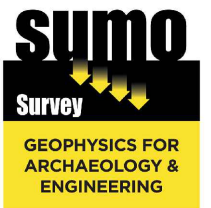
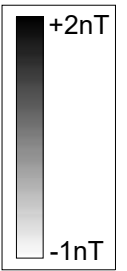
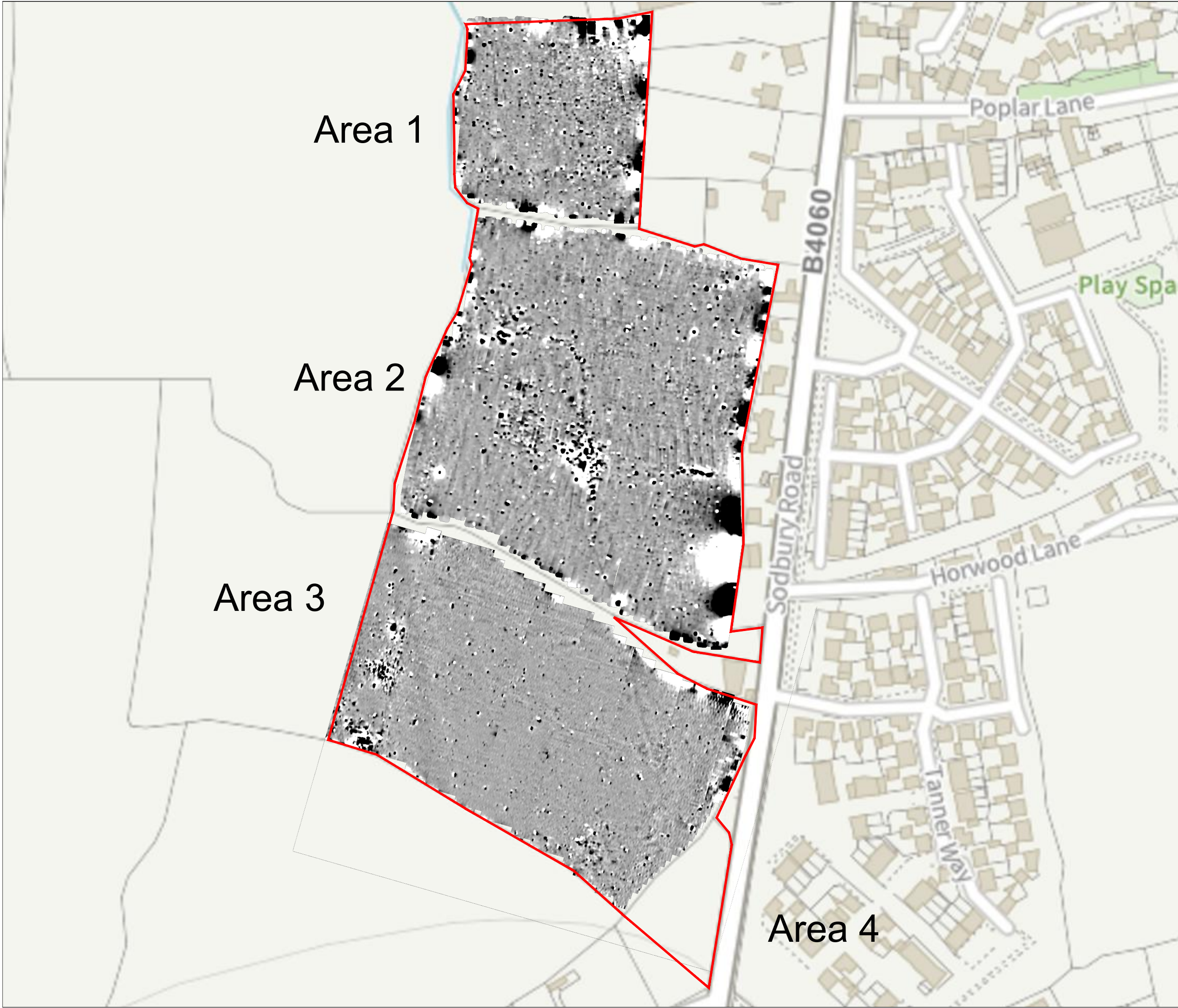


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	Unsurveyable
	Survey Areas



Title: Site Location	
Client: The Environmental Dimension Partnership	
Project: 12869 - Land at South Farm, Wickwar, South Gloucestershire	
Scale: NOT TO SCALE	Fig No: 01



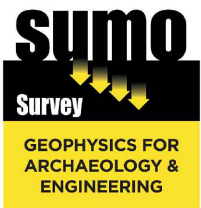
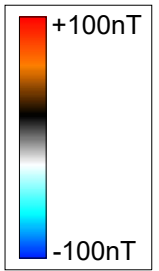
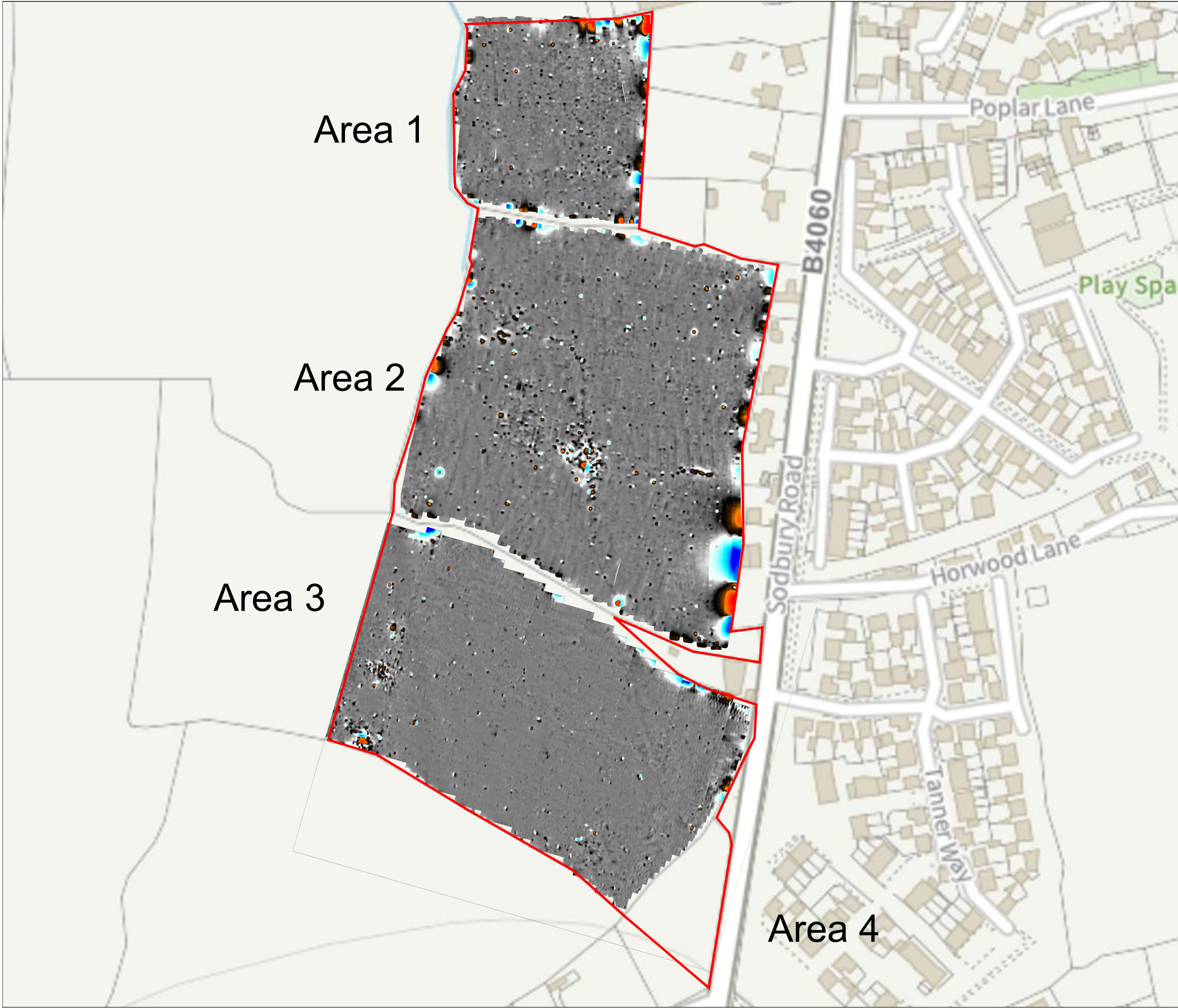
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Magnetometer Survey - Greyscale Plots

Client:
The Environmental Dimension Partnership

Project:
12869 - Land at South Farm, Wickwar, South Gloucestershire

Scale:
0 metres 100
1:2000 @ A3

Fig No:
02



Title:
Magnetometer Survey - Colour Plots

Client:
The Environmental Dimension Partnership







Project:
12869 - Land at South Farm, Wickwar, South Gloucestershire

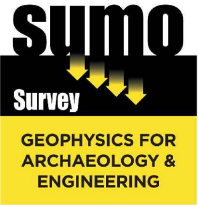
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0 metres 100
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Fig No:
03

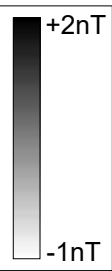
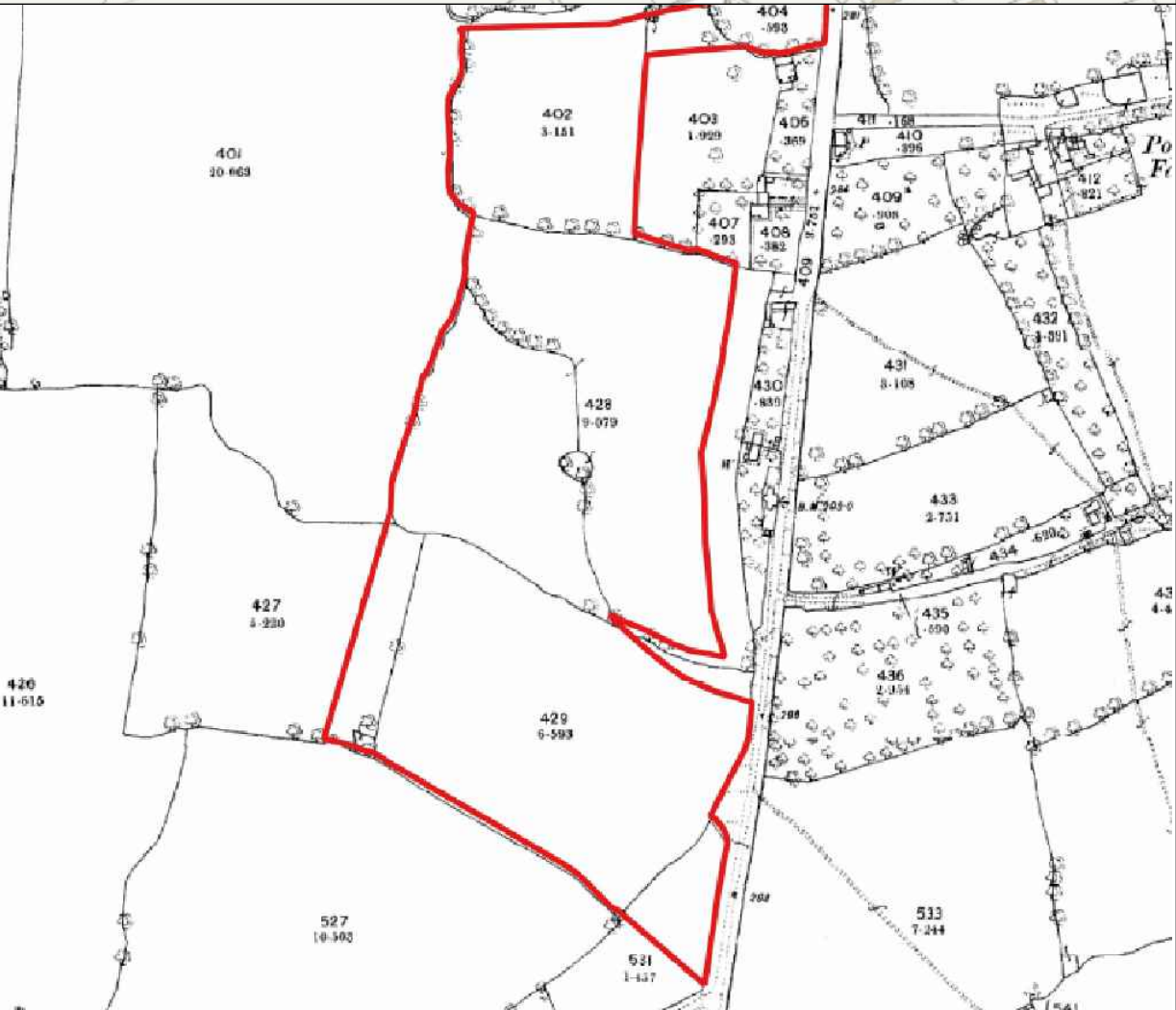
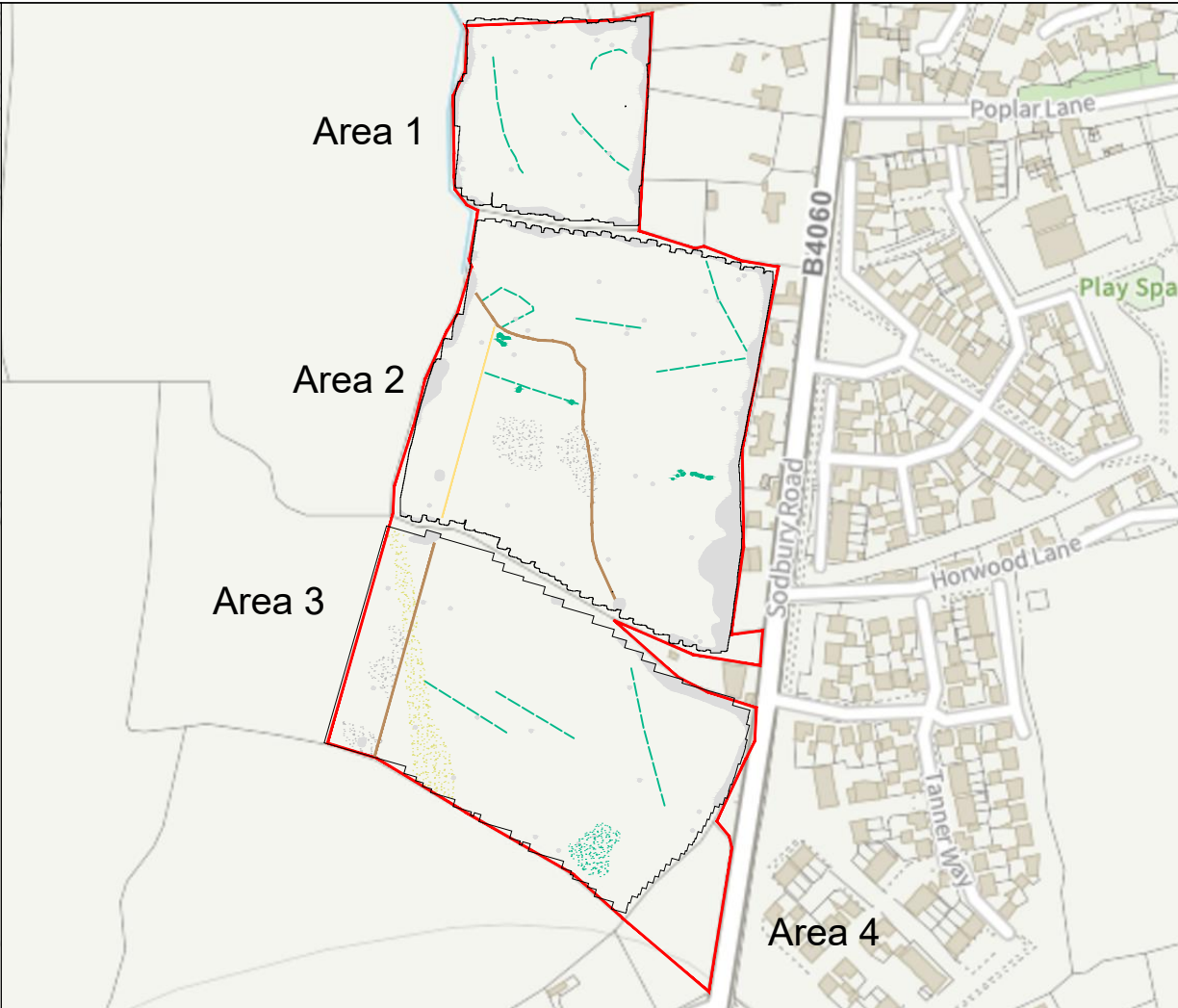
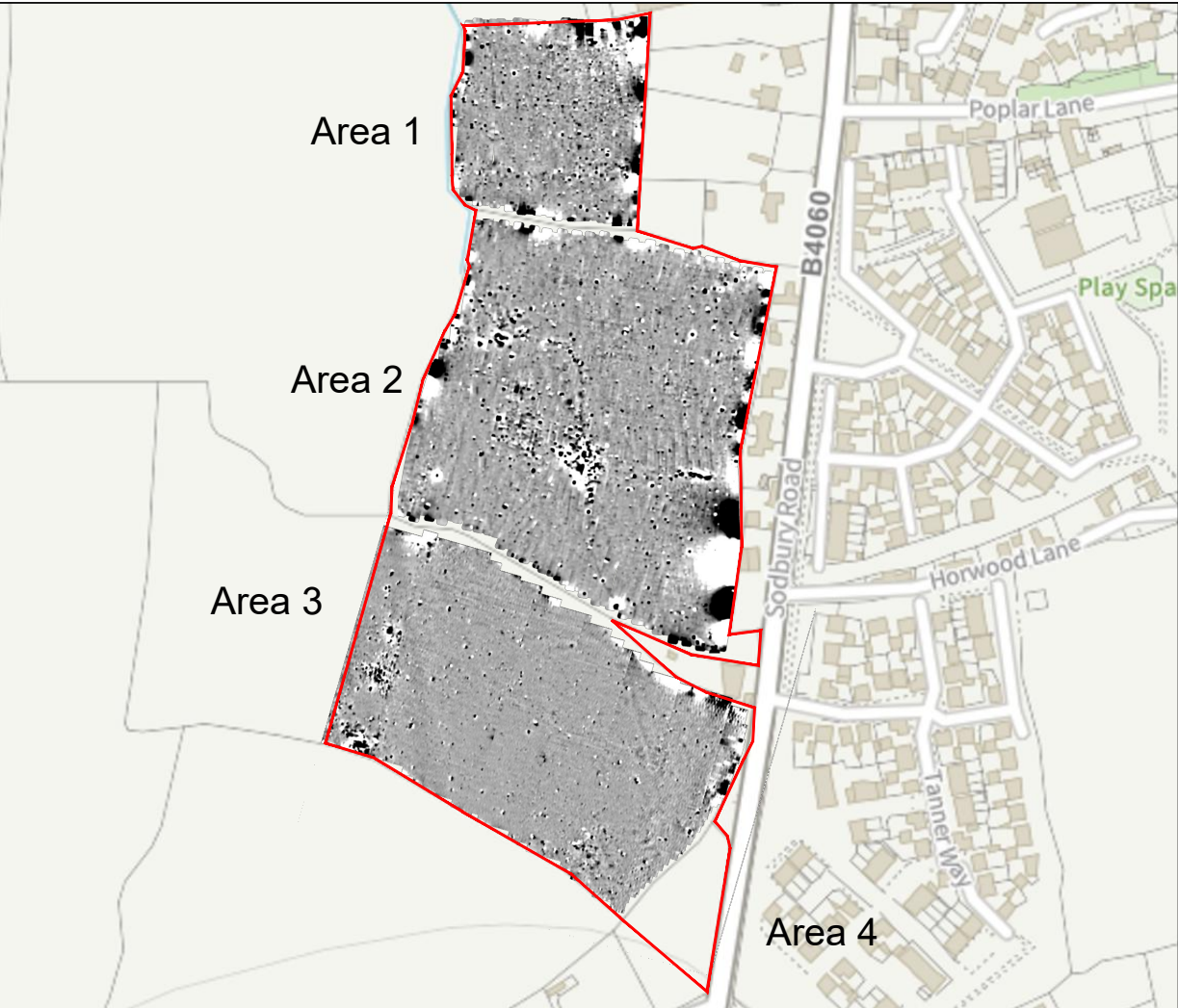


KEY

	Uncertain Origin (discrete anomaly / trend / increased response)
	Former field boundary (corroborated)
	Former field boundary (conjectural)
	Natural (e.g. geological / pedological)
	Magnetic disturbance
	Ferrous

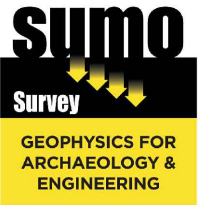


Title: Magnetometer Survey - Interpretation	
Client: The Environmental Dimension Partnership	
Project: 12869 - Land at South Farm, Wickwar, South Gloucestershire	
Scale: 0 100 metres 1:2000 @ A3	Fig No: 04

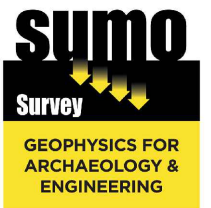
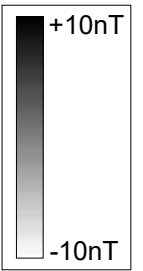
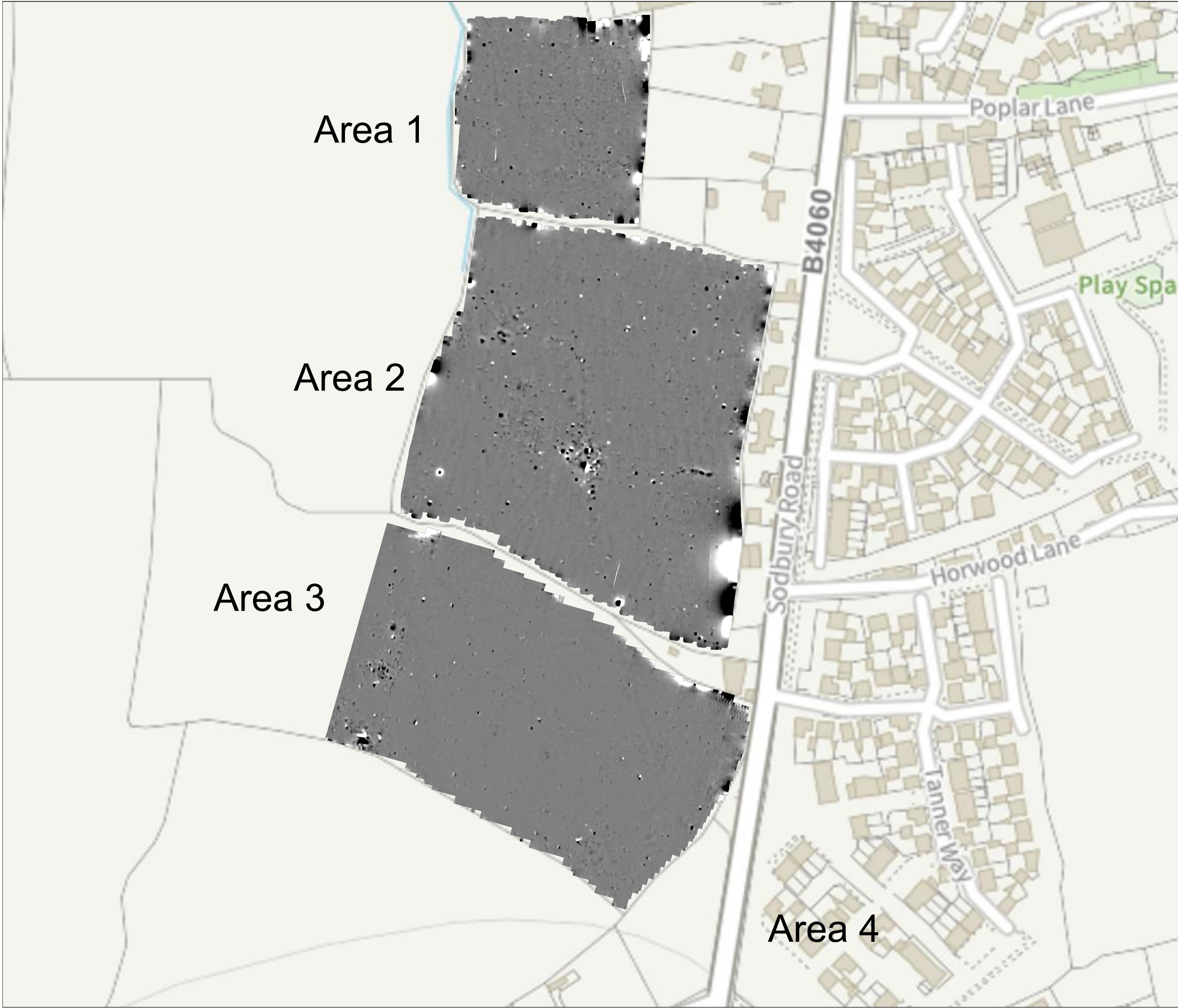


KEY

	Uncertain Origin (discrete anomaly / trend / increased response)
	Former field boundary (corroborated)
	Former field boundary (conjectural)
	Natural (e.g. geological / pedological)
	Magnetic disturbance
	Ferrous



Title: Greyscale Plots / Interpretation / 1882 Ordnance Survey Map (EDP 2021) / 2021 Aerial Imagery	
Client: The Environmental Dimension Partnership	
Project: 12869 - Land at South Farm, Wickwar, South Gloucestershire	
Scale: 0 metres 200 1:4000 @ A3	Fig No: 05



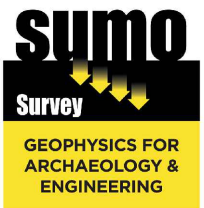
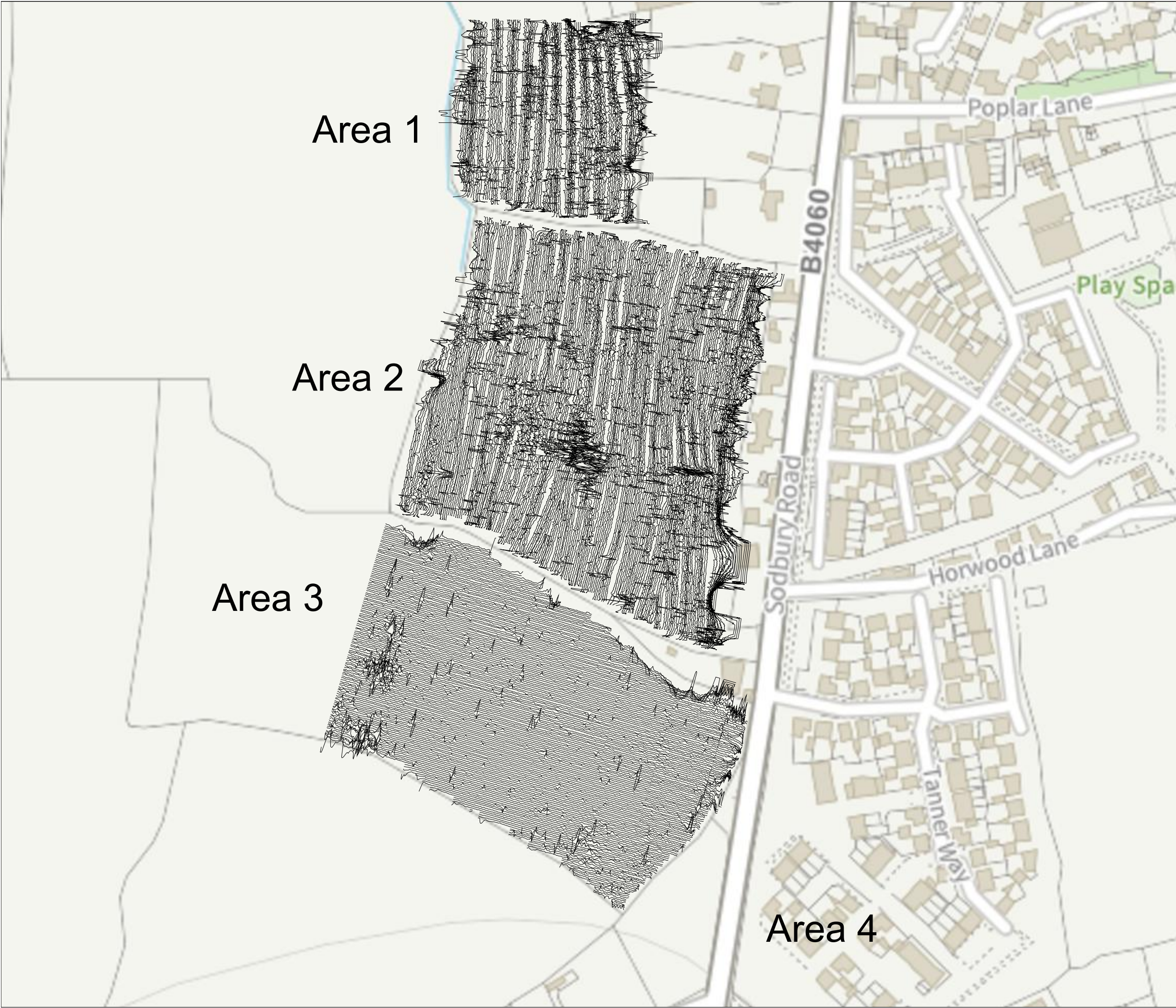
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Minimally Processed Data - Greyscale Plots

Client:
The Environmental Dimension Partnership

Project:
12869 - Land at South Farm, Wickwar, South Gloucestershire

Scale:
0 metres 100
1:2000 @ A3

Fig No:
06



Title: XY Trace Plots (clipped at +/-15nT)	
Client: The Environmental Dimension Partnership	
Project: 12869 - Land at South Farm, Wickwar, South Gloucestershire	
Scale: 0 100 metres 1:2000 @ A3	Fig No: 07

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.

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	1.0m	0.25m
Magnetometer	Bartington Cart System	1.0m	0.125m

Instrumentation:

Bartington instruments operate in a gradiometer configuration which comprises fluxgate sensors mounted horizontally, 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.

Bartington Grad 601-2

Hand-Held: Data will be collected using a Bartington Grad 601-2. The instrument consists of two paired sensors and readings are logged at 0.25m centres along traverses 1.0m apart across 30m grids. The collection of data at 0.25m centres provides an appropriate methodology balancing cost and time with resolution as per Historic England guidelines

Bartington Cart System

Data will be collected using a cart carrying four paired Bartington magnetic sensors. Each data point is geographically referenced using an on-board Trimble RTK survey grade GPS system. Readings will be taken at 0.125m centres along traverses 1.0m apart.

Data Processing

Zero Mean Traverse	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.
Step Correction (De-stagger)	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.
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Interpretation Categories

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.

<i>Archaeology / Probable Archaeology</i>	This term is used when the form, nature and pattern of the responses are clearly or very probably archaeological and /or if corroborative evidence is available. These anomalies, whilst considered anthropogenic, could be of any age.
<i>Possible Archaeology</i>	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 orientation.
<i>Industrial / Burnt-Fired</i>	Strong magnetic anomalies that, due to their shape and form or the context in which they 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.
<i>Former Field Boundary (probable & possible)</i>	Anomalies that correspond to former boundaries indicated on historic mapping, or which 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.
<i>Ridge & Furrow</i>	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.
<i>Agriculture (ploughing)</i>	Parallel linear anomalies or trends with a narrower spacing, sometimes aligned with existing boundaries, indicating more recent cultivation regimes.
<i>Land Drain</i>	Weakly magnetic linear anomalies, quite often appearing in series forming parallel and herringbone patterns. Smaller drains may lead and empty into larger diameter pipes, which in turn usually lead to local streams and ponds. These are indicative of clay fired land drains.
<i>Natural</i>	These responses form clear patterns in geographical zones where natural variations are known to produce significant magnetic distortions.
<i>Magnetic Disturbance</i>	Broad zones of strong dipolar anomalies, commonly found in places where modern ferrous or fired materials (e.g. brick rubble) are present.
<i>Service</i>	Magnetically strong anomalies, usually forming linear features are indicative of ferrous pipes/cables. Sometimes other materials (e.g. pvc) or the fill of the trench can cause weaker magnetic responses which can be identified from their uniform linearity.
<i>Ferrous</i>	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.
<i>Uncertain Origin</i>	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 <i>Possible Archaeology / Natural</i> or (in the case of linear responses) <i>Possible Archaeology / Agriculture</i> ; 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 0.1 nanoTeslas (nT) in an overall field strength of 48,000 (nT), can be accurately detected.

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; 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 feature. The difference between the two sensors will relate to the strength of a magnetic field created by this 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.

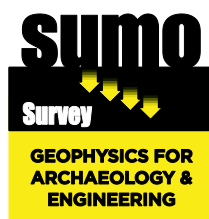
Factors affecting the magnetic survey may include soil type, local geology, previous human activity and disturbance from modern services.

Summary for sumogeop1-516393

OASIS ID (UID)	sumogeop1-516393
Project Name	Geophysical Survey at Land at South Farm, Wickwar, South Gloucestershire
Sitename	Land at South Farm, Wickwar, South Gloucestershire
Activity type	Geophysical Survey, MAGNETOMETRY SURVEY
Project Identifier(s)	12869
Planning Id	
Reason For Investigation	Planning requirement
Organisation Responsible for work	SUMO Geophysics Ltd.
Project Dates	30-May-2023 - 31-May-2023
Location	Land at South Farm, Wickwar, South Gloucestershire NGR : ST 72369 87562 LL : 51.586228364275726, -2.400199343996041 12 Fig : 372369,187562
Administrative Areas	Country : England County : Gloucestershire District : South Gloucestershire Parish : Wickwar
Project Methodology	A temporary grid system was established over the site and marked out using canes. The location of the grid will was set out using an RTK GPS system theoretically accurate to some 0.01m and referenced to OS co-ordinates. Hand Held: Data was collected using a Bartington Grad 601-2. The instrument consists of two paired sensors (see below) and readings are logged at 0.25m centres along traverses 1.0m apart across 30m grids. Two sensors mounted 1m horizontally apart and very accurately aligned to nullify the effects of the earth's magnetic field. Cart: Data was also collected using a cart carrying four paired Bartington magnetic sensors. Four sensors mounted 1m horizontally apart and very accurately aligned to nullify the effects of the earth's magnetic field. Each data point is geographically referenced using an on-board Trimble RTK survey grade GPS system. Readings will be taken at 0.125m centres along traverses 1.0m apart. The collection of data provides an appropriate methodology balancing cost and time with resolution as per Historic England guidelines. Readings relate to the difference in localised magnetic anomalies compared with the general magnetic background.
Project Results	No magnetic responses have been recorded that could be interpreted as being of definite archaeological interest. Curvilinear and linear trends, discrete anomalies and a zone of increased magnetic response have been assigned to the category of uncertain; they are likely to be due to natural and agricultural processes. Three former field boundaries have been plotted in the survey and a zone of magnetic disturbance associated with an infilled former pond is also visible.
Keywords	Field Boundary - POST MEDIEVAL - FISH Thesaurus of Monument Types
Funder	
HER	South Gloucestershire HER - unRev - STANDARD
Person Responsible for work	Thomas, Cockcroft, Simon, Lobel

HER Identifiers

Archives



- Archaeological
- Geophysical
- Laser Scanning
- Measured Building
- Topographic
- Utility Mapping

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