GEOPHYSICAL SURVEY REPORT G1482

Land South of Banbury, Oxfordshire





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GSB Survey Report No. G1482

Land South of Banbury

Contents

Page 1 Background Project Details

Aims

Summary of Results

Page 2 Method

Data Processing Interpretation

General Considerations

Page 3 Survey Results – Magnetometer Survey

Page 4 Conclusions

Page 5 References

Appendix Technical Information

List of Figures (Printed and on CD)

| Figure 1 | Site Location Diagram | 1:50000 |
|-----------|---|---------|
| Figure 2 | Location of Survey Areas | 1:5000 |
| Figure 3 | Magnetometer Survey (Overview) - Greyscale Plot | 1:5000 |
| Figure 4 | Magnetometer Survey (Overview) - Interpretation Plot | 1:5000 |
| Figure 5 | Magnetometer Survey (Areas 1 - 2) - Greyscale Plot | 1:2500 |
| Figure 6 | Magnetometer Survey (Areas 1 - 2) - Interpretation Plot | 1:2500 |
| Figure 7 | Magnetometer Survey (Areas 3 - 5) - Greyscale Plot | 1:2500 |
| Figure 8 | Magnetometer Survey (Areas 3 - 5) - Interpretation Plot | 1:2500 |
| Figure 9 | Magnetometer Survey (Area 6) - Greyscale Plot | 1:2500 |
| Figure 10 | Magnetometer Survey (Area 6) - Interpretation Plot | 1:2500 |

List of Archive Figures (on CD only)

| Figure A1 Figure A2 Figure A3 Figure A4 Figure A5 Figure A6 Figure A7 Figure A8 | Magnetic Data - Area 1: XY Trace Plot Magnetic Data - Area 1: Greyscale Plot Magnetic Data - Area 2: XY Trace Plot Magnetic Data - Area 2: Greyscale Image Magnetic Data - Area 3: XY Trace & Greyscale Image Magnetic Data - Area 4: XY Trace Plot Magnetic Data - Area 4: Greyscale Image Magnetic Data - Area 5: XY Trace & Greyscale Image | 1:500 1:500 1:500 1:500 1:500 1:500 1:500 |
|---|--|---|
| Figure A9 Figure A10 | Magnetic Data - Area 6: XY Trace Plot Magnetic Data - Area 6: Greyscale Image | 1:500 1:500 |
| Figure T1 | Tie-in Diagram | 1:5000 |

Survey Personnel

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Project Assistants: Adrian Dillon Bsc

Dates

Fieldwork: 22 September – 2 October 2014

Report: 27 October 2014

Report Approved: Dr John Gater MIFA FSA

Background Project Details

NGR SP 470 377

Location The site is located approximately 2.2 miles south of Banbury, in the fields to

the east of the village of Bodicote.

HER/SMR Oxfordshire HER

District Cherwell

Parish Bodicote and Adderbury

Topography Flat
Current Land Use Arable

Soils Banbury (544): Well drained brashy fine and coarse loamy ferruginous soils

over ironstone. Some deep fine loamy over clayey soils with slowly permeable subsoils and slight seasonal waterlogging (SSEW 1983).

Geology The bedrock geology consists of: Marlstone Rock Formation - Ferruginous

Limestone and Ironstone. No superficial deposits have been recorded. (BGS

2014).

Archaeology No designated heritage assets exist within the survey area. A possible cursus

identified from aerial photographs lies partially within the southernmost field, and Neolithic pits were revealed through trial trenching c. 500m west of the site. Immediately south of Bodicote and west of the A4260, geophysical survey and trial trenching located Iron Age settlement. Romano-British activity is evidenced by findspots and the remains of a building in the vicinity of the site: however, Romano-British settlement is thought to be concentrated west of the A4260. The trackway traversing the site could be of some antiquity, and a "verbal informant" notified the Oxfordshire HER that it is a Roman road. Finds of Anglo-Saxon pottery are recorded around Bodicote, and a medieval cross ("Weeping Cross") marked the crossroads of the (present) A4260 and the trackway referred to above: this was removed in 1803. The existing fields were formerly subdivided. A dark linear, visible on Google Earth, enters the site from the north and curves to continue to the

east of the site: it is thought to be a modern service (BSA 2014).

Survey Methods Detailed magnetometer survey (fluxgate gradiometer)

Study Area 44ha

Aims

To locate and characterise any anomalies of possible archaeological interest within the study area. The work forms part of a wider archaeological assessment being carried out by **BSA Heritage Limited** on behalf of **Hallam Land Management**.

A Written Scheme of Investigation (WSI) was prepared in advance of the survey and this proposed that, in light of the known archaeology and the presence of highly suitable soils, a magnetic survey would be best for mapping any features across the survey area (GSB 2014). The results clearly testify to this being an appropriate method of assessment.

Summary of Results

The magnetic data have revealed a plethora of multi period archaeological features including enclosures, trackways, pits, ditches, isolated structures, a potential barrow, a probable cursus, areas of industrial activity and field systems. Ridge and furrow cultivation plus former field boundaries are also visible. All these responses indicate the site has been occupied from as early as the Neolithic through to the medieval period and as such have revealed a complex dataset due to the 'overlapping' of features.

Method

All survey data points had their position recorded using Trimble R10 Real Time Kinematic (RTK) VRS Now GNSS equipment. The geophysical survey area is georeferenced relative to the Ordnance Survey National Grid. The GNSS trace locations are presented in FigureT1. Please refer to this diagram when re-establishing the grid or positioning trenches.

| Technique | Instrument | Traverse Interval | Sample Interval |
|--------------|---|-------------------|-----------------|
| Magnetometer | CARTEASY ^N cart system (Bartington Grad 601sensors) | 0.75m | 0.125m |

All survey work is carried out in accordance with the current English Heritage guidelines (EH 2008).

Data Processing

Data processing was performed as appropriate using both in-house and commercial software packages (CARTEASY^N) as outlined below.

Magnetic Data - CART
Zero Mean Traverse, Gridding

Interpretation

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: *Archaeology – ?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 *?Archaeology*. Details of the data plot formats and interpretation categories used are given in the Appendix: Technical Information at the end of the report.

General Considerations

Site conditions were perfect for data collection as the fields were flat and were recently rolled.

1.0 Survey Results - Magnetometer Survey

1.1 Magnetic responses indicative of buried archaeological remains have been identified in many of the fields investigated. Anomalies of likely interest are described starting in the north moving from west (left) to east (right); individual complexes, or specific features, have been assigned letters and these appear in the text below, in parentheses [A, B etc.]. Please refer to Figure 4 in first instance.

Archaeology / ?Archaeology

- 1.2 A series of linear anomalies [A] indicate buried ditches forming what appear to be two incomplete enclosures with further, maybe unrelated, ditches or trackways [B] immediately to the south. The extent and true nature of the ditches [A] have not been defined; this is due to the fact they appear to continue westwards, beyond the survey area, and northwards where they are obscured by a large ferrous pipe. The presence of medieval ridge and furrow cultivation patterns are also partially masking the ditches. It is interesting to note that in places the ditches [A] appear to underlie the ploughing, whilst elsewhere the magnetic anomalies suggest they are on top of the cultivation patterns (this demonstrates the dangers of trying to assign relative dates based on what are simply variations in magnetic fields).
- 1.3 A second group of linear magnetic responses [C] indicates further ditch systems and another possible track. There is a small sub-rectangular enclosure [D] (33 x 21m) which has an 'entrance' in the south-west. There appears to be two large, rectangular pit-like anomalies abutting the ditches [D] plus other features inside the enclosure. There are a number of large oval pits to the south and west. Immediately to the east are other well-defined responses [E] indicating another possible rectilinear feature but the results are partially obscured by the lane which forms the eastern boundary of the survey area. On the other side of this lane, in the adjacent field, are ditches [F] indicating another, larger, enclosure measuring 75m in width which has several probable pits both internally and externally.
- 1.4 A series of apparently criss-crossing ditches, some on slightly differing alignments, is visible at **[G]**, though the ridge and furrow cultivation lines are again partially obscuring the results.
- 1.5 At [H] is a large D-shaped enclosure (90 x 77 m) which is unfortunately bisected by a track and service pipe. As a consequence of the two latter modern-day features it is difficult to identify whether or not internal features are present. There are suggestions of possible pits but even if this interpretation is correct, it cannot be stated with any confidence that the features are associated with [H] or the track. There are no indications of any breaks in the ditch so presumably any original entrances have coincidentally been obscured by the track and / or pipe. A small, suboval ditch (6m across) [I] lies immediately to the southwest; while it might be associated with a buried ferrous object, it appears to have characteristics more indicative of an archaeological feature, especially given the presence of other nearby archaeological features.
- 1.6 At [J] there are some very strong magnetic anomalies, which could indicate a small complex of ovens or kilns, or perhaps small scale metal-working activity. Given the context of the survey results such an archaeological interpretation has to be considered, though in other situations the results might simply indicate modern debris.
- 1.7 To the east at [**K**] are possibly two conjoined rectangular enclosures which have been cut into by more recent field boundaries and a lane to the south. The easternmost enclosure might also be the terminus of a possible cursus [**P**] to the south (see Paragraph 1.9).
- 1.8 An apparently isolated ring feature [L] measures 12m in diameter; given the lack of any break in the ditch it seems likely that it is a ploughed out barrow. Also separated from other groups of features is a small open-sided enclosure [M] (c.20m across); there are several pit-like or perhaps small-scale industrial features located immediately to the south

- 1.9 The largest complex of archaeological features occupies most of the southern quarter of the whole survey area. There are ditches forming field systems, enclosures (many with sub-divisions), tracks and droveways. Numerous pits are present as are other settlement-type features, such as gullies and scoops. The plethora of anomalies indicate multi-period activity, with some of the features being typical of those associated with Iron Age and Romano British settlements, whilst others (particularly the track [N]) respects the ridge and furrow cultivation. Aerial photographs are thought to indicate the presence of a Neolithic cursus monument in the south of the site; the responses at [O] would support such an interpretation. However, those at [P] have very similar characteristics.
- 1.10 Two specific features stand out within the complex. At [Q] is a small square anomaly (10 x 10m) with a ring inside and a rectangular feature appended on the north. Taken as a whole [Q] could indicate a single structure, perhaps a dwelling, or in a Romano-British context such responses could easily indicate a mausoleum, especially if the responses [R] indicate a Roman road. Such an interpretation could equally be applied to the 20m square anomaly [S] which does not appear to have an entrance.
- 1.11 The interpretation of linear and possible pit-like responses [T] either side of the lane separating Areas 4 and 6 is confusing; they could represent archaeological features or they may be simply associated with agricultural activity close to the field boundaries.

Ridge and furrow / Old field boundaries.

1.12 Ridge and furrow cultivation patterns are clearly visible across much of the survey area and the alignment helps to define many of the earlier fields. Additionally a number of old boundaries have been detected and coincide with old mapping dating from 1885 (OS 2014); these have been highlighted as such on the interpretation plots.

Uncertain / Modern

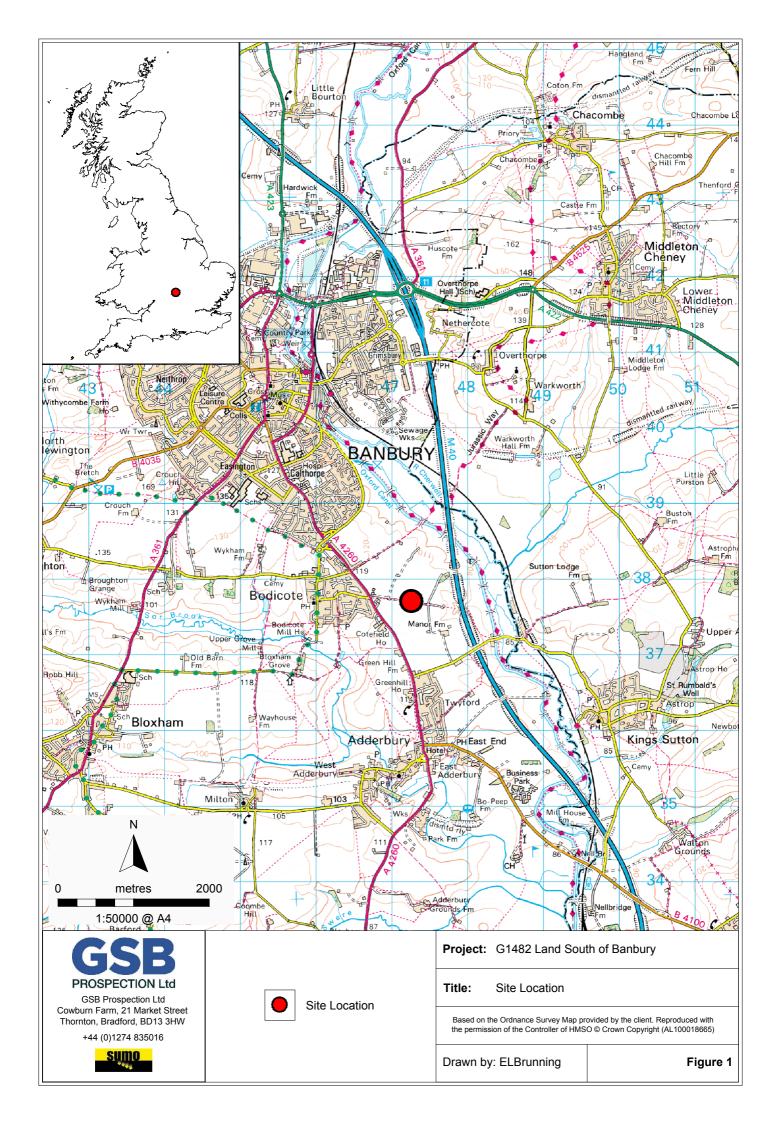
- 1.13 A handful of responses have been interpreted as having an uncertain origin. These are typically weaker in magnetic strength to the archaeological type anomalies. However, given the context of the site an archaeological origin cannot be ruled out.
- 1.14 A large linear ferrous response running on an approximate north to south alignment through the centre of the site is modern service route and can be seen on Google Earth images. Ferrous responses along some of the survey boundary edges are due to metal fencing. Smaller scale anomalies are seen throughout. These can be best seen in the XY trace plots (see Archive CD) as sharp spikes and are due to iron debris within the topsoil or on the surface and are deemed modern in origin.

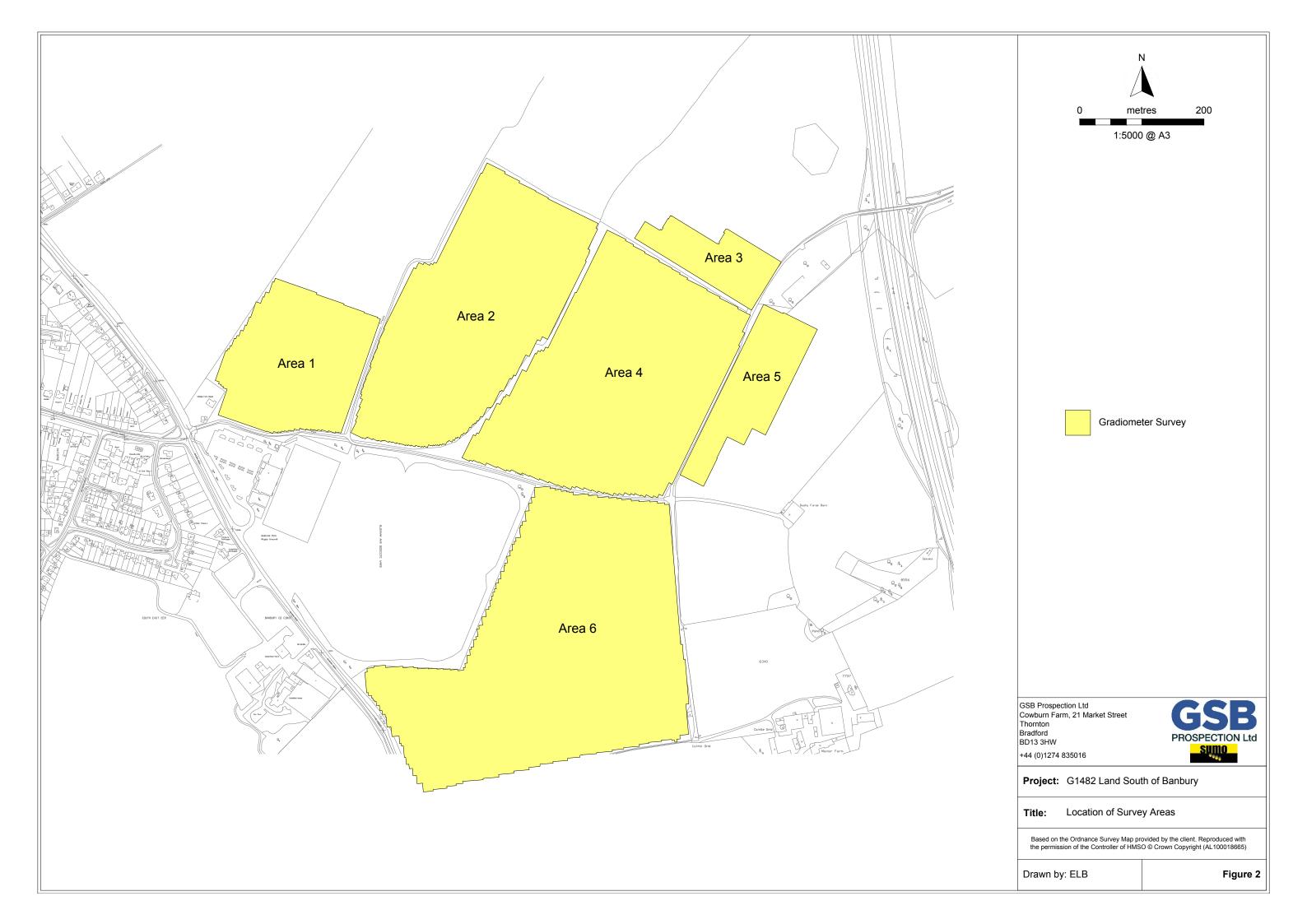
2.0 Conclusions

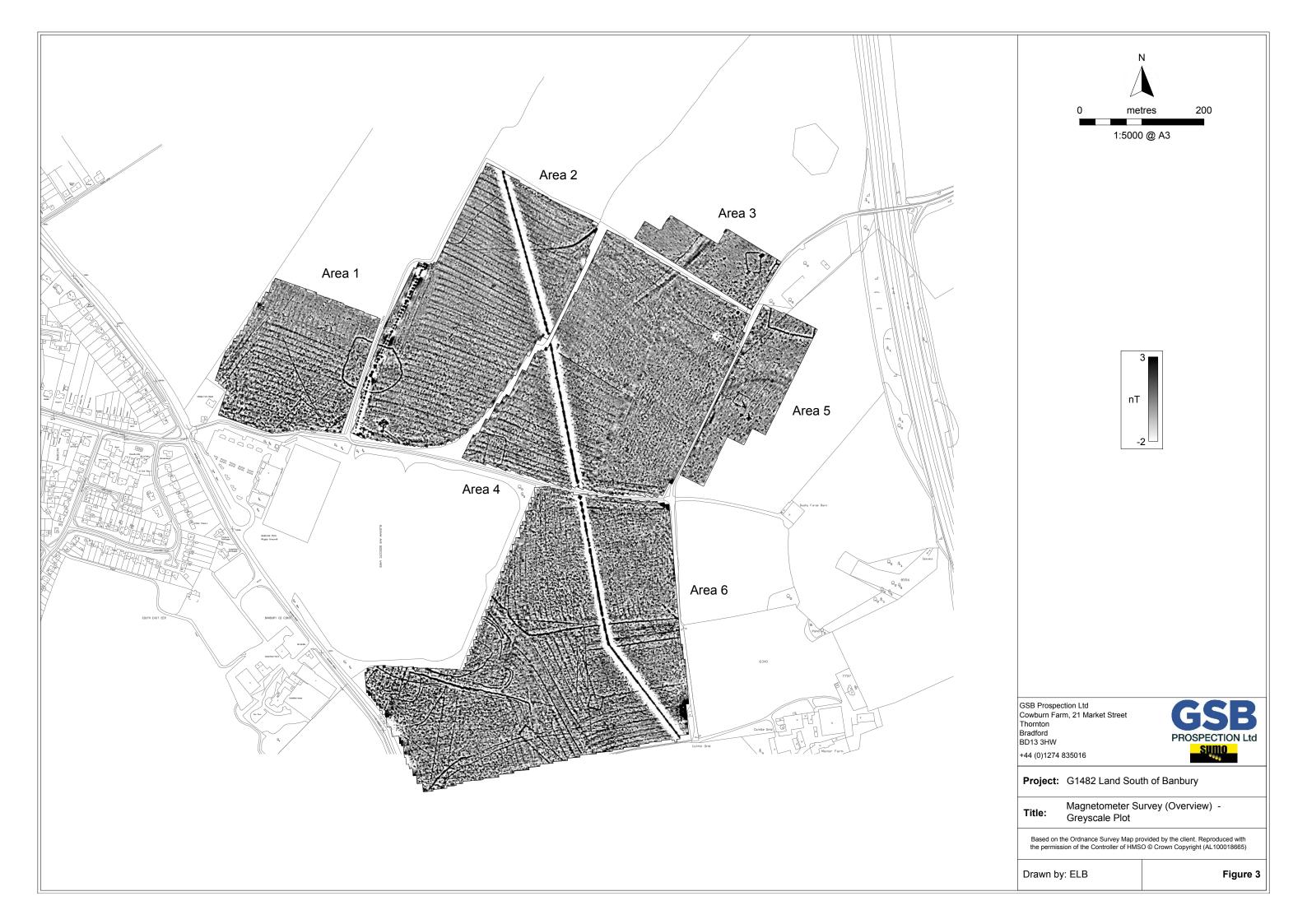
- 2.1 An extensive, complex pattern of archaeological responses have been detected by the magnetic survey. These features include enclosures, trackways, droveways, structures, a barrow, cursus, ditches, pits, industrial responses and field systems.
- 2.2 Medieval ridge and furrow cultivation can be seen throughout the dataset and a number of former field boundaries have also been located.

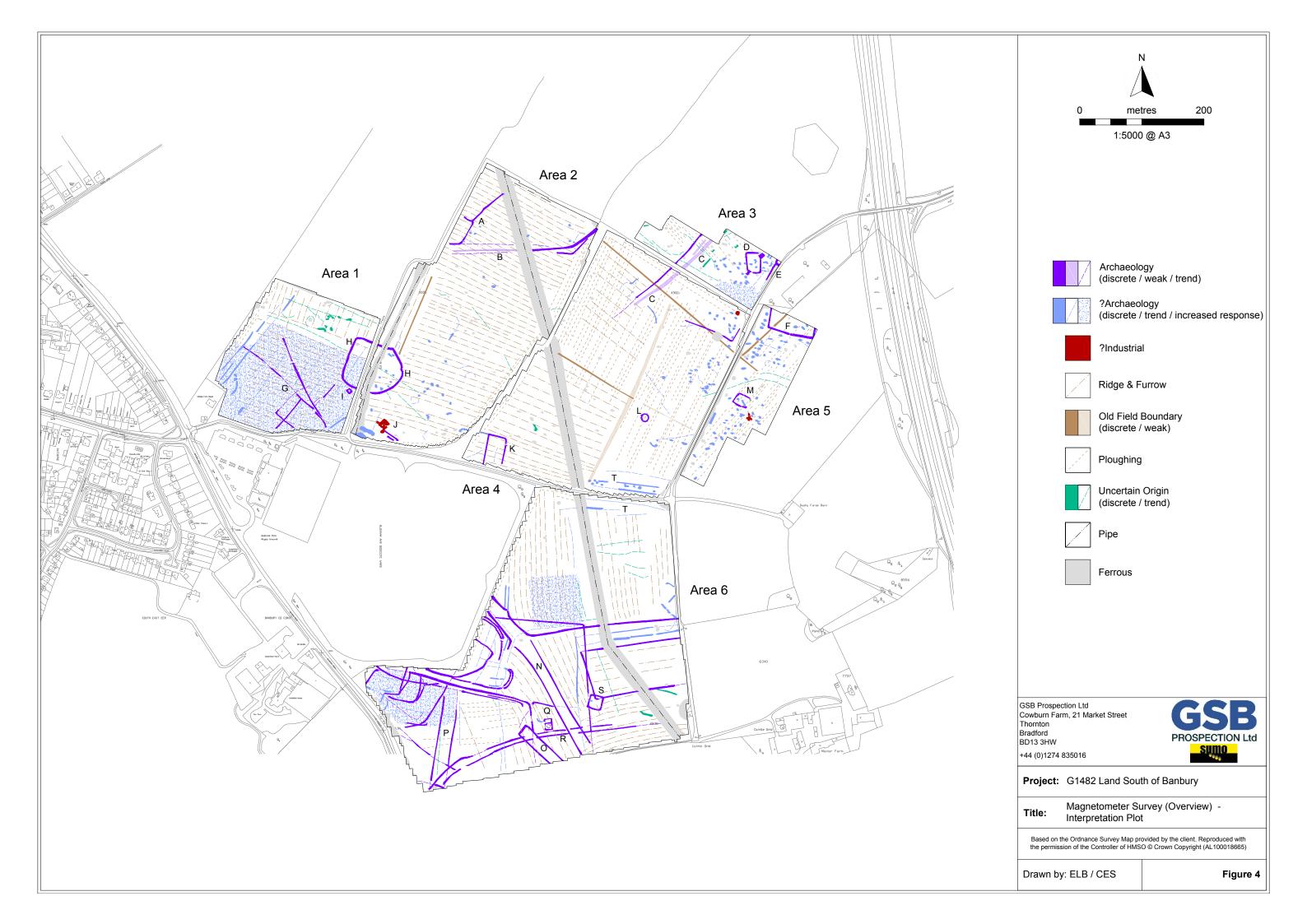
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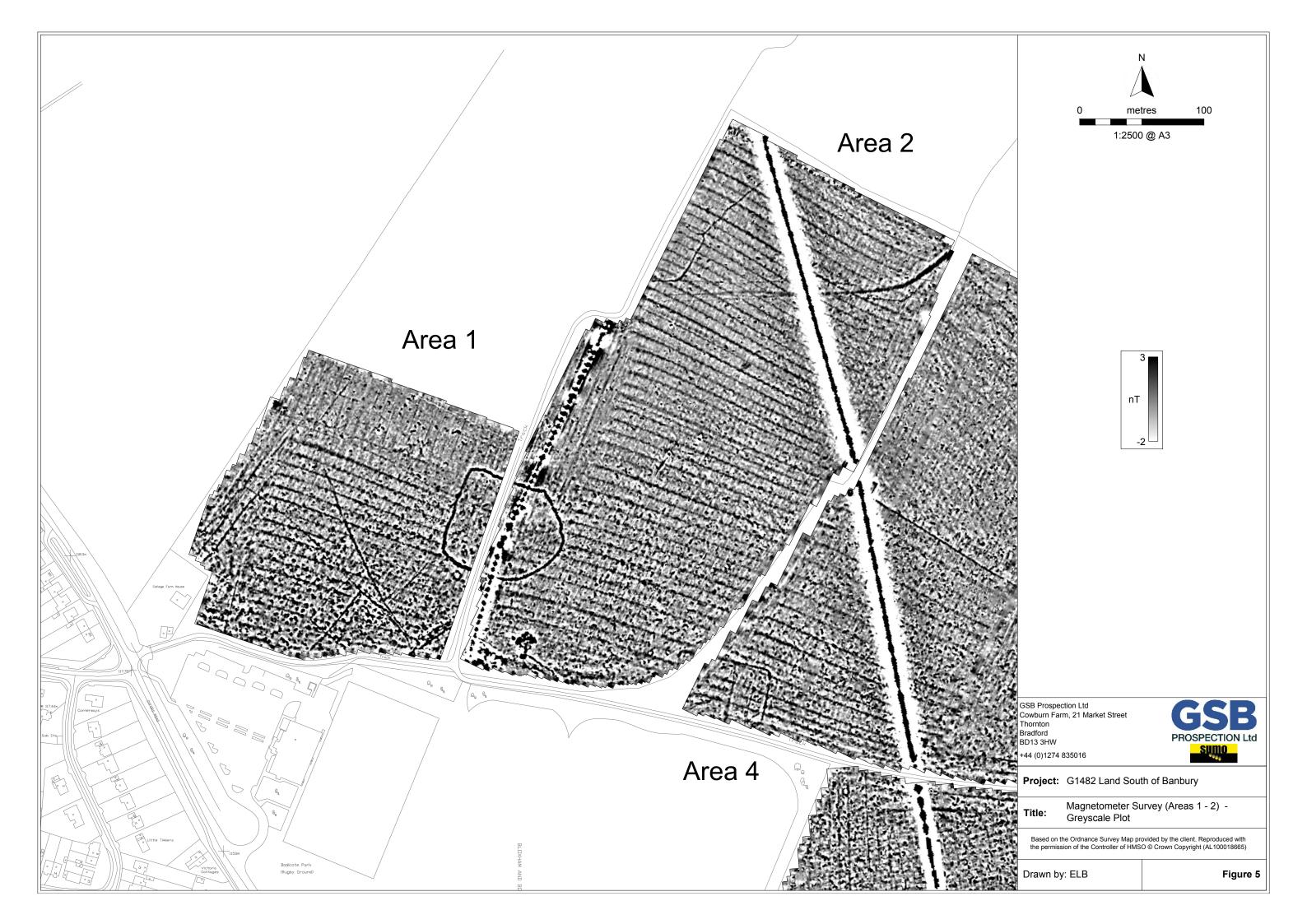
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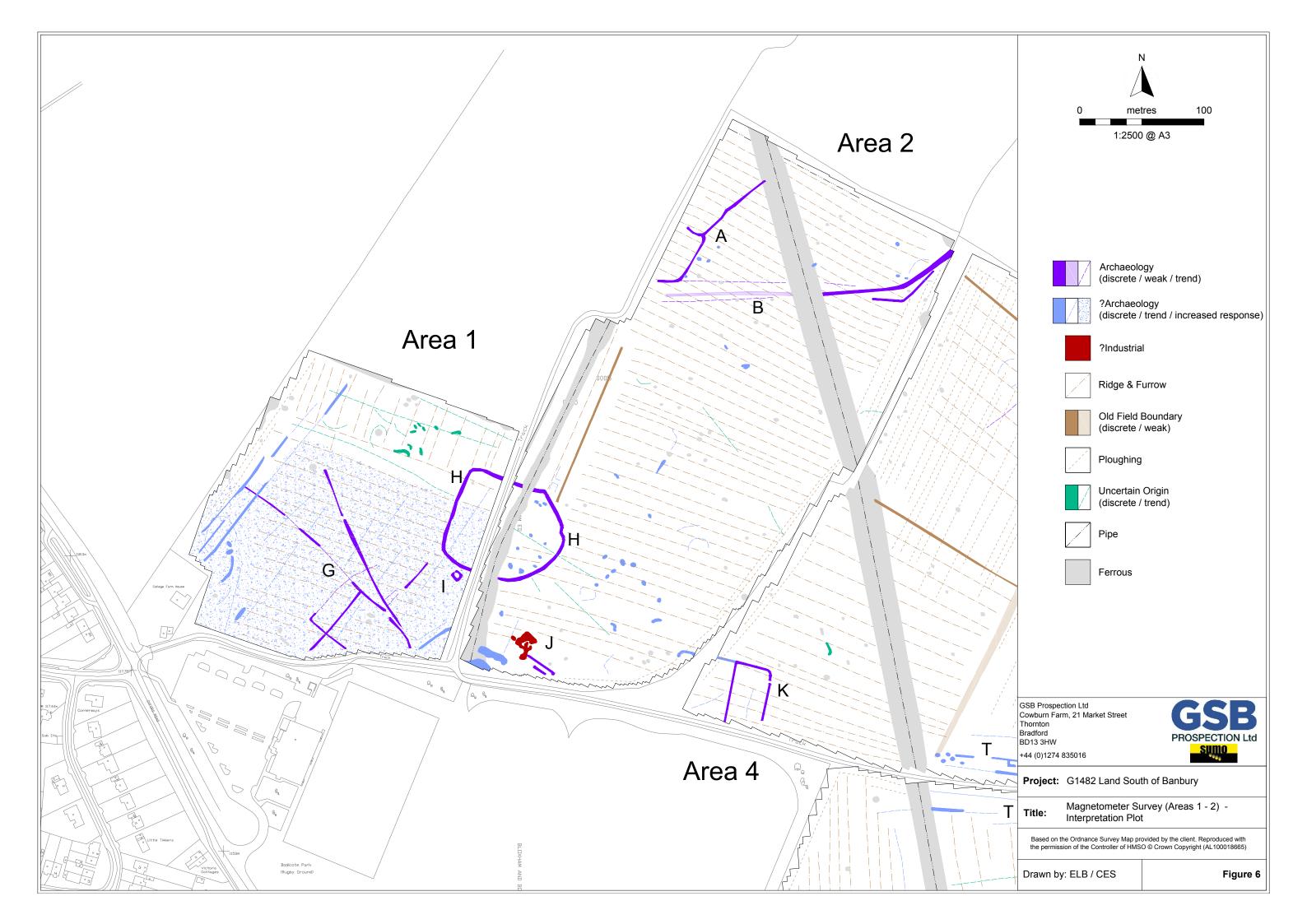


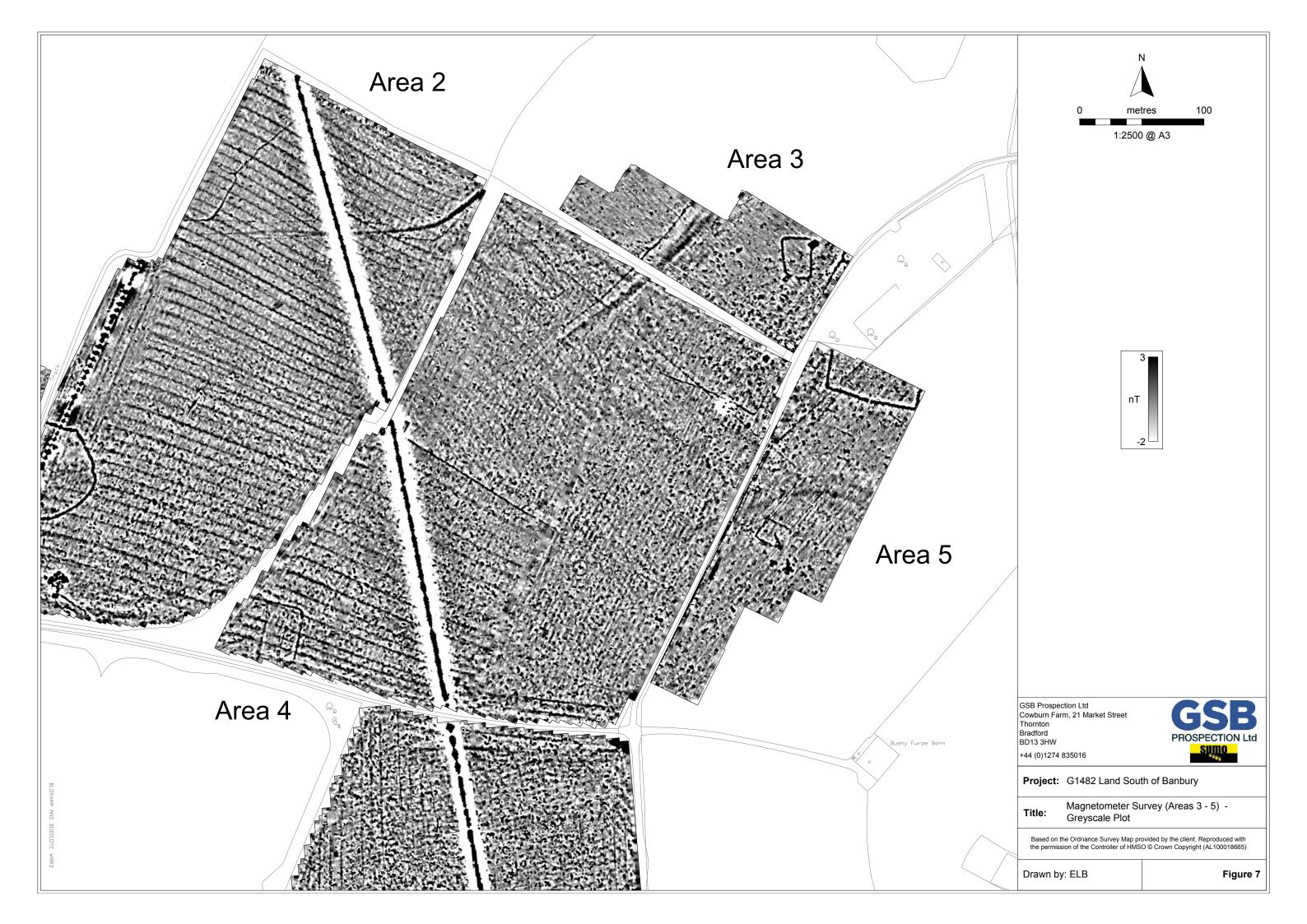


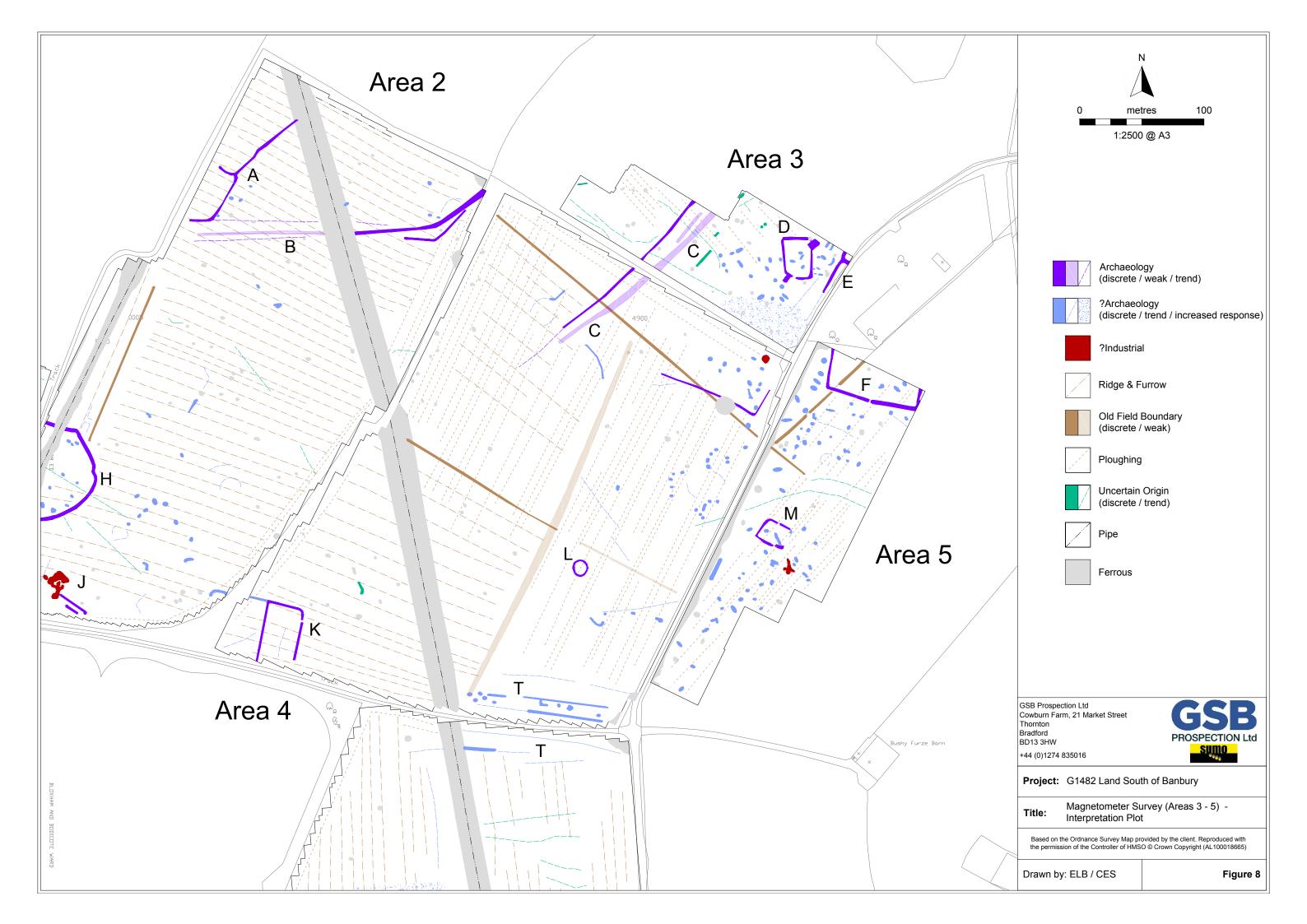




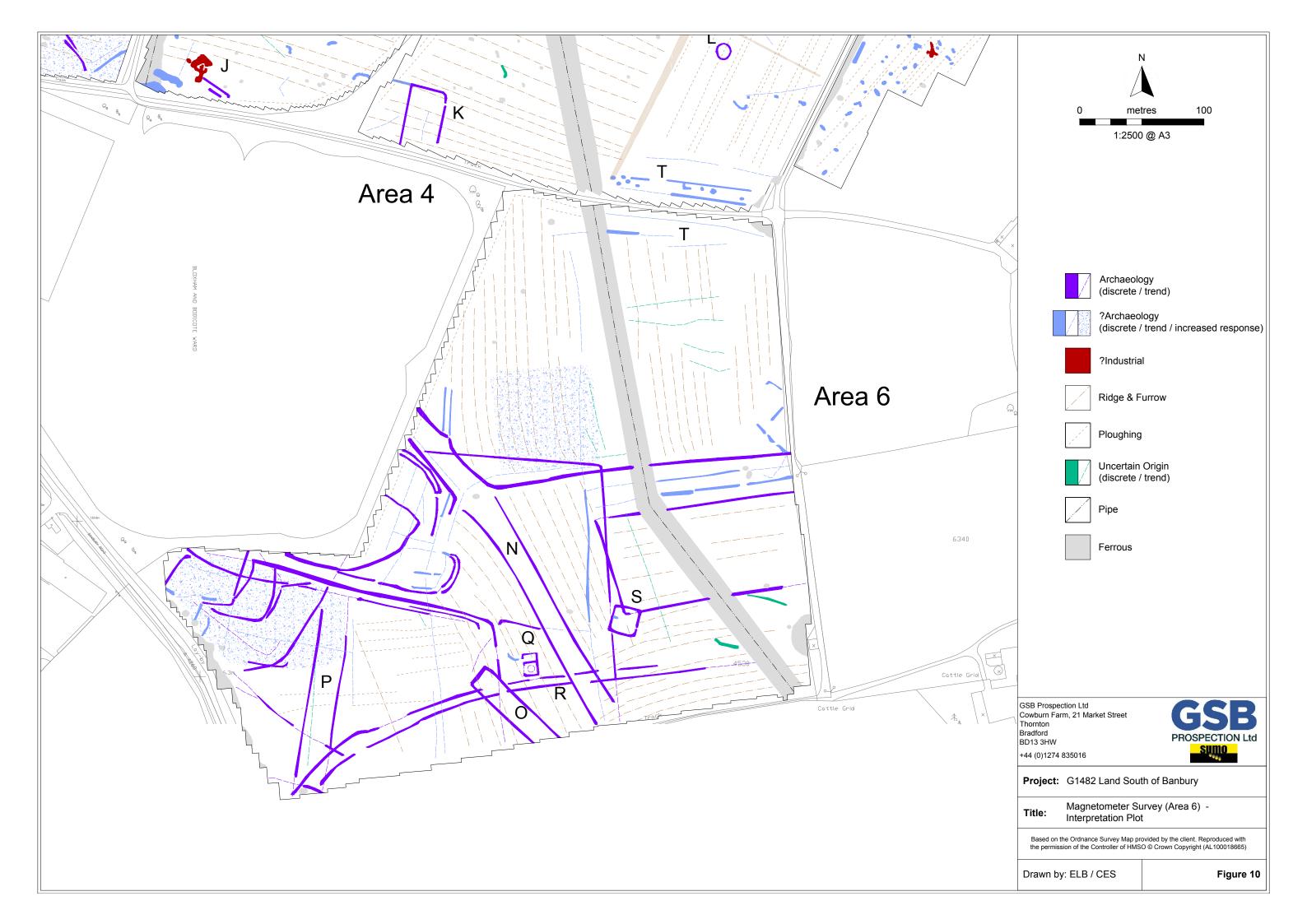












Appendix - Technical Information: Magnetometer Survey

Instrumentation: Bartington Grad601-2 / GSB CARTEASYN Cart system

Both the Bartington and CARTEASY^N 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. The Bartington instrument can collect two lines of data per traverse with gradiometer units mounted laterally with a separation of 1.0m. The CARTEASYN system has four gradiometer units mounted at 0.75m intervals across its frame - rather than working in grids, the cart uses an on-board survey grade GNSS for positioning. The cart system allows for the collection of topographic data in addition to the magnetic field measurements.

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 (Destagger)

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.

Interpolation

When geophysical data are presented as a greyscale, each data point is represented as a small square. The resulting plot can sometimes have a 'blocky' appearance. The interpolation process calculates and inserts additional values between existing data points. The process can be carried out with points along a traverse (the x axis) and/or between traverses (the y axis) and results in a smoother greyscale image.

Display

XY Trace Plot

This involves a line representation of the data. Each successive row of data is equally incremented in the Y axis, to produce a stacked profile effect. This display may incorporate a hidden-line removal algorithm, which blocks out lines behind the major peaks and can aid interpretation. The advantages of this type of display are that it allows the full range of the data to be viewed and shows the shape of the individual anomalies. The display may also be changed by altering the horizontal viewing angle and the angle above the plane.

Grevscale/ 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.

3D Surface Plot

This is similar to the XY trace, but in 3 dimensions. Each data point of a survey is represented in its relative position on the x and y axes and the data value is represented in the z axis. This gives a digital terrain, or topographic effect.

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.

Archaeology This term is used when the form, nature and pattern of the response are clearly

or very probably archaeological and /or if corroborative evidence is available.

These anomalies, whilst considered anthropogenic, could be of any age.

These anomalies exhibit either weak signal strength and / or poor definition, or ?Archaeology 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.

Increased Magnetic An area where increased fluctuations attest to greater magnetic enhancement of Response the soils, but no specific patterns can be discerned in the data and no visual

indications on the ground surface hint at a cause. They may have some

archaeological potential, suggesting damaged archaeological deposits.

Industrial / Strong magnetic anomalies that, due to their shape and form or the context in Burnt-Fired 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.

Old Field Boundary Anomalies that correspond to former boundaries indicated on historic mapping,

or which are clearly a continuation of existing land divisions.

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

cultivation. In some cases the response may be the result of more recent

agricultural activity.

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

with existing boundaries, indicating more recent cultivation regimes.

Natural These responses form clear patterns in geographical zones where natural

> variations are known to produce significant magnetic distortions. Smaller, isolated responses which do not form such obviously 'natural' patterns but which are,

nonetheless, likely to be natural in origin may be classified as ?Natural.

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 ?Archaeology and ?Natural or (in the case of linear responses) ?Archaeology

and ?Ploughing; occasionally they are simply of an unusual form.

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

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

presumed to be modern.

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.

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).

Disturbance



Celebrating over 25 years at the forefront of archaeological geophysics



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