Land at Holywell
Yeovil, Somerset

Detailed Gradiometer Survey Report

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Summary

A detailed gradiometer survey was conducted over land off West Coker Road, near Yeovil, Somerset. The project was commissioned by Brooke Smith Planning Consultants Limited, on behalf of their client J.T. Cullen, with the aim of establishing the presence, or otherwise, and nature of detectable archaeological features on the site ahead of a proposed development.

The site comprises arable and pasture fields to the south of West Coker Road, some 3km southwest of the centre of Yeovil. The Site occupies the southern flank of a low ridge, extending SW-NE, lying at c. 85m above Ordnance Datum. The survey area is defined by residential properties to the north and east and by farmland to the south. Detailed gradiometer survey was undertaken over all accessible parts of the Site, a total of 7.1 ha, and identified the presence of anomalies of probabel and possible archaeological interest.

Several linear anomalies were identified across the central and eastern portions of the survey area, which are consistent with former field boundaries. Whilst it is not possible to determine the date or relationships of these field systems, some share common alignments, suggesting that they are associated. Elsewhere, other bands of magnetic disturbance and ferrous responses are consistent with other former boundaries.

Numerous isolated pit-like anomalies have been identified throughout the dataset, which are considered to be of possible archaeological interest. It is conceivable that some of these will be natural in origin, and may relate to geological features or tree throws, for instance.

A curving anomaly across the southeastern portion of the site is consistent with a former channel or stream; its response is characteristically broad and diffuse, indicating a natural origin.

Ploughing trends have been can be seen oriented approximately E-W throughout the survey area, and are consistent with modern ploughing activity. Given that the gradiometer survey has detected these ephemeral features, it is considered likely that more substantial archaeological features would have produced detectable magnetic anomalies, should any have been present.

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Acknowledgements

The detailed gradiometer survey was commissioned by Brooke Smith Planning Consultants Limited, on behalf of their client J.T. Cullen. The assistance of Keir Price is gratefully acknowledged in this regard.

The fieldwork was directed by Jennifer Smith and assisted by Alistair Black and Patrick Dresch. Ben Urmston processed and interpreted the geophysical data in addition to writing this report. The geophysical work was quality controlled by Dr. Paul Baggaley. Illustrations were prepared by Kitty Foster. The project was managed on behalf of Wessex Archaeology by Ben Urmston.

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1 INTRODUCTION

1.1 Project background

1.1.1 Wessex Archaeology was commissioned by Brooke Smith Planning Consultants, on behalf of their client J. T. Cullen, to carry out a geophysical survey of land off West Coker Road near Yeovil, Somerset (**Figure 1**), hereafter "the Site" (centred on NGR 353315 114115). The survey forms part of an ongoing programme of archaeological works being undertaken ahead of proposed development at the Site.

1.1.2 The aim of the geophysical survey was to establish the presence/absence, extent and character of detectable archaeological remains within the survey area.

1.1.3 This report presents a brief description of the methodology followed, the detailed survey results and the archaeological interpretation of the geophysical data.

1.2 The Site

1.2.1 The survey area comprises arable and pasture fields to the south of West Coker Road (A30), some 3km southwest of the centre of Yeovil (**Figure 1**). Detailed gradiometer survey was undertaken over all accessible parts of the Site, a total of 7.1 ha.

1.2.2 The Site occupies the southern flank of a low ridge, extending SW-NE, lying at c. 85m above Ordnance Datum. The survey area is defined by residential properties to the north and east and by farmland to the south.

1.2.3 The soils underlying the Site are likely to be typical brown earths of the 541m (South Petherton) association (SSEW 1983). Soils derived from such geological parent material have been shown to produce magnetic contrasts acceptable for the detection of archaeological remains through magnetometer survey.

2 METHODOLOGY

2.1 Introduction

2.1.1 The detailed magnetometer survey was conducted using a Bartington Grad601-2 dual fluxgate gradiometer system. The survey was conducted in accordance with English Heritage guidelines (2008).

2.1.2 The geophysical survey was undertaken by Wessex Archaeology's in-house geophysics team between 29th July and 2nd August 2013. Field conditions at the time of the survey were good, with the majority of the area under stubble at the time of survey.

2.2 Method

2.2.1 Individual survey grid nodes were established at 30m x 30m intervals using a Leica Viva RTK GNSS instrument, which is precise to approximately 0.02m and therefore exceeds English Heritage recommendations (2008).

2.2.2 The magnetometer survey was conducted using a Bartington Grad601-2 fluxgate gradiometer instrument, which has a vertical separation of 1m between sensors. Data were collected at 0.25m intervals along transects spaced 1m apart with an effective sensitivity of 0.03nT, in accordance with EH guidelines (2008). Data were collected in the zigzag method.

2.2.3 Data from the survey was subject to minimal data correction processes. These comprise a zero mean traverse function (±5nT thresholds) applied to correct for any variation between the two Bartington sensors used, and a de-step function to account for variations in traverse position due to varying ground cover and topography. These two steps were applied to all survey areas, with no interpolation applied.

2.2.4 Further details of the geophysical and survey equipment, methods and processing are described in **Appendix 1**.

3 GEOPHYSICAL SURVEY RESULTS AND INTERPRETATION

3.1 Introduction

3.1.1 The gradiometer survey has been successful in identifying anomalies of probable and possible archaeological interest across the Site, along with natural features and ploughing trends.

3.1.2 Results are presented as a series of greyscale and XY plots, and archaeological interpretations, at a scale of 1:2,000 (**Figures 2** and **3**). The data are displayed at -2nT (white) to +3nT (black) for the greyscale image and 25nT per cm for the XY trace plots.

3.1.3 The interpretation of the datasets highlights the presence of potential archaeological anomalies, ferrous/burnt or fired objects, and magnetic trends (**Figure 4**). Full definitions of the interpretation terms used in this report are provided in **Appendix 2**.

3.1.4 Numerous ferrous anomalies are visible throughout the detailed survey dataset. These are presumed to be modern in provenance and are not referred to, unless considered relevant to the archaeological interpretation.

3.2 Gradiometer Survey Results and Interpretation

3.2.1 At the southeastern extent of the Site, pit-like anomalies **4000** are of possible archaeological interest, although they appear to be unenclosed and are relatively sparse in their distribution. Immediately to the east, linear band of ferrous responses **4001** extends northwards from the southern boundary and is consistent with the remnants of a former field boundary; a weak trend can be seen on the same orientation extending to the north.

3.2.2 Linear anomaly **4002** is not well defined from the magnetic background, although its orientation is coincident with the existing boundary dividing the pasture fields to the north; it is considered likely to be associated with a former field boundary. Further linear anomalies **4003**, **4004** and **4005** are similarly weak in response, although it is possible that they indicate the presence of a wider network of former fields, although their date is

uncertain. It is interesting to note the weak trends extending northeast from **4004**, perhaps indicating the continuation of this field system.

3.2.3 Band of magnetic disturbance **4006** extends across the survey area, oriented approximately N-S and joins two extant corners of boundaries. It is therefore likely to represent the remnants of a ploughed-out field boundary.

3.2.4 Curvilinear anomaly **4007** extends across the southern portion of the survey area, bifurcating at its western extent. **4007** is poorly defined and is consistent with a former channel or stream.

3.2.5 Towards the northeastern extent of the Site, linear anomalies **4008**, **4009**, **4010** and **4011** lie on approximately N-S orientations and are probably associated with former field boundaries. Further linear anomalies **4012** and **4014** are aligned NE-SW and are likely to also be former field boundaries; their orientation is somewhat different from **4008** to **4011**, indicating they are likely to date from different periods, although they are aligned with **4002** and **4004** and may therefore be related. It is not possible to infer relative phasing from the geophysical survey, despite apparent intersections between the field systems, e.g. **4013**.

3.2.6 The central portion of the survey is relatively quiet, e.g. **4015**, although ploughing trends oriented E-W are evident.

3.2.7 The pasture fields at the northern extent of the survey show extensive magnetic disturbance associated with the fencing and existing buildings. However, several 'windows' of more coherent data are visible, within which linear anomaly **4016** can be seen; this anomaly is weakly defined and is probably associated with former fencing, given the field's current use as a paddock.

3.2.8 Elsewhere within the dataset, weak magnetic trends and isolated pit-like anomalies can be seen. In general, these responses lack definition and clearly coherent distribution. It is possible that some may be of archaeological origins, although geological or pedological changes cannot be excluded.

4 CONCLUSION

4.1.1 The detailed gradiometer survey has been successful in detecting anomalies of probable and possible archaeological interest within the Site, in addition to natural features and ploughing trends.

4.1.2 Several probable former field systems have been identified as linear anomalies within the dataset. It is likely that some of these field systems are associated, given their common orientations, although it is difficult to ascertain from what period they date. Several of the anomalies are parallel with existing boundaries and are similar in character to medieval strip fields.

4.1.3 The ploughing trends visible within the survey area are oriented approximately E-W, and do not appear to respect the former field boundaries, suggesting that they are more likely to be modern in origin.

4.1.4 Given the detection of ploughing trends, it is considered likely that more substantial archaeological features would have produced detectable magnetic anomalies, should any have been present.

5 REFERENCES

English Heritage, 2008. *Geophysical Survey in Archaeological Field Evaluation*. Research and Professional Service Guideline No 1, 2nd edition.

Soil Survey of England and Wales, 1983. *Sheet 5, South West England*. Ordnance Survey, Southampton.

APPENDIX 1: SURVEY EQUIPMENT AND DATA PROCESSING

Survey Methods and Equipment

The magnetic data for this project was acquired using a Bartington 601-2 dual magnetic gradiometer system. This instrument has two sensor assemblies fixed horizontally 1m apart allowing two traverses to be recorded simultaneously. Each sensor contains two fluxgate magnetometers arranged vertically with a 1m separation, and measures the difference between the vertical components of the total magnetic field within each sensor array. This arrangement of magnetometers suppresses any diurnal or low frequency effects.

The gradiometers have an effective resolution of 0.03nT over a ±100nT range, and measurements from each sensor are logged at intervals of 0.25m. All of the data are stored on an integrated data logger for subsequent post-processing and analysis.

Wessex Archaeology undertakes two types of magnetic surveys: scanning and detail. Both types depend upon the establishment of an accurate 20m or 30m site grid, which is achieved using a Leica Viva RTK GNSS instrument and then extended using tapes. The Leica Viva system receives corrections from a network of reference stations operated by the Ordnance Survey and Leica Geosystems, allowing positions to be determined with a precision of 0.02m in real-time and therefore exceed the level of accuracy recommended by English Heritage (2008) for geophysical surveys.

Scanning surveys consist of recording data at 0.25m intervals along transects spaced 10m apart, acquiring a minimum of 80 data points per transect. Due to the relatively coarse transect interval, scanning surveys should only be expected to detect extended regions of archaeological anomalies, when there is a greater likelihood of distinguishing such responses from the background magnetic field.

The detailed surveys consist of 20m x 20m or 30m x 30m grids, and data are collected at 0.25m intervals along traverses spaced 1m apart. These strategies give 1600 or 3600 measurements per 20m or 30m grid respectively, and are the recommended methodologies for archaeological surveys of this type (EH, 2008).

Data may be collected with a higher sample density where complex archaeological anomalies are encountered, to aid the detection and characterisation of small and ephemeral features. Data may be collected at up to 0.125m intervals along traverses spaced up to 0.25m apart, resulting in a maximum of 28800 readings per 30m grid, exceeding that recommended by English Heritage (2008) for characterisation surveys.

Post-Processing

The magnetic data collected during the detail survey are downloaded from the Bartington system for processing and analysis using both commercial and in-house software. This software allows for both the data and the images to be processed in order to enhance the results for analysis; however, it should be noted that minimal data processing is conducted so as not to distort the anomalies.

As the scanning data are not as closely distributed as with detailed survey, they are georeferenced using the GPS information and interpolated to highlight similar anomalies in adjacent transects. Directional trends may be removed before interpolation to produce more easily understood images.

Typical data and image processing steps may include:

- Destripe – Applying a zero mean traverse in order to remove differences caused by directional effects inherent in the magnetometer;
- Destagger – Shifting each traverse longitudinally by a number of readings. This corrects for operator errors and is used to enhance linear features;
- Despike – Filtering isolated data points that exceed the mean by a specified amount to reduce the appearance of dominant anomalous readings (generally only used for earth resistance data)

Typical displays of the data used during processing and analysis:

- XY Plot – Presents the data as a trace or graph line for each traverse. Each traverse is displaced down the image to produce a stacked profile effect. This type of image is useful as it shows the full range of individual anomalies.
- Greyscale – Presents the data in plan view using a greyscale to indicate the relative strength of the signal at each measurement point. These plots can be produced in colour to highlight certain features but generally greyscale plots are used during analysis of the data.

APPENDIX 2: GEOPHYSICAL INTERPRETATION

The interpretation methodology used by Wessex Archaeology separates the anomalies into two main categories: archaeological and unidentified responses.

The archaeological category is used for features when the form, nature and pattern of the anomaly are indicative of archaeological material. Further sources of information such as aerial photographs may also have been incorporated in providing the final interpretation. This category is further sub-divided into three groups, implying a decreasing level of confidence:

- Archaeology – used when there is a clear geophysical response and anthropogenic pattern.
- Probable archaeology – used for features which give a clear response but which form incomplete patterns.
- Possible archaeology – used for features which give a response but which form no discernible pattern or trend.

The unidentified category is used for features when the form, nature and pattern of the anomaly are not sufficient to warrant a classification as an archaeological feature. This category is further sub-divided into:

- Increased magnetic response – used for areas dominated by indistinct anomalies which may have some archaeological potential.
- Trend – used for low amplitude or indistinct linear anomalies.
- Ferrous – used for responses caused by ferrous material. These anomalies are likely to be of modern origin.

Finally, services such as water pipes are marked where they have been identified.