STRATASCAN

Geophysical Survey Report

Area H17
Leighton Buzzard,
Bedfordshire

for

Albion Archaeology

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J2095

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LIST OF FIGURES

1 SUMMARY OF RESULTS

A magnetic susceptibility survey with subsequent targeted detailed gradiometry was carried out in Area H17, south of Leighton Buzzard. Five areas were chosen for detailed survey from the results of the magnetic susceptibility. Situated in the centre of the survey area are a series of agricultural marks and possible field boundaries that may be associated with a medieval field system. The east of the survey area is dominated by agricultural marks of possible modern origin. Two possible field drains have been identified in Area 3 along with two positive area anomalies that may represent cut features of archaeological origin. Situated in the west of the survey area are a series of positive area and linear anomalies. These anomalies may be of archaeological or pedological origin. Further intrusive investigation is needed to understand the nature and extent of these anomalies. Two services have been identified within the survey area, one situated in the western end of the survey and another running from a pylon in the northeast of the survey across Areas 1and 4.

2 INTRODUCTION

2.1 Background synopsis

Stratascan were commissioned by Albion Archaeology to undertake a geophysical survey of an area outlined for development.

2.2 Site location

The site is located south of Leighton Buzzard, Bedfordshire at OS ref. SP 927 235.

2.3 Description of site

The survey area is approximately 17 hectares. The survey area is relatively flat pasture or rough grass with a slight rise towards Grovebury Farm. The underlying geology is Gualt clay with pockets of Boulder clay and glacial gravels (British Geological Survey South Sheet, Third Edition Solid, 1979). The overlying soils are likely to be Evesham 3 soils which are typical calcareous pelosols. These consist of slowly permeable calcareous clayey and fine loamy over clayey soils (Soil Survey of England and Wales, Sheet 4 Eastern England).

2.4 Site history and archaeological potential

The survey area is situated within a landscape containing archaeological remains of various periods. The ancient Thiodweg route way is situated along the northern boundary of the survey area. A number of Roman burial urns have been discovered to the west of the survey area with a scatter of Roman pottery sherds identified within the northeast corner of the survey area. A series of Medieval field systems are present within and around the survey area.

2.5 Survey objectives

The objective of the survey was to locate any features of possible archaeological significance in order that they may be trenched prior to development.

2.6 Survey methods

The reconnaissance technique of magnetic susceptibility was employed over the whole of the survey area. From this, areas of enhancement will be targeted with detailed gradiometer survey together with an area of low enhancement to test 'blank' areas. More information regarding these techniques is included in the Methodology section below.

3 METHODOLOGY

3.1 Date of fieldwork

The fieldwork was carried out over 6 days from the 12th to the 14th, 16th and 19th to the 20th of December 2005 when the weather was variable.

3.2 Grid locations

The location of the survey grids has been plotted in Figure 2.

3.3 Description of techniques and equipment configurations

3.3.1 Magnetic Susceptibility

Alteration of iron minerals in topsoil through biological activity and burning can enhance the magnetic susceptibility (MS) of that soil. Measuring the MS of a soil can therefore give a measure of past human activity and can be used to target the more intensive and higher resolution techniques of Gradiometry and Resistivity. Measurements of MS were carried out using a field coil which provides a rapid scan and has the benefit of allowing "insitu" readings to be taken.

The equipment used on this contract was an MS2 Magnetic Susceptibility meter manufactured by Bartington Instruments Ltd. A field coil known as an MS2D was used to take field readings. This assessed the top 200mm or so of topsoil. To overcome the problem of ground contact all readings were taken 4 or 5 times and an average taken. All obvious localised "spikes" were ignored.

3.3.2 Gradiometer

Although the changes in the magnetic field resulting from differing features in the soil are usually weak, changes as small as 0.2 nanoTesla (nT) in an overall field strength of 48,000nT, can be accurately detected using an appropriate instrument.

The mapping of the anomaly in a systematic manner will allow an estimate of the type of material present beneath the surface. Strong magnetic anomalies will be generated by

buried iron-based objects or by kilns or hearths. More subtle anomalies such as pits and ditches can be seen if they contain more humic material which is normally rich in magnetic iron oxides when compared with the subsoil.

To illustrate this point, the cutting and subsequent silting or backfilling of a ditch may result in a larger volume of weakly magnetic material being accumulated in the trench compared to the undisturbed subsoil. A weak magnetic anomaly should therefore appear in plan along the line of the ditch.

The magnetic survey was carried out using a dual sensor Grad601-2 Magnetic Gradiometer manufactured by Bartington Instruments Ltd. The Grad601-2 consists of two high stability fluxgate gradiometers suspended on a single frame. Each sensor has a 1m separation between the sensing elements increasing the sensitivity to small changes in the Earths magnetic field.

3.4 Sampling interval, depth of scan, resolution and data capture

3.4.1 Sampling interval

Magnetic susceptibility
Data was collected at 20m centres along transects 20m apart. The node positions were located using the Leica GS50 Global Positioning System (GPS); the OS grid location of each survey point was uploaded onto the GPS from data points established from the OS base mapping. The average value was then logged and recorded using the Leica GS50.

Gradiometer
Readings were taken at 0.25m centres along traverses 1m apart. This equates to 3600 sampling points in a full 30m x 30m grid.

3.4.2 Depth of scan and resolution

Magnetic Susceptibility
The MS2D coil assesses the average MS of the soil within a hemisphere of radius 200mm. This equates to a volume of some $0.016m^3$ and maximum depth of 200mm. As readings are only at 20m centres this results in a very coarse resolution but adequate to pick up trends in MS variations.

Gradiometer
The FM256 has a typical depth of penetration of 0.5m to 1.0m. This would be increased if strongly magnetic objects have been buried in the site. The collection of data at 0.5m centres provides an appropriate methodology balancing cost and time with resolution.

3.4.3 Data capture

Magnetic susceptibility
The data is logged as an attribute to the relevant GPS point within the Leica GS50. The GPS data was then downloaded using Leica Survey Office.

Gradiometer
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 job, data is transferred to the office for processing and presentation.

3.5 Processing, presentation of results and interpretation

3.5.1 Processing

Magnetic susceptibility
No processing of the data has been undertaken.

Gradiometer
Processing is performed using specialist software known as *Geoplot 3.* This can emphasise various aspects contained within the data but which are often not easily seen in the raw data. Basic processing of the magnetic data involves 'flattening' the background levels with respect to adjacent traverses and adjacent grids. 'Despiking' is also performed to remove the anomalies resulting from small iron objects often found on agricultural land. Once the basic processing has flattened the background it is then possible to carry out further processing which may include low pass filtering to reduce 'noise' in the data and hence emphasise the archaeological or man-made anomalies.

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

Zero mean grid	*Threshold = 0.25 std. dev.*
Zero mean traverse	*Last mean square fit = off*
Despike	*X radius = 1 Y radius = 1*
	Threshold = 3 std. dev.
	Spike replacement = mean

3.5.2 Presentation of results and interpretation

Magnetic susceptibility
The presentation of the data for this site involves a colour scale plot of the field measurements overlain onto a site plan (see Figure 3).

Gradiometer
The presentation of the data for each site involves a print-out of the raw data both as grey scale (Figures 4 and 5) and trace plots (Figures 6 - 9), together with a grey scale plot of the processed data (Figure 10 and 11). Magnetic anomalies have been identified and plotted onto the 'Abstraction and Interpretation of Anomalies' drawing for the site (Figure 12 and 13).

4 RESULTS

4.1 Magnetic susceptibility

The magnetic susceptibility results have produced a discrete area of high susceptibility within the boundaries of the north field parcel. These high reading may be caused by localised agricultural activity due to the contained area of high readings. However these high results may still relate to archaeological activity possibly enhanced by the agricultural activity. A high susceptibly linear may also be identified within this area. An area of moderate low susceptibility has been identified within the southwest corner of the survey area along with a linear band of low resistance.

Situated across the centre of the survey is an area of slightly varying susceptibility with a discrete area of moderate high susceptibility. These results may indicate weak evidence of archaeological activity. Very high susceptibility reading situated in close proximity to the farm and along the perimeter of the survey area is likely to be caused by modern activity and debris.

The detailed gradiometer survey has targeted the area of high susceptibility and in the northeast corner of the survey area, along with an area in the centre of the survey to cover the area of moderate to high susceptibility. The area of low susceptibility situated in the southeast of the survey area has also been targeted along with a small area situated in the southwest corner of the survey. These have been targeted to investigate the band of low resistance and to test an area of null readings for archaeological activity.

4.2 Detailed gradiometry

Five areas have been targeted for detailed gradiometry. Area 1 covers the high levels of magnetic susceptibility identified within the northeast of the survey area. Area 2 targets the wide band of low susceptibility situated within the southeast of the survey area. Areas 3 and 4 target the areas of slight varying susceptibility within the centre of the survey area. Area 5 targets an area of null values situated within the south west of the survey.

4.2.1 Area 1

A modern service has been identified running across the survey area in an east to west orientation in the direction of a pylon. An area of magnetic disturbance has been caused by the pylon. Further areas of magnetic disturbance have been identified along the perimeter of the survey area and are likely to be caused by the nearby field boundaries and road. A number of positive anomalies with associated negative returns, these anomalies may represent near surface ferrous objects of possible modern origin.

Two phases of agricultural activity can be identified within survey Area 1 from a series of parallel linear anomalies with north to south and northeast to southwest orientations.

4.2.2 Area 2

Situated across the southwestern edge of survey Area 2 is a large area of magnetic disturbance caused by the nearby field boundary. A number of positive responses with negative returns have been identified that may represent near surface ferrous objects.

Two phases of agricultural activity can be identified within Area 2. A series of parallel positive linear anomalies associated with agricultural activity can be identified running parallel with the present field boundaries. A further set of parallel linear anomalies can be identified across the centre of the survey area in a northwest to southeast orientation and may be associated with the band of low susceptibility identified within the magnetic susceptibility data.

4.2.3 Area 3

A small area of magnetic disturbance is situated in the northeast corner of the survey area and is associated with the nearby field boundary. A number of ferrous objects have been identified across the survey area in the form of discrete positive anomalies with negative returns.

Two parallel faint magnetic linear anomalies have been identified across the centre of the survey area in a northeast to southwest orientation. These anomalies may relate to land drains. Two agricultural marks have been identified in a northwest to southeast orientation across the centre of the survey area.

Two positive area anomalies have been identified in the east of the survey area. These anomalies may represent cut features of archaeological origin.

4.2.4 Area 4

The continuation of the service identified with survey Area 1 can be seen can be identified in the northwest corner of Area 4. A large number of positive anomalies with negative returns are situated within this area. These anomalies may represent near surface ferrous objects.

Situated across the centre of the survey area in a northwest to southeast orientation is a band of positive and negative linear anomalies representing agricultural activity and possible banks of agricultural origin associated with a medieval field system. Three possible subdivisions of agricultural activity can be identified within this survey area. The agricultural features correspond well with the area of moderate susceptibility readings identified within the magnetic susceptibility data.

A faint positive linear anomaly can be identified in the south of the survey area in a northwest to southeast orientation. This anomaly may represent a cut feature of archaeological origin.

4.2.5 Area 5

A modern service has been identified across the centre of the survey area. A number of near surface ferrous objects can be identified in the form of discrete positive anomalies with negative returns.

In the eastern end of the survey area are a series of positive area and linear anomalies. These anomalies may represent cut features of archaeological origin; however they may also signify pedological or geological anomalies.

5 CONCLUSION

Situated in the centre of the survey area are a series of agricultural marks and possible field boundaries that may be associated with a medieval field system. The east of the survey area is dominated by agricultural marks of possible modern origin. Two possible field drains have been identified in Area 3 along with two positive area anomalies that may represent cut features of archaeological origin. Situated in the west of the survey area are a series of positive area and linear anomalies that may be of archaeological or pedological origin. Further intrusive investigation is needed to understand the nature and extent of these anomalies. Two services have been identified within the survey area, one situated in the western end of the survey and another running from a pylon in the northeast of the survey across Areas 1and 4.