STRATASCAN

Geophysical Survey Report

Wigmore Farm, Godmanchester

for

Archaeological Solutions

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J 2033

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REGISTERED IFA ORGANISATION

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National Grid Ref:	**TL 245 696**

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1 SUMMARY OF RESULTS

A reconnaissance magnetic susceptibility survey was carried out over 4ha of land at Wigmore Farm, Godmanchester. This was followed by 1ha of targeted detailed magnetic survey.

Several anomalies were identified which have uncertain origins. To clarify their cause further investigation is required, possibly through excavation. Responses probably caused by ridge and furrow ploughing have also been observed.

2 INTRODUCTION

2.1 Background synopsis

Stratascan were commissioned by Archaeological Solutions to undertake a geophysical survey.

2.2 Site location

The site is located at Wigmore Farm, Godmanchester, Cambridgeshire at OS ref. TL 245 696.

2.3 Description of site

The total site area is 4ha of flat ground covered with long grass.

The underlying geology is Oxford Clay and the Kellaway Beds (British Geological Survey South Sheet, Fourth Edition Solid, 2001). The overlying soils are of the Efford 1 soil association. These consist of well drained fine loamy soils over gravel, associated with similar permeable soils variably affected by groundwater (Soil Survey of England and Wales, Sheet 4 Eastern England).

2.4 Site history and archaeological potential

No specific details are available to Stratascan.

2.5 Survey objectives

The objective of the survey was to locate any features of possible archaeological origin.

2.6 Survey methods

The reconnaissance technique of magnetic susceptibility was employed over the whole site. From this three areas of the site were targeted with detailed gradiometer survey. Areas B and C cover enhanced magnetic susceptibility measurements while Area A is located on an area of low magnetic susceptibility to test the null.

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 2 days, 4th & 5th July 2005. During this time the weather was overcast.

3.2 Grid locations

The location of the detailed magnetic survey grids has been plotted in Figure 4.

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 Magnetometry 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
The magnetic susceptibility survey was carried out on a 20 m grid with readings being taken at the node points.

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 Grad601-2 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 readings are logged manually on site, and then transferred to the office where they are entered into a computer and grey scale plots are produced.

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 magnetometer data used in this report:

Despike	*X radius = 1 Y radius = 1*
	Threshold = 3 std. dev.
	Spike replacement = mean
Zero mean traverse	*Least mean square fit = on*
	Threshold = +/-3000

3.5.2 Presentation of results and interpretation

Magnetic susceptibility
The presentation of the data for this site involves a grey scale plot of the field measurements overlain onto a site plan (see Figure 2).

Gradiometer
The presentation of the data for each site involves a print-out of the raw data both as grey scale (Figure 5) and trace plots (Figure 6 and 7), together with a grey scale plot of the processed data (Figure 8). Magnetic anomalies have been identified and plotted onto the 'Abstraction and Interpretation of Anomalies' drawing for the site (Figure 9).

4 RESULTS

4.1 Magnetic susceptibility

The results from the magnetic susceptibility survey are generally low across the site. This probably reflects the naturally low level of magnetic minerals in the soil.

Two areas have been identified as having enhanced magnetic susceptibility readings. Areas B & C have values ranging up to around 27 $x10^{-8}$ SI units. While on many sites these values would be considered only moderate enhancement, on this site they are considered high compared to the general low response throughout the data. These two areas, along with an area of low values have been targeted for detailed magnetic survey.

4.2 Detailed magnetic survey

4.2.1 Area A

Area A is located on an area of low magnetic susceptibility values. The detailed magnetic survey results correlate with this by revealing very few anomalies.

Two weak positive linear anomalies are observed. One running north west to south east which aligns with other linear anomalies seen in Area B. This is likely to represent agricultural activity. Another weak positive linear anomaly cuts across this. It is unclear what may be the cause of this second anomaly.

The discrete positive anomaly with associated negative response seen in the north corner of the survey area is probably related to a ferrous object.

4.2.2 Area B

This is located on an area of high magnetic susceptibility enhancement.

A series of roughly parallel positive linear anomalies are identified in the data. These are around 10m apart. It is likely they represent the effect of ridge and furrow ploughing.

In the north west of the survey area three weak positive anomalies with associated negative responses are observed. They may be related to infilled cut features of archaeological origin, although natural or agricultural origins are also possible.

4.2.3 Area C

Area C is located on high magnetic susceptibility readings.

The data in this area shows a higher level of magnetic variation compared to Areas A & B. In the north east of the area is a bipolar linear response. This is best seen in the raw data (Figure 5). It is likely this is caused by a utility pipe. The anomaly appears to extend and terminate in a square shaped area of magnetic disturbance. This magnetic disturbance is caused by metal fencing and may contain a feature related to the termination of the service.

Several positive anomalies with associated negative responses are observed in the data. These are similar in style to those seen in Area B. They have an uncertain origin. An infilled cut feature with bank of archaeological origin is possible, although so is a natural or agricultural origin.

5 CONCLUSION

Evidence of ridge and furrow ploughing is observed in Areas B & C. No other clear evidence of archaeological features is apparent. Several anomalies have been identified with uncertain origins, further investigation would be required to clarify the cause of these responses.

REFERENCES

British Geological Survey, 2001. *Geological Survey Ten Mile Map, South Sheet, Fourth Edition (Solid).* British Geological Society.

Soil Survey of England and Wales, 1983. *Soils of England and Wales, Sheet 4 Eastern England.*