STRATASCAN

Geophysical Survey Report

Skippetts House

for

Wessex Archaeology

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LIST OF FIGURES

1 SUMMARY OF RESULTS

A detailed magnetic survey was carried out at Skippetts House, Basingstoke. Initial concerns over the quality of data due to recent tree felling work were not realised. Although it seems unlikely any archaeological features will remain in the west of the site where it appears 1.5m depth of land has been removed.

Linear responses have been identified that may be of archaeological origin. Other anomalies remain ambiguous and would require further investigations to clarify their origin.

2 INTRODUCTION

2.1 Background synopsis

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

2.2 Site location

The site is located at Skippetts House, Basingstoke, Hampshire at OS ref. SU 640 506.

2.3 Description of site

The original survey area was approximately 4.5ha of land surrounding Skippetts House. Numerous wooded areas made accessing this difficult and resulted in a final area surveyed of around 2ha. See reconnaissance photographs on Figures 2 & 3.

On the western side of the site around 1.5m depth of land has been removed making it unlikely for any archaeological features to remain in this area.

2.4 Geology and soils

The underlying geology is chalk (British Geological Survey South Sheet, Fourth Edition Solid, 2001). The overlying soils are near the boundary between Andover 1 in the east and Carstens to the west. The Andover 1 soil association consists of shallow well drained calcareous silty soils over chalk on crests and slopes, with deep calcareous and non calcareous fine silty soils in valley bottoms (Soil Survey of England and Wales, Sheet 6 South East England). The Carstens soil association consists of well drained fine silty over clayey soils and clayey and fine silty soils often very flinty (Soil Survey of England and Wales, Sheet 6 South East England).

2.5 Site history and archaeological potential (Hawkins, 2005)

Investigations near to the site have identified settlement features dating from the Iron Age and Roman periods. Skippetts House itself is originally thought to be of Tudor origin with subsequent alterations made during the eighteenth and twentieth centuries.

The potential for further archaeological remains from these periods is considered to be good.

2.6 Survey objectives

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

2.7 Survey methods

Detailed magnetic survey (gradiometry) was used as an efficient and effective method of locating archaeological anomalies. More information regarding this technique is included in the Methodology section below.

3 METHODOLOGY

3.1 Date of fieldwork

The fieldwork was carried out over 2 days on the 7th & 10th October 2005. Weather conditions during the survey were warm and sunny.

3.2 Grid locations

The location of the survey grids has been plotted in Figure 4 together with the referencing information. Grids were set out using a Leica 705auto Total Station and referenced to suitable topographic features around the perimeter of the site.

3.3 Survey equipment

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

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

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 0.25m centres provides an appropriate methodology balancing cost and time with resolution.

3.4.3 Data capture

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

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:

1. *Despike* (useful for display and allows further processing functions to be carried out more effectively by removing extreme data values)

   Geoplot parameters:
   X radius = 1, y radius = 1, threshold = 3 std. dev.
   Spike replacement = mean

2. *Zero mean traverse* (sets the background mean of each traverse within a grid to zero and is useful for removing striping effects)

   Geoplot parameters:
   Least mean square fit = on

3.5.2 Presentation of results and interpretation

The presentation of the data for each site involves a print-out of the raw data both as greyscale (Figure 5) and trace plots (Figure 6 and 7), together with a greyscale 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

Despite initial concerns regarding the quality of data with respect to the recent tree felling activities numerous geophysical anomalies are apparent.

Running along the western edge of the survey area is a linear bipolar anomaly. While in places the strength of this anomaly reaches +/-3000nT it generally reads around +/-100nT. A buried service would typically return values of at least several hundred nanotesla, the fact that it is generally around +/-100nT suggests there may be a variance in material composition along its length. This is also true of a similar response observed toward the centre of the site.

In the east of the site negative linear anomalies are observed which cross each other. These are likely to be caused by earthworks of an anthropogenic origin. On the south eastern side of this 'X' is a positive anomaly which may represent an accompanying cut feature. Just north of the 'X' are two weak positive linear anomalies which may also represent cut features of an archaeological origin, and an area of both positive and negative response. This area may be associated with a depression in the land surface although it is not clear whether this has an archaeological or natural cause.

Three areas of weak magnetic debris have been identified. Responses such as these can be caused by several types of feature including, burning, heated objects such as bricks, general ground disturbance or weakly magnetic metal objects. The 'L' shaped area of magnetic debris may be caused by a spread of brick hardcore or rubble forming a right angle suggestive of a former building. The circular response may be caused by a feature such as a bonfire, while the elongate area remains ambiguous.

5 CONCLUSION

The detailed magnetic survey has successfully enabled the identification of geophysical anomalies despite concerns that tree felling activity may have resulted in poor data. It seems that around 1.5m depth of land has been removed from the west of the site making it unlikely any archaeological features remain in this area.

Anomalies have been noted which may have an archaeological origin, particularly in the east of the site where an 'X' shape of linear anomalies is observed. Several other anomalies remain ambiguous and require further investigation to clarify their origin.

REFERENCES

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

Hawkins, D. 2005. *Archaeological Desk Based Assessment: Land At Skippetts House, Skippetts Lane West, Basingstoke, Hampshire*. CgMs Consulting.

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

APPENDIX A – Basic principles of magnetic survey

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.

Weakly magnetic iron minerals are always present within the soil and areas of enhancement relate to increases in *magnetic susceptibility* and permanently magnetised *thermoremnant* 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.

Thermoremnance 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. Thermoremnant archaeological features can include hearths and kilns and 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 either 0.5 or 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 field. The difference between the two sensors will relate to the strength of a magnetic field created by a buried 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, disturbance from modern services etc.