GEOPHYSICAL SURVEY REPORT

STRATASCAN™

SUMO Survey Services
SUMO Group Member

Project name:
Cannington, Bridgwater, Somerset

Client:
Context One

Job ref:
J9755

April 2016

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Project name: **Cannington, Bridgwater, Somerset** Client: **Context One**	Job ref: **J9755**
Survey date: **1st & 4th April 2016**	Report date: **April 2016**
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Version number and issue date:	Amendments:
V1 04/05/2016	

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1 SUMMARY OF RESULTS

A detailed gradiometry survey was carried out over approximately 6.1 hectares of arable farmland. No features of probable archaeological have been identified, however a single positive linear anomaly, and a series of negative linear anomalies may be of archaeological origin. Evidence of ridge and furrow cultivation and a former field boundary indicate that the site has been used for agricultural purposes since the medieval period. A large area of enhanced magnetic response and associated linear anomalies are likely to be natural and relate to the underlying slate geology. Two discrete areas of magnetic disturbance are of unknown origin, while the remaining features are modern. The modern anomalies include services, scattered magnetic debris, and disturbance from nearby ferrous objects.

2 INTRODUCTION

2.1 Background synopsis

Stratascan were commissioned to undertake a geophysical survey of an area outlined for development. This survey forms part of an archaeological investigation being undertaken by Context One.

2.2 Site Details

NGR / Postcode	ST 226 386 / TA5 2NH
Location	The site is located north of Currypool Farm, approximately 7.5km east of Bridgwater, Somerset. The A39 lies immediately north of the site, with Currypool Lane to the east, and open agricultural land to the west.
HER/SMR	Somerset
District	Sedgemoor
Parish	Spaxton
Topography	The site lies on a steep east facing slope and changes in height from approximately 65m AOD to approximately 45m AOD.
Current Land Use	Arable
Weather Conditions	Overcast
Soils	The overlying soils are known as Milford, which are typical brown earths. These consist of fine loamy, reddish soils over rock (Soil Survey of England and Wales, Sheet 5 South West England).
Geology	The underlying geology comprises slate of Leighland Slate Member. No drift geology is recorded (British Geological Survey website).

Archaeology	A search of Somerset Historic Environment Record (HER) (Somerset County Council, 2016) within a 1km radius of the site identifies a number of possible prehistoric and medieval remains. An irregular, oval-shaped enclosure (11871) is recorded to the east of the site, alongside ditched boundaries, the possible remains of an additional enclosure, and a possible pit (26921). To the south-east, a weak, trapezoidal, single ditched enclosure is visible on aerial photographs (10831). The dates of these features remain unknown. Possible ring ditches are recorded to the south and east of the site (12620, 12389) and may be associated with Bronze Age barrows, though no evidence of a mound is visible at either site. A circular anomaly to the south (12620) may also be the remains of a relatively recent pond. Currypool itself is recorded as a possible deserted medieval village (DMV) (10797) and is documented in c.1327 as having 19 people live there. Though a DMV is suggested, there is no literary or ground evidence to support the claim. Immediately south of the survey area, at Currypool Farm, the possible remains of a moated site are recorded (10211). It can therefore be determined that the site has a moderate potential for prehistoric remains and a moderate-high potential for remains dating to the medieval period.
Survey Methods	Detailed magnetic survey (gradiometry)
Study Area	c.6.1ha, of which 0.5ha was unsurveyable due to large piles of tyres and farm outbuildings.

2.3 Aims and objectives

To locate and characterise any anomalies of possible archaeological interest within the study area.

3 METHODS, PROCESSING & PRESENTATION

3.1 Standards & Guidance

This report and all fieldwork have been conducted in accordance with the latest guidance documents issued by Historic England (2008) and the Chartered Institute for Archaeologists (2002 & 2014).

Stratascan Ltd are a Registered Organisation with the CIfA and are committed to upholding its policies and standards.

3.2 Survey methods

Due to the moderate potential for both prehistoric and medieval remains, detailed magnetic survey was used as an efficient and effective method of locating archaeological anomalies.

More information regarding this technique is included in Appendix A.

3.3 Processing

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

1. *Destripe*
2. *Destagger*

3.4 Presentation of results and interpretation

The presentation of the data for each site involves a plot of the minimally processed data as a greyscale plot and a colour plot showing extreme magnetic values. Magnetic anomalies have been identified and plotted onto the 'Interpretation of Anomalies' drawing.

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: probable, or possible 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 "possible".

4 RESULTS

The detailed magnetic gradiometer survey conducted at Currypool Farm has identified a number of anomalies that have been characterised as being of a *possible* archaeological origin. The following list of numbered anomalies refers to numerical labels on the interpretation plots.

4.1 Probable Archaeology

No probable archaeology has been identified within the survey area.

4.2 Possible Archaeology

A small, positive linear anomaly in the east of the site **[1]** is indicative of a former cut feature, such as a ditch, and may be of archaeological origin. A series of negative linear anomalies **[2]** in the south-east of the area may also be archaeological in origin, and are indicative of former banks or earthworks. The exact origin of both anomalies 1 and 2 cannot be determined with confidence, with natural or agricultural origins equally as likely as archaeological.

4.3 *Medieval/Post-Medieval Agriculture*

Evidence of ridge and furrow cultivation **[3]** in the south-west of the site is visible in the form of widely spaced, parallel linear anomalies. The cultivation is on the same alignment as the former field boundary **[4]** which is visible on OS mapping from 1888 to 1962.

4.4 *Other Anomalies*

A number of positive and negative linear anomalies **[5]** are visible across the site, largely situated amongst a large area of natural magnetic response **[6]**. The anomalies are likely related to the underlying slate geology. Two areas of high amplitude magnetic debris and disturbance **[7]** are of uncertain origin, though are likely to be related to modern features. Strong bipolar linear anomalies in the north of the site **[8]** are related to modern underground services, such as pipes or cables. A small area of scattered magnetic debris **[9]**, areas of magnetic disturbance from nearby fencing **[10],** and magnetic spikes **[11]** are all modern in origin and relate to nearby ferrous metal objects.

5 DATA APPRAISAL & CONFIDENCE ASSESSMENT

Magnetometer surveys over slate geologies can provide variable results, but are generally effective. The moderate-high amplitude of the, natural response in the north-west has the potential to mask weaker archaeological anomalies. The data across the south of the site is fairly uniform in appearance, though possible archaeological features have still been identified.

6 CONCLUSION

The survey at Currypool Farm has not identified any features of probable archaeological origin, despite the potential for both prehistoric and medieval remains. A series of possible former banks or earthworks, along with a small former cut feature may be of archaeological origin, though their exact origin cannot be determined with confidence. Evidence of ridge and furrow cultivation along with a former field boundary indicate that the site has a largely agricultural past. The data is dominated by the large, natural response in the north-west and associated linear anomalies. Two discrete areas of magnetic disturbance are of uncertain origin, though are likely to be modern. The remaining features are all modern and include underground services, an area of scattered magnetic debris, magnetic disturbance from nearby ferrous objects, and magnetic spikes, which are likely to be modern rubbish.

7 REFERENCES

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Appendix A - Technical Information: Magnetometer Survey Method

Grid Positioning

For hand held gradiometers the location of the survey grids has been plotted together with the referencing information. Grids were set out using a Trimble R8 Real Time Kinematic (RTK) VRS Now GNSS GPS system.

An RTK GPS (Real-time Kinematic Global Positioning System) can locate a point on the ground to a far greater accuracy than a standard GPS unit. A standard GPS suffers from errors created by satellite orbit errors, clock errors and atmospheric interference, resulting in an accuracy of 5m-10m. An RTK system uses a single base station receiver and a number of mobile units. The base station re-broadcasts the phase of the carrier it measured, and the mobile units compare their own phase measurements with those they received from the base station. This results in an accuracy of around 0.01m.

Technique	Instrument	Traverse Interval	Sample Interval
Magnetometer	Bartington Grad 601-2	1m	0.25m

Instrumentation: Bartington *Grad*601-2

Bartington 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, though strongly magnetic objects may be visible at greater depths. The Bartington instrument can collect two lines of data per traverse with gradiometer units mounted laterally with a separation of 1.0m.

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 site survey, data is transferred to the office for processing and presentation.

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.

Display

Greyscale/ 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.

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/Probable 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.
Possible Archaeology	These anomalies exhibit either weak signal strength and / or poor definition, or 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.
Industrial / Burnt-Fired	Strong magnetic anomalies that, due to their shape and form or the context in 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.
Former Field Boundary (probable & possible)	Anomalies that correspond to former boundaries indicated on historic mapping, or which are clearly a continuation of existing land divisions. Possible denotes less confidence where the anomaly may not be shown on historic mapping but nevertheless the anomaly displays all the characteristics of a field boundary.
Ridge & Furrow	Parallel linear anomalies whose broad spacing suggests ridge and furrow cultivation. In some cases the response may be the result of more recent agricultural activity.
Agriculture (ploughing)	Parallel linear anomalies or trends with a narrower spacing, sometimes aligned with existing boundaries, indicating more recent cultivation regimes.
Land Drain	Weakly magnetic linear anomalies, quite often appearing in series forming parallel and herringbone patterns. Smaller drains will often lead and empty into larger diameter pipes and which in turn usually lead to local streams and ponds. These are indicative of clay fired land drains.
Natural	These responses form clear patterns in geographical zones where natural variations are known to produce significant magnetic distortions.
Magnetic Disturbance	Broad zones of strong dipolar anomalies, commonly found in places where modern ferrous or fired materials (e.g. brick rubble) are present. They are presumed to be modern.
Service	Magnetically strong anomalies usually forming linear features indicative of ferrous pipes/cables. Sometimes other materials (e.g. pvc) cause weaker magnetic responses and can be identified from their uniform linearity crossing large expanses.
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.
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 *Possible Archaeology* and *Possible Natural* or (in the case of linear responses) *Possible Archaeology* and *Possible Agriculture*; occasionally they are simply of an unusual form.

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).

Appendix B - Technical Information: Magnetic Theory

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

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

Thermoremanence 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. Thermoremanent 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 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.

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