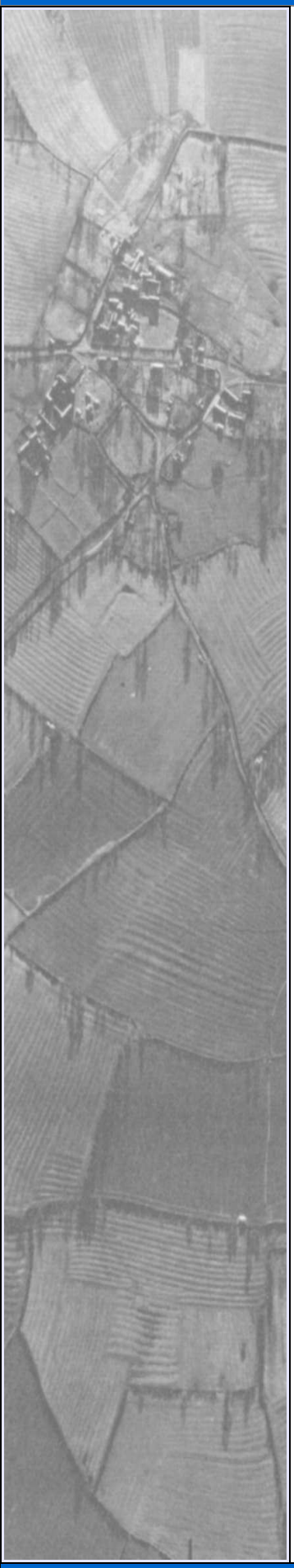

Baldwin's Gate Farm
Baldwin's Gate
Staffordshire

MAGNETOMETER SURVEY REPORT

for

Richborough Estates Ltd

Kerry Donaldson & David Sabin

March 2015

Ref. no. 600

ARCHAEOLOGICAL SURVEYS LTD

Baldwin's Gate Farm
Baldwin's Gate
Staffordshire

Magnetometer Survey Report

for

Richborough Estates Ltd

Fieldwork by David Sabin (Hons) MCIfA
Report by Kerry Donaldson BSc (Hons)
Report checked by David Sabin
Primary archive location - Archaeological Surveys Ltd, Yatesbury, Wiltshire

Survey dates – 25th to 27th March 2015
Ordnance Survey Grid Reference – **SJ 792 402**

OASIS ID:archaeol20-208667

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SUMMARY

A detailed magnetometer survey was carried out by Archaeological Surveys Ltd over 10ha at Baldwin's Gate Farm, Whitmore, Staffordshire. The survey was requested by Richborough Estates Ltd and carried out in accordance with a brief issued by the county Principal Archaeologist. The western part of the site, Area 1, contains an elongated mound, broader at its northern end and rising to 3m in height. The results show positive responses at the summit of this mound and extending along the north eastern side of the mound. Another broad, weak linear response extends for 145m from the mound towards the south eastern corner of the field. Other positive and negative responses can also be seen in the vicinity of the mound, including two series of pit-like anomalies, one close to the crest of the mound and one further to the north. Within the eastern part of the site, Area 2 contains what appears to be three sides of a rectilinear feature, possibly surrounding natural responses. The rectilinear anomaly has eastern and western sides that are parallel with existing and former land boundaries, and association is possible. Two formerly mapped field boundaries have also been located. Widespread magnetic debris, presumably introduced through manuring, and a number of land drains have also been located.

1 INTRODUCTION

1.1 Survey background

1.1.1 Archaeological Surveys Ltd was commissioned by Richborough Estates Ltd to undertake a magnetometer survey of an area of land at Baldwin's Gate Farm, Baldwin's Gate, Whitmore, Staffordshire. The site has been outlined for a proposed housing development, (planning application Newcastle-under-Lyme Borough Council 13/14026/OUT) and the survey is being carried out under condition 16 of the planning permission which requires a scheme of archaeological investigation in advance of groundworks to inform the need for and scale of any further archaeological mitigation across the site.

1.1.2 The geophysical survey was carried out in accordance with a Written Scheme of Investigation (WSI) produced by Archaeological Surveys (2015). The WSI considers the requirements of a Brief for geophysical survey issued by Stephen Dean (2015), Principal Archaeologist, Staffordshire County Council .

1.2 Survey objectives and techniques

1.2.1 The objective of the survey was to use magnetometry to locate geophysical anomalies that may be archaeological in origin so that they may be assessed prior to development of the site. The methodology is considered an efficient and effective approach to archaeological prospection.

1.2.2 The survey and report generally follow the recommendations set out by:

English Heritage (2008) *Geophysical survey in archaeological field evaluation;* and Institute for Archaeologists (2002) *The use of Geophysical Techniques in Archaeological Evaluations*. The work has been carried out to the Chartered Institute for Archaeologists (2014) *Standard and Guidance for Archaeological Geophysical Survey.*

1.3 Site location, description and survey conditions

1.3.1 The site is located at Baldwin's Gate Farm within the parish of Whitmore in Staffordshire, see Fig1 below. It is situated 7km south west of Newcastle-under-Lyme and the central OS Grid Reference is SJ 792 402, see Figures 01 and 02.

1.3.2 The geophysical survey covers approximately 10ha within two pasture fields forming an L shape and referred to as Areas 1 and 2. Area 1 forms the western part of the site and Area 2 the northern. Area 1 is to contain a temporary construction access route, and Area 2 is to contain 113 dwellings. The site is bounded by the A53 to the south and the railway that extends between Stafford and Crewe to the east. The Sandyfields housing estate is located immediately to the south and east, with agricultural land to the north and west.

1.3.3 Area 1 contains a large mound or hillock that is likely to be natural in origin. Immediately south west of the area there are barns surrounded by a large area of poached and boggy ground. Area 2 has some natural undulations and there are sources of magnetic disturbance bordering the adjacent housing estate and associated with gantries along the electrified railway line.

Plate 1: Area 1 looking towards the south

Plate 2: Area 2 looking towards the east

1.3.4 The ground conditions across the site were generally considered to be favourable for the collection of magnetometry data, although data could not be collected over waterlogged and boggy ground within Area 1. The survey was carried out in wet and very windy conditions within Area 1 and fine and sunny conditions in Area 2.

1.4 Site history and archaeological potential

1.4.1 An archaeological desk-based assessment has been carried out for the site by Northamptonshire Archaeology (2013). The site lies within the former Madeley Great Park, a deer park dating to the 13th century and not disparked until the 19th century. The park boundary defines the southern edge of the site along the A53.

1.4.2 The nearest scheduled monument is Berth Hill Camp Iron Age hillfort, located 800m to the south west. A number of mounds in the surrounding area have been interpreted as possible barrows, but excavation indicates they may be natural features. A large mound is located in the western part of the site (Area 1), which may be a natural feature, although later utilisation is also possible.

1.5 Geology and soils

1.5.1 The underlying solid geology across the site is mainly Triassic sandstone from the Wildmoor Sandstone Formation with some conglomerate from the Kidderminster Formation at the eastern edge. There are overlying

glaciofluvial deposits within the central zone of the eastern part of the site with peat deposits at the far eastern corner (BGS, 2015).

1.5.2 The overlying soil across the survey area is from the Bridgnorth association and is a typical brown sand. It consists of a well drained, sandy and coarse loamy soil over soft sandstone (Soil Survey of England and Wales, 1983). Some made ground was visible adjacent to farm buildings in Area 1.

1.5.3 Magnetometry survey carried out across similar soils has produced variable results (English Heritage, 2008). There can be a poor magnetic contrast between the fill of cut features and the material into which they are cut; however, long term settlement can produce sufficient magnetic enhancement for features to be located. The underlying geology and soils are therefore considered acceptable for magnetic survey.

2 METHODOLOGY

2.1 Technical synopsis

2.1.1 Magnetometry survey records localised magnetic fields that can be associated with features formed by human activity. Magnetic susceptibility and magnetic thermoremnance are factors associated with the formation of localised fields. Additional details are set out below and within Appendix A.

2.1.2 Iron minerals within the soil may become altered by burning and the break down of biological material; effectively the magnetic susceptibility of the soil is increased, and the iron minerals become magnetic in the presence of the Earth's magnetic field. Accumulations of magnetically enhanced soils within features, such as pits and ditches, may produce magnetic anomalies that can be mapped by magnetic prospection.

2.1.3 Magnetic thermoremnance can occur when ferrous minerals have been heated to high temperatures such as in a kiln, hearth, oven etc. On cooling, a permanent magnetisation may be acquired due to the presence of the Earth's magnetic field. Certain natural processes associated with the formation of some igneous and metamorphic rock may also result in magnetic thermoremnance.

2.1.4 The localised variations in magnetism are measured as sub-units of the Tesla, which is a SI unit of magnetic flux density. These sub-units are nano Teslas (nT), which are equivalent to 10^{-9} Tesla (T).

2.2 Equipment configuration, data collection and survey detail

2.2.1 The detailed magnetic survey was carried out using a SENSYS MAGNETO®MXPDA 5 channel cart-based system. The instrument has 5 fluxgate gradiometers spaced 0.5m apart with readings recorded at 20 Hz.

The gradiometers have a range of recording data between 0.1nT and 10,000nT. The system is linked to a Leica GS10 RTK GPS with data recorded by SENSYS MAGNETO®MXPDA software on a rugged PDA computer system.

2.2.2 Data are collected along a series of parallel survey transects wherever possible. The length of each transect is variable and relates to the size of the survey area and other factors including ground conditions. A visual display allows accurate placing of transects and helps maintain the correct separation between adjacent traverses.

2.2.3 Data are not collected within fixed grids and data points are considered to be random even though the data are collected in a systematic manner covering all accessible areas (Aspinall, Gaffney and Schmidt, 2009).

2.3 Data processing and presentation

2.3.1 Magnetic data collected by the MAGNETO®MXPDA cart-based system are initially prepared using SENSYS MAGNETO®DLMGPS software. Survey tracks are analysed and georeferenced raw data (UTM Z30N) are then exported in ASCII format for further analysis and display using TerraSurveyor.

2.3.2 The data are collected between limits of ±10000nT and clipped for display at ±3nT. Data are interpolated to a resolution of effectively 0.5m between tracks and 0.12m along each survey track. A zero median traverse function is required in order to remove fixed offset values present within the sensors which do not undergo a zeroing procedure in the field. The approach ensures that the gradiometer sensors are very accurately aligned and fixed to the vertical magnetic field and are not influenced by localised magnetic fields or disturbed by vibration. Although a zero median traverse algorithm can remove anomalies aligned with the survey tracks, in practice this rarely occurs due to the use of long traverses, high resolution measurement and variability within the magnetic susceptibility of long linear features.

2.3.3 Appendix C contains metadata concerning the survey and data attributes and is derived directly from TerraSurveyor. Reference should be made to Appendix B for further information on any processes, such as clipping, carried out on the data. An unfiltered image is shown in Fig 03, with a filtered image displayed in Figs 05 & 07, where a high pass filter is applied to smooth data and remove slight variations along survey tracks.

2.3.4 A TIF file is produced by TerraSurveyor software along with an associated world file (.TFW) that allows automatic georeferencing (OSGB36 datum) when using GIS or CAD software. The main form of data display used in the report is the filtered greyscale plot.

2.3.5 The raster images are combined with base mapping using ProgeCAD Professional 2014, creating DWG file formats. All images are externally

referenced to the CAD drawing in order to maintain good graphical quality. The CAD plots are effectively georeferenced facilitating relocation of features using GPS, resection method, etc.

2.3.6 An abstraction and interpretation is offered for all geophysical anomalies located by the survey. Anomalies are abstracted using colour coded points, lines and polygons. All plots are scaled to landscape A3 for paper printing. A brief summary of each anomaly, with an appropriate reference number, is set out in list form within the results (Section 3) to allow a rapid and objective assessment of features within each survey area.

2.3.7 A digital archive is produced with this report, see Appendix D below. The main archive is held at the offices of Archaeological Surveys Ltd.

3 RESULTS

3.1 General assessment of survey results

3.1.1 The detailed magnetic survey was carried out over a total of two survey areas covering approximately 10ha.

3.1.2 Magnetic anomalies located can be generally classified as positive and negative anomalies of an uncertain origin, anomalies associated with land management, areas of magnetic debris and disturbance, strong discrete dipolar anomalies relating to ferrous objects and strong multiple dipolar linear anomalies relating to buried services or pipelines. Anomalies located within each survey area have been numbered and are described below in 3.4 and 3.5.

3.2 Statement of data quality

3.2.1 Data are considered representative of the magnetic anomalies present within the site. There are no significant defects within the dataset. Rapid temperature change within a small part of Area 2, due to the weather conditions, has created several weak linear anomalies along the line of the survey tracks near the western boundary. These were removed using a high pass filter. The processing has not removed any anomalies of archaeological potential.

3.3 Data interpretation

3.3.1 The list of sub-headings below attempts to define a number of separate categories that reflect the range and type of features located during the survey. A basic explanation of the characteristics of the magnetic anomalies is set out for each category in order to justify interpretation, a basic key is indicated to allow cross referencing to the abstraction and interpretation plot. CAD layer names are included to aid reference to associated digital files

(.dwg/.dxf). Sub-headings are then used to group anomalies with similar characteristics for each survey area.

Report sub-heading CAD layer names and plot colour	Description and origin of anomalies
Anomalies with an uncertain origin AS-ABST MAG POS LINEAR UNCERTAIN AS-ABST MAG NEG LINEAR UNCERTAIN AS-ABST MAG POS DISCRETE UNCERTAIN AS-ABST MAG POS UNCERTAIN	The category applies to a range of anomalies where there is not enough evidence to confidently suggest an origin. Anomalies in this category may well be related to archaeologically significant features, but equally relatively modern features, geological/pedological features and agricultural features should be considered. Positive anomalies are indicative of magnetically enhanced soils that may form the fill of 'cut' features or may be produced by accumulation within layers or 'earthwork' features; soils subject to burning may also produce positive anomalies. Negative anomalies are produced by material of comparatively low magnetic susceptibility such as stone and subsoil.
Anomalies relating to land management AS-ABST MAG BOUNDARY AS-ABST MAG LAND DRAIN	Anomalies are mainly linear and may be indicative of the magnetically enhanced fill of cut features (i.e. ditches). The anomalies may be long and/or form rectilinear elements and they may relate to topographic features or be visible on early mapping. Associated agricultural anomalies (e.g. headlands, plough marks and former ridge and furrow) may support the interpretation. Land drains can appear in a classic herringbone pattern of interconnected multiple dipolar linear anomalies, or as parallel linear anomalies. The multiple dipolar response indicates a ceramic land drain.
Anomalies associated with magnetic debris AS-ABST MAG DEBRIS AS-ABST MAG STRONG DIPOLAR	Magnetic debris often appears as areas containing many small dipolar anomalies that may range from weak to very strong in magnitude. It often occurs where there has been dumping or ground make-up and is related to magnetically thermoremnant materials such as brick or tile or other small fragments of ferrous material. This type of response is occasionally associated with kilns, furnace structures, or hearths and may therefore be archaeologically significant. It is also possible that the response may be caused by natural material such as certain gravels and fragments of igneous or metamorphic rock. Strong discrete dipolar anomalies are responses to ferrous objects within the topsoil.
Anomalies with a modern origin AS-ABST MAG DISTURBANCE AS-ABST MAG SERVICE	The magnetic response is often strong and dipolar indicative of ferrous material and may be associated with extant above surface features such as wire fencing, cables, pylons etc.. Often a significant area around such features has a strong magnetic flux which may create magnetic disturbance; such disturbance can effectively obscure low magnitude anomalies if they are present. Fluxgate sensors may respond erratically and with hysteresis adjacent to strong magnetic sources. Buried services may produce characteristic multiple dipolar anomalies dependant upon their construction.
Anomalies with a natural origin AS-ABST MAG NATURAL FEATURES	Naturally formed magnetic anomalies are are caused by localised variability in the magnetic susceptibility of soils, subsoils and other drift or solid geologies. Anomalies may be amorphous, linear or curvilinear and may appear 'fluvial' or discrete; the latter are almost impossible to distinguished from pit-like anomalies with an anthropogenic origin. Fluvial, glacial and periglacial processes may be responsible for their formation within drift material and subsoil. Igneous and metamorphic activity can lead to anomalies within more solid geology.

Table 1: List and description of interpretation categories

3.4 List of anomalies - Area 1

Area centred on OS NGR 379120 340120, see Figures 03 – 06.

Anomalies with an uncertain origin

(1) – A positive anomaly is located on the top of, and along the eastern slope of a large mound within the survey area. The anomaly is oriented along the long axis of the mound; however, it is not possible to determine if it is a naturally formed feature, or if it has an anthropogenic origin.

(2) – A positive anomaly extends down the south eastern long tail of the mound and beyond it for approximately 150m in total. It is very weak (<1nT) and indistinct, and it is not possible to determine if it has a natural or anthropogenic origin. Several other positive responses are also located in the vicinity.

(3) – A positive response, similar to anomaly (2) extends partly down the northern slope of the large mound. A negative linear anomaly is located adjacent to it, with a number of positive and negative responses to the south, within the area of the mound. The origin of the anomalies is uncertain.

(4) – Three discrete positive responses are located just to the west of the crest of the mound within the field. They appear as an irregular line of three pit-like responses and it is possible that they are anthropogenic in origin.

(5) – A number of discrete positive responses, one is within the north eastern part of the mound. It is possible that these relate to pit-like responses that may have an anthropogenic origin, and an association with anomalies (4) should be considered.

(6) – Two discrete positive responses are located at the western edge of the survey area. They have a similar orientation to anomalies (4) and (5) and an association is possible.

(7) – A group of positive linear, curvilinear, amorphous and discrete responses are located in the northern and north eastern part of the survey area. Although this type of response may indicate cut features, such as ditches and pits, there is no coherent morphology or pattern. It is possible that some of the responses are associated with a buried pipe.

(8) – In the northern part of the survey area are a number of negative linear anomalies. This type of response may indicate a drainage channel or pipe.

(9) – The survey area contains a small number of short, weakly positive responses with no definable pattern or morphology. It is not possible, therefore, to determine if they relate to cut features.

Anomalies associated with magnetic debris

(10) – A patch of strongly magnetic debris is located close to the north western corner of the survey area. This is response to ferrous and other magnetically thermoremnant material that has been used to infill a former pond.

(11) – The survey area contains a number of patches of magnetic debris. These responses are generally associated with magnetically thermoremnant material that has been used to consolidate and infill damp areas of ground.

(12) – The site contains widespread and numerous strong, discrete, dipolar anomalies which are a response to ferrous and other magnetically thermoremnant objects within the topsoil.

Anomalies with a modern origin

(13) – Towards the north western corner of the survey area is a strong, multiple dipolar, linear anomaly that appears to indicate a buried service or pipe that stops abruptly, or continues with a non-magnetic material adjacent to the northern field boundary.

(14) – Two buried services or pipes are located in the southern part of the site. One crosses the south western corner, the other extends around the southern edge of the field, possibly continuing up the eastern edge of the field, just beyond the limit of the survey area.

(15) – A strong magnetic response is located in the northern part of the survey area and appears to relate to a large buried ferrous object. It is possible that it is associated with a buried service or pipe.

3.5 List of anomalies - Area 2

Area centred on OS NGR 379305 340375, see Figures 03, 04, 07 & 08.

Anomalies with an uncertain origin

(16) – In the western part of the field is what appears to be three sides of a weakly positive rectilinear anomaly with a response of 0.6nT. This type of response may indicate a former enclosure.

(17) – Positive responses and a negative linear anomaly are located within and to the east of the north eastern part of anomaly (16). However, it is not possible to determine if these relate to naturally or anthropogenically formed features.

(18) – A narrow, weakly positive, linear anomaly extends across the western part of the survey area. It is broadly parallel with, and 105m south of anomaly (22);

however, no field boundary has been mapped in this position. It is possible that it is associated with a buried service or pipe.

(19) – A number of positive linear anomalies are located within the southern part of anomaly (16), within a zone of magnetically variable responses (25). It is possible that these relate to naturally formed features, although their linearity may indicate an anthropogenic origin.

(20) – Two short, weakly positive linear anomalies are located to the east of and parallel with anomaly (21). It is possible that they are associated.

Anomalies associated with land management

(21) – A weakly positive linear anomaly appears to relate to a former field boundary mapped between 1880 and 1960, but removed by 1995.

(22) – A positive linear anomaly extends across the eastern part of the survey area and relates to a former field boundary, mapped between 1880 and 1925, but removed by 1960.

(23) – The survey area contains a number of weak, multiple dipolar, linear anomalies which are a response to terracotta land drains. A series of them can be seen towards the north eastern corner of the field in an area containing peat deposits.

Anomalies associated with magnetic debris

(24) – The survey area contains a large number of bands of magnetic debris that extend along the long axis of the field. This type of response indicates magnetically thermoremant material that has been spread within the field, presumably within the process of manuring.

Anomalies with a natural origin

(25) – A zone of magnetically variable response appears to be contained within the confines of anomaly (16), but may relate to natural variations within the underlying geology.

Anomalies with a modern origin

(26) – A number of strong, multiple dipolar, linear anomalies are located within the western part of the survey area. They appear to converge or join, and it seems that they relate to buried services or pipes.

4 CONCLUSION

4.1.1 The detailed magnetometer survey was carried out within two fields covering approximately 10ha in total. The western field, Area 1, contains a mound with a maximum extent of 145m by 80m, and approximately 3m high. The results show a positive response at the crest of the mound, and extending partly along the eastern edge. A broad, weakly positive linear response appears to extend from the south eastern edge of the mound, with another along the north eastern edge. These anomalies appear to be associated with the mound, but their origin is not certain. There are also two groups of pit-like responses on or immediately adjacent to the mound.

4.1.2 Within the eastern part of the site, Area 2 contains a weakly positive rectilinear anomaly. This appears to surround a number of positive and magnetically variable responses, some or all of which may relate to naturally formed features. However, the rectilinear anomaly has elements that are parallel with the surrounding field boundaries and an anthropogenic origin should be considered. Two formerly mapped field boundaries, removed during the 20th century have also been located, together with a number of land drains and buried services.

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Appendix A – basic principles of magnetic survey

Iron minerals are always present to some degree within the topsoil and enhancement associated with human activity is related to increases in the level of magnetic susceptibility and thermoremnant material.

Magnetic susceptibility is an induced magnetism within a material when it is in the presence of a magnetic field. This can be thought of as effectively permanent due to the presence of the Earth's magnetic field.

Thermoremnant magnetism occurs when ferrous material is heated beyond a specific temperature known as the Curie Point. Demagnetisation occurs at this temperature with re-magnetisation by the Earth's magnetic field upon cooling.

Enhancement of magnetic susceptibility can occur in areas subject to burning and complex fermentation processes on biological material; these are frequently associated with human settlement. Thermoremnant features include ovens, hearths, and kilns. In addition thermoremnant material such as tile and brick may also be associated with human activity and settlement.

Silting and deliberate infilling of ditches and pits with magnetically enhanced soil can create an area of enhancement compared with surrounding soils and subsoils into which the feature is cut. Mapping enhanced areas will produce linear and discrete anomalies allowing an assessment and characterisation of hidden subsurface features.

It should be noted that areas of negative enhancement can be produced from material having lower magnetic properties compared to the topsoil. This is common for many sedimentary bedrocks and subsoils which were often used in the construction of banks and walls etc. Mapping these 'negative' anomalies may also reveal archaeological features.

Magnetic survey or magnetometry can be carried out using a fluxgate gradiometer and may be referred to as gradiometry. The SENSYS gradiometer is a passive instrument consisting of two fluxgate sensors mounted vertically 65cm apart. The instrument is carried about 10-20cm above the ground surface and the upper sensor measures the Earth's magnetic field as does the lower sensor but this is influenced to a greater degree by any localised buried field. The difference between the two sensors will relate to the strength the magnetic field created by the buried feature.

There are a number of factors that may affect the magnetic survey and these include soil type, local geology and previous human activity. Situations arise where magnetic disturbance associated with modern services, metal fencing, dumped waste material etc., obscures low magnitude fields associated with archaeological features.

Appendix B – data processing notes

Clipping

Minimum and maximum values are set and replace data outside of the range with those values. Extreme values are removed improving colour or greyscale contrast associated with data values that may be archaeologically significant. It has been found that clipping data to ranges between ±20nT and ±10nT often improves the appearance of features associated with archaeology. Different ranges are applied to data in order to determine the most suitable for anomaly abstraction and display.

Zero (destripe) Median/Mean Traverse

The median (or mean) of each traverse is calculated ignoring data outside a threshold value, the median (or mean) is then subtracted from the traverse. The process is used to equalise differences between the baseline value of gradiometer sensors.

High Pass Filtering

A mathematical process used to remove low frequency anomalies relating to survey tracks and modern agricultural features.

Appendix C – survey and data information

Area 1

COMPOSITE
Filename: J600-mag-Area1-proc.xcp
Description: Imported as Composite from: J600-mag-Area1.asc
Instrument Type: Sensys DLMGPS
Units: nT
UTM Zone: 30U
Survey corner coordinates (X/Y): OSGB36
Northwest corner: 378975.273399734, 340329.709762393 m
Southeast corner: 379264.593399734, 339909.589762393 m
Collection Method: Randomised
Sensors: 5
Dummy Value: 32702

Source GPS Points: 1348300

Dimensions
Composite Size (readings): 2411 x 3501
Survey Size (meters): 289 m x 420 m
Grid Size: 289 m x 420 m
X Interval: 0.12 m
Y Interval: 0.12 m

Stats
Max: 3.32
Min: -3.30
Std Dev: 1.28
Mean: 0.01
Median: 0.00
Composite Area: 12.155 ha
Surveyed Area: 3.5747 ha

PROGRAM
Name: TerraSurveyor
Version: 3.0.23.0

Processes: 1
1 Base Layer

GPS based Proce4
1 Base Layer.
2 Unit Conversion Layer (to OSGB36).
3 DeStripe Median Traverse:
4 Clip from -3.00 to 3.00 nT

Area 1 – filtered data

COMPOSITE
Filename: J600-mag-Area1-proc-hpf.xcp
Description: Imported as Composite from: J600-mag-Area1.asc
Instrument Type: Sensys DLMGPS
Units: nT
UTM Zone: 30U
Survey corner coordinates (X/Y): OSGB36
Northwest corner: 378975.273399734, 340329.709762393 m
Southeast corner: 379264.593399734, 339909.589762393 m
Collection Method: Randomised
Sensors: 5
Dummy Value: 32702

Source GPS Points: 1348300

Dimensions
Composite Size (readings): 2411 x 3501
Survey Size (meters): 289 m x 420 m
Grid Size: 289 m x 420 m
X Interval: 0.12 m
Y Interval: 0.12 m

Stats
Max: 3.00
Min: -3.00
Std Dev: 1.03
Mean: 0.02
Median: 0.00
Composite Area: 12.155 ha
Surveyed Area: 3.5747 ha

Processes: 2
1 Base Layer
2 Clip from -3.00 to 3.00 nT

GPS based Proce5
1 Base Layer.
2 Unit Conversion Layer (Lat/Long to OSGB36).
3 DeStripe Median Traverse:
4 Clip from -3.00 to 3.00 nT
5 High pass Uniform (median) filter: Window dia: 250

Area 2

COMPOSITE
Filename: J600-mag-Area2.xcp
Description: Imported as Composite from: J600-mag-Area2.asc
Instrument Type: Sensys DLMGPS
Units: nT
UTM Zone: 30U
Survey corner coordinates (X/Y):OSGB36
Northwest corner: 379079.79758759, 340522.269054532 m
Southeast corner: 379433.43758759, 340177.389054532 m
Collection Method: Randomised
Sensors: 5
Dummy Value: 32702

Source GPS Points: 1436700

Dimensions
Composite Size (readings): 2947 x 2874
Survey Size (meters): 354 m x 345 m
Grid Size: 354 m x 345 m
X Interval: 0.12 m
Y Interval: 0.12 m

Stats
Max: 3.32
Min: -3.30
Std Dev: 1.23
Mean: 0.01
Median: 0.01
Composite Area: 12.196 ha
Surveyed Area: 5.1949 ha

Processes: 1
1 Base Layer

GPS based Proce4
1 Base Layer.
2 Unit Conversion Layer (Lat/Long to OSGB36).
3 DeStripe Median Traverse:
4 Clip from -3.00 to 3.00 nT

Area 2 - filtered data

COMPOSITE
Filename: J600-mag-Area2-proc-hpf.xcp
Description: Imported as Composite from: J600-mag-Area2.asc
Instrument Type: Sensys DLMGPS
Units: nT
UTM Zone: 30U
Survey corner coordinates (X/Y):OSGB36
Northwest corner: 379079.697587566, 340522.369054556 m
Southeast corner: 379433.547587566, 340177.219054556 m
Collection Method: Randomised
Sensors: 5
Dummy Value: 32702

Source GPS Points: 1436700

Dimensions
Composite Size (readings): 2359 x 2301
Survey Size (meters): 354 m x 345 m
Grid Size: 354 m x 345 m
X Interval: 0.15 m
Y Interval: 0.15 m

Stats
Max: 3.00
Min: -3.00
Std Dev: 1.04
Mean: 0.02
Median: 0.01
Composite Area: 12.213 ha
Surveyed Area: 5.1936 ha

Processes: 2
1 Base Layer
2 Clip from -3.00 to 3.00 nT

GPS based Proce5
1 Base Layer.
2 Unit Conversion Layer (Lat/Long to OSGB36).
3 DeStripe Median Traverse:
4 Clip from -3.00 to 3.00 nT
5 High pass Uniform (median) filter: Window dia: 300

Appendix D – digital archive

Archaeological Surveys Ltd hold the primary digital archive at their offices in Wiltshire. Data are backed-up onto an on-site data storage drive and at the earliest opportunity data are copied to CD ROM for storage on-site and off-site.

A copy of the report, together with a PDF copy on CD will supplied to the Staffordshire County Council Principal Archaeologist. The report will be accompanied by the Activity Sources Submission Form for the Staffordshire County Council Historic Environment Record. A submission of the report will also be made to Online AccesS to the Index of archaeological investigationS (OASIS). A short summary of the work will also be submitted for inclusion in the next edition of West Midlands Archaeology.

Archive contents:

Geophysical data Area 1 - path: J600 Baldwins's Gate\Data				
Path and Filename	**Software**	**Description**	**Date**	**Creator**
baldwin1\MX\ .prm .dgb .disp	Sensys MXPDA	Proprietary data formats representing magnetometer survey traverses logged to a PDA. Three files for each traverse with numerical prefix representing date and time.	26/03/15	D.J.Sabin
baldwin1\MX\J600-mag-Area1.asc	Sensys DLMGPS	ASCII CSV (tab) file representing survey Area 1 in eastings, northings (UTM Z30N), magnetic measurement, traverse file and sensor number.		D.J.Sabin
Area1\comps\J600-mag-Area1.xcp	TerraSurveyor 3.0.23.0	Composite data file derived from ASCII CSV.		D.J.Sabin
Area1\comps\J600-mag-Area1-proc.xcp	TerraSurveyor 3.0.23.0	Processed composite data file (zmt and clipping to ±3nT).		D.J.Sabin
Area1\comps\J600-mag-Area1-proc-hpf.xcp	TerraSurveyor 3.0.23.0	Processed composite data file (zmt and clipping to ±3nT and high pass filter applied).		K. T. Donaldson
Geophysical data Area 2 - path: J600 Baldwins's Gate\Data				
baldwin2\MX\ .prm .dgb .disp	Sensys MXPDA	Proprietary data formats representing magnetometer survey traverses logged to a PDA. Three files for each traverse with numerical prefix representing date and time.	26/03/15	D.J.Sabin
baldwin2\MX\J600-mag-Area2.asc	Sensys DLMGPS	ASCII CSV (tab) file representing survey Area 2 in eastings, northings (UTM Z30N), magnetic measurement, traverse file and sensor number.		D.J.Sabin
Area2\comps\J600-mag-Area2.xcp	TerraSurveyor 3.0.23.0	Composite data file derived from ASCII CSV.		D.J.Sabin
Area2\comps\J600-mag-Area2-proc.xcp	TerraSurveyor 3.0.23.0	Processed composite data file (zmt and clipping to ±3nT).		D.J.Sabin
Area2\comps\J600-mag-Area2-proc-hpf.xcp	TerraSurveyor 3.0.23.0	Processed composite data file (zmt and clipping to ±3nT and high pass filter applied).		K. T. Donaldson
Graphic data - path: J600 Baldwins's Gate\Data				
Area1\graphics\ J600-mag-proc.tif	TerraSurveyor 3.0.23.0	TIF file showing a minimally processed greyscale plot clipped to ±3nT.		K.T.Donaldson
Area1\graphics\ J600-mag-proc.tfw	TerraSurveyor 3.0.23.0	World file for georeferencing TIF to OSGB36.		K.T.Donaldson
Area1\comps\J600-mag-Area1-proc-hpf.xcp	TerraSurveyor 3.0.23.0	Processed composite data file (zmt and clipping to ±3nT and high pass filter applied).		K. T. Donaldson
Area1\graphics\ J600-mag-proc-hpf.tfw	TerraSurveyor 3.0.23.0	World file for georeferencing TIF to OSGB36.		K.T.Donaldson

Area2\graphics\ J600-mag-proc.tif	TerraSurveyor 3.0.23.0	TIF file showing a minimally processed greyscale plot clipped to ±3nT.		K.T.Donaldson
Area2\graphics\ J600-mag-proc.tfw	TerraSurveyor 3.0.23.0	World file for georeferencing TIF to OSGB36.		K.T.Donaldson
Area2\comps\J600-mag-Area2-proc-hpf.xcp	TerraSurveyor 3.0.23.0	Processed composite data file (zmt and clipping to ±3nT and high pass filter applied).		K. T. Donaldson
Area2\graphics\ J600-mag-proc-hpf.tfw	TerraSurveyor 3.0.23.0	World file for georeferencing TIF to OSGB36.		K.T.Donaldson
CAD data - path: J600 Baldwins's Gate\CAD				
J600 version 1.dwg	ProgeCAD 2014	CAD file for creating plots of greyscales, abstraction, interpretation and mapping. Grid coordinates as OSGB. AutoCAD 2010 format.		K.T.Donaldson
Text data - path: J600 Baldwins's Gate\Documentation				
J600 report.odt	OpenOffice.org 3.0.1 Writer	Report text as an Open Office document.		K.T.Donaldson

Appendix E – copyright and intellectual property

Appendix F.
Staffordshire County Council Sites and Monuments Record
Activity and Source Submission Form.

Submission date -

Site Activity or Event

Name of **event**

Geophysical survey

Location of **event**

Baldwin's Gate Farm, Baldwin's Gate, Staffordshire

NGR SJ 792 402

Civil Parish

Whitmore

Brief Description of **event**

Detailed magnetometer survey undertaken over 10ha within two fields to the north and east of Sandyfields Estate, Bishop's Gate Farm.

"Activity Type(s)" (highlight as appropriate) *Air Photography / Evaluation-trial excavation / Field Walking / Measured survey-drawing / Geophysical survey / Archaeological excavation-full / Archaeological excavation-part / Field survey / Photogrammetric survey / Rectified photo survey / Photographic record /AP interpretation / Salvage-rescue excavation / Watching brief / Environmental sampling / Post-excavation analysis / Documentary research*

Commencement date (eg. 01-May-1978)

25-March-2015

Completion date (eg. 02-Sept-1983)

27-March-2015

Organisation or contractor details (organisation name, address, telephone, e-mail etc.)

Archaeological Surveys Ltd
1 West Nolands, Nolands Road, Yatesbury, Calne, Wiltshire, SN11 8YD
01249 814231
info@archaeological-surveys.co.uk

Report Details

Date

April 2015

Type of document (highlight as appropriate) *Written / Photographic / Cartographic / Drawn*

Title

Baldwin's Gate Farm, Baldwin's Gate, Staffordshire, Magnetometer Survey Report

Author(s)

Donaldson, K. & Sabin, D.

Brief summary of contents

The results show a number of positive responses, some associated with an elongated mound that exists within the western part of the site, and others forming a possible rectilinear feature in the eastern part of the site. A number of field boundaries, services and land drains have also been located.

Brief description of document (eg. Written text with illustrations, bibliography and references. Appendices dealing with environmental sampling. 32 pages. *etc*.)

PDF written report with 17 A4 pages and 8 A3 figures

Cross references to Staffordshire SMR (if applicable please list Primary record numbers)

OASIS DATA COLLECTION FORM: England

Printable version

OASIS ID: archaeol20-208667

Project details

Project name	Baldwin's Gate Farm, Baldwin's Gate, Staffordshire, Magnetometer Survey Report
Short description of the project	A detailed magnetometer survey was carried out by Archaeological Surveys Ltd over 10ha at Baldwin's Gate Farm, Whitmore, Staffordshire. The survey was requested by Richborough Estates Ltd and carried out in accordance with a brief issued by the county Principal Archaeologist. The western part of the site, Area 1, contains an elongated mound, broader at its northern end and rising to 3m in height. The results show positive responses at the summit of this mound and extending along the north eastern side of the mound. Another broad, weak linear response extends for 145m from the mound towards the south eastern corner of the field. Other positive and negative responses can also be seen in the vicinity of the mound, including two series of pit-like anomalies, one close to the crest of the mound and one further to the north. Within the eastern part of the site, Area 2 contains what appears to be three sides of a rectilinear feature, possibly surrounding natural responses. The rectilinear anomaly has eastern and western sides that are parallel with existing and former land boundaries, and association is possible. Two formerly mapped field boundaries have also been located. Widespread magnetic debris, presumably introduced through manuring, and a number of land drains have also been located.
Project dates	Start: 25-03-2015 End: 27-03-2015
Previous/future work	Not known / Not known
Type of project	Field evaluation
Monument type	NONE None
Significant Finds	NONE None
Methods & techniques	"Geophysical Survey"
Development type	Housing estate
Prompt	Planning condition
Position in the planning process	After full determination (eg. As a condition)
Solid geology	PERMIAN AND TRIASSIC SANDSTONES - UNDIFFERENTIATED
Drift geology	PEAT
Drift geology	GLACIAL SAND AND GRAVEL
Techniques	Magnetometry

Project location

Country	England
Site location	STAFFORDSHIRE NEWCASTLE UNDER LYME WHITMORE Baldwin's Gate Farm, Baldwin's Gate, Staffordshire
Study area	10.00 Hectares
Site coordinates	SJ 792 402 52.9584541908 -2.30967027667 52 57 30 N 002 18 34 W Point

Project creators

Name of Organisation	Archaeological Surveys Ltd
Project brief originator	Staffordshire County Council Principal Archaeologist
Project design originator	Archaeological Surveys Ltd
Project director/manager	Archaeological Surveys Ltd
Project supervisor	Archaeological Surveys Ltd

Project archives

Physical Archive Exists?	No
Digital Archive recipient	Archaeological Surveys Ltd
Digital Contents	"Survey"
Digital Media available	"Geophysics"
Paper Archive Exists?	No

Project bibliography 1

Publication type	Grey literature (unpublished document/manuscript)
Title	Baldwin's Gate Farm, Baldwin's Gate, Staffordshire, Magnetometer Survey Report
Author(s)/Editor(s)	Donaldson, K and Sabin, D.
Other bibliographic details	Report ref 600
Date	2015
Issuer or publisher	Archaeological Surveys Ltd
Place of issue or publication	Yatesbury

Entered by	Kerry Donaldson (kerry.donaldson@archaeological-surveys.co.uk)
Entered on	13 April 2015

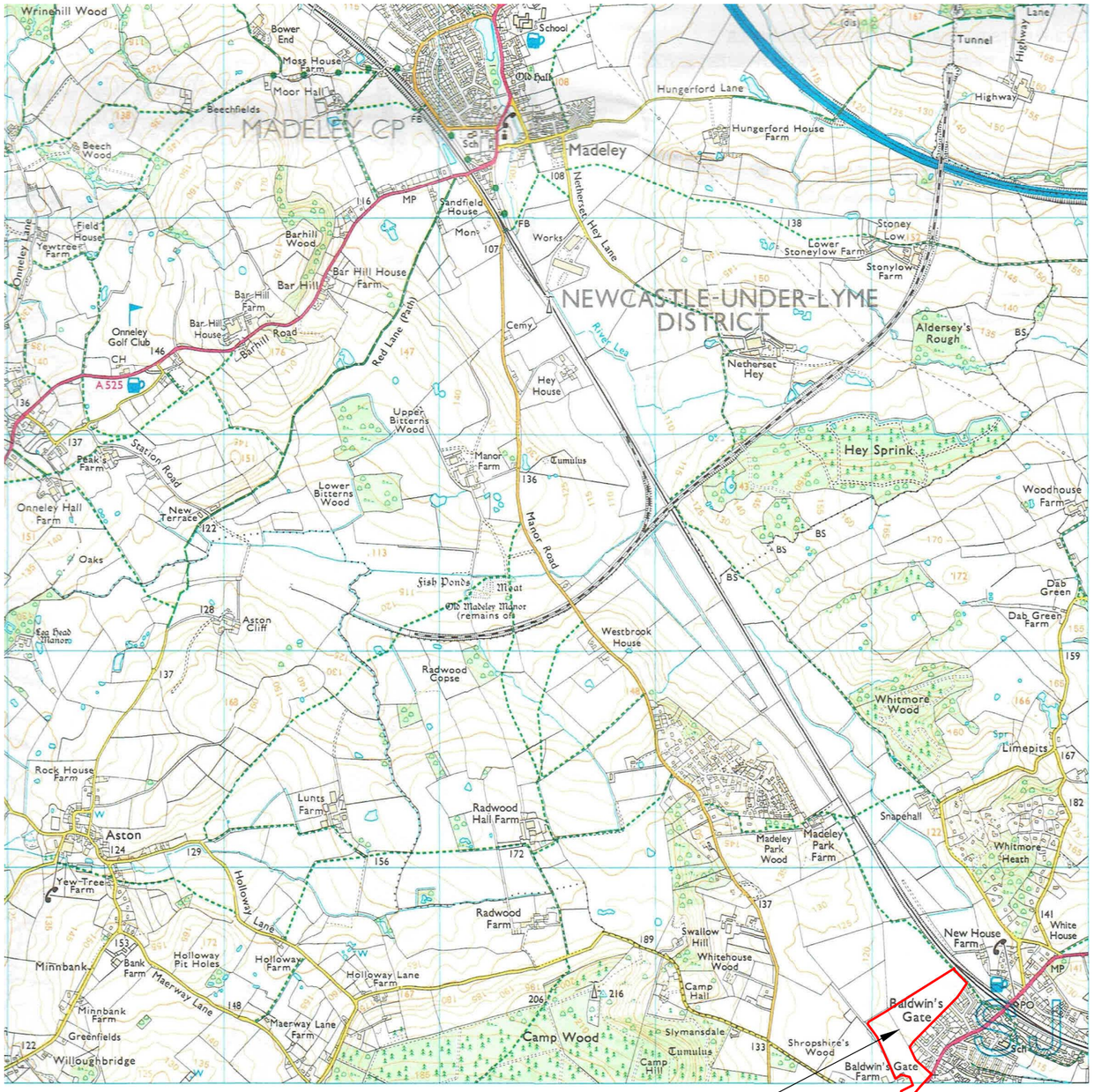
OASIS:

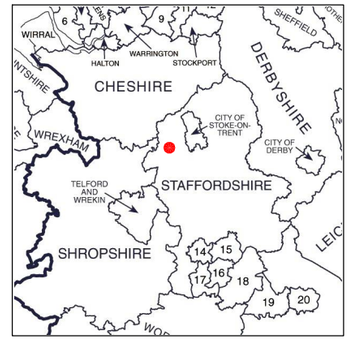
Please e-mail Historic England for OASIS help and advice
 Created by Jo Gilham and Jen Mitcham, email Last modified Wednesday 9 May 2012
Cite only: http://www.oasis.ac.uk/form/print.cfm for this page

Archaeological Surveys Ltd

Geophysical Survey
Baldwin's Gate Farm
Baldwin's Gate
Staffordshire

Map of survey area





Survey location

Site centred on OS NGR
SJ 79120 40120

SCALE 1:25 000

0m 500m 1000m

SCALE TRUE AT A3

FIG 01

Archaeological Surveys Ltd

Geophysical Survey
Baldwin's Gate Farm
Baldwin's Gate
Staffordshire

Referencing information

Referencing grid to OSGB36 datum at 100m intervals

Data collected at 20Hz and georeferenced to ETRS89 zone 30 with conversion to OSGB36 using OSTN02

● 379200 340000

SCALE 1:2500

0m 50 100m

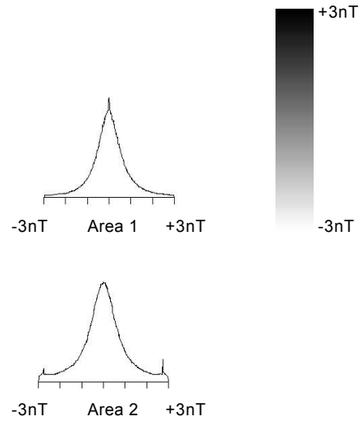
SCALE TRUE AT A3

FIG 02

Archaeological Surveys Ltd

Geophysical Survey
Baldwin's Gate Farm
Baldwin's Gate
Staffordshire

Greyscale plot of minimally processed magnetometer data



SCALE 1:2500

0m 50 100m

SCALE TRUE AT A3

FIG 03

Archaeological Surveys Ltd

Geophysical Survey
Baldwin's Gate Farm
Baldwin's Gate
Staffordshire

Abstraction and interpretation of magnetometer anomalies with contours

- Positive linear anomaly - possible ditch-like feature
- Positive linear anomaly - possible land drain
- Positive linear anomaly - possible former field boundary
- Negative linear anomaly - material of low magnetic susceptibility
- Discrete positive response - possible pit-like feature
- Positive anomaly - magnetically enhanced material
- Variable magnetic response - of natural origin
- Magnetic debris - spread of magnetically thermoremnant/ferrous material
- Magnetic disturbance from ferrous material
- Strong multiple dipolar linear anomaly - pipeline / cable / service
- Strong dipolar anomaly - ferrous object

SCALE 1:2500

0m 50 100m

SCALE TRUE AT A3

FIG 04

Area 1

Aulfield
Kifissia
Brockenhurst
Ashenden
Briar Lodge
N
Monte-Vista
Martin House
Borrowdale
Long Meadow
Green Nook
Danianne
Cherry Cottage
Ruthen
Meriden
Heather Round
Greenhills
The Croft
Hafod
SANDYFIELDS
Three Ways
Fawn Thatch
Hunters Croft
117.7m
Quest Cottage
Meadowcroft
Pine Croft
Griffin House
Tan-Y-Moy
LB
Ashlyn
Fairview
119.1m
A 53
Silo
Baldwin's Gate Farm
121.2m
Holmcroft

Archaeological Surveys Ltd

Geophysical Survey
Baldwin's Gate Farm
Baldwin's Gate
Staffordshire

Greyscale plot of filtered magnetometer data - Area 1

+3nT
-3nT
-3nT
+3nT

SCALE 1:1500

0m 10 20 30 40 50m

SCALE TRUE AT A3

FIG 05

Area 1

Archaeological Surveys Ltd

Geophysical Survey
Baldwin's Gate Farm
Baldwin's Gate
Staffordshire

Abstraction and interpretation of magnetometer anomalies - Area 1

- Positive linear anomaly - possible ditch-like feature
- Negative linear anomaly - material of low magnetic susceptibility
- Discrete positive response - possible pit-like feature
- Positive anomaly - magnetically enhanced material
- Magnetic debris - spread of magnetically thermoremnant/ferrous material
- Magnetic disturbance from ferrous material
- Strong dipolar anomaly - ferrous object
- Strong multiple dipolar linear anomaly - pipeline / cable / service

SCALE 1:1500

0m 10 20 30 40 50m

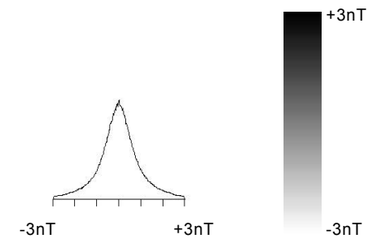
SCALE TRUE AT A3

FIG 06

Archaeological Surveys Ltd

Geophysical Survey
Baldwin's Gate Farm
Baldwin's Gate
Staffordshire

Greyscale plot of filtered magnetometer data - Area 2



Area 2

Area 1

N

HILLVIEW CRESCENT

GATEWAY AVENUE

Aulfield
Kilfissia
Brockenhurst
Ashenden
Normalyn
Ruthen
Berwyn
Oak Lodge
Meriden
Heather Round
Greenhills
Hunters Croft
Fawn Thatch
Three Ways
Briar Lodge
Monte-Vista
Martin House
Borrowdale
Long Meadow
Green Nook
Dorianne
Cherry Cottage
The Croft
Hafod
Meadowcroft
Pine Croft
Griffin House
Tan-Y-May
SANDYFIELDS
117.7m
Quest Cottage
LB

SCALE 1:1500

0m 10 20 30 40 50m

SCALE TRUE AT A3

FIG 07

Archaeological Surveys Ltd

Geophysical Survey
Baldwin's Gate Farm
Baldwin's Gate
Staffordshire

Abstraction and interpretation of magnetometer anomalies - Area 2

- Positive linear anomaly - possible ditch-like feature
- Positive linear anomaly - possible land drain
- Positive linear anomaly - possible former field boundary
- Discrete positive response - possible pit-like feature
- Positive anomaly - magnetically enhanced material
- Variable magnetic response - of natural origin
- Magnetic debris - spread of magnetically thermoremnant/ferrous material
- Magnetic disturbance from ferrous material
- Strong multiple dipolar linear anomaly - pipeline / cable / service
- Strong dipolar anomaly - ferrous object

SCALE 1:1500

0m 10 20 30 40 50m

SCALE TRUE AT A3

FIG 08