

**Land off The Forty/Chelworth Road
Cricklade
Wiltshire**

MAGNETOMETER SURVEY REPORT

for

Hannick Homes

Kerry Donaldson & David Sabin

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ARCHAEOLOGICAL SURVEYS LTD

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Hannick Homes

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Ordnance Survey Grid Reference – **SU 09345 93085 & SU 09615 93035**



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SUMMARY

A geophysical survey, comprising detailed magnetometry, was carried out within two areas of land to the south east of Cricklade, Wiltshire, ahead of the development of a new cemetery and housing. Both parts of the site contain evidence of former ridge and furrow cultivation and also a number of weakly positive linear and discrete anomalies; however, they generally lack a coherent morphology and cannot be confidently interpreted. The eastern area contains a number of positive curvilinear anomalies, that could be associated with the former location of animal feeders, but this is not certain.

1 INTRODUCTION

1.1 *Survey background*

- 1.1.1 Archaeological Surveys Ltd was commissioned by Landgate Heritage, on behalf of Hannick Homes, to undertake a magnetometer survey within two areas of land off The Forty and Chelworth Road, Cricklade, Wiltshire. The western part of the site off Chelworth Road (Area 1) has been outlined for a proposed development of a new cemetery and the eastern part off The Forty (Area 2) has been outlined for a proposed residential development. The survey forms part of an archaeological assessment.

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 Geophysical survey can provide useful information on the archaeological potential of a site; however, the outcome of any survey relies on a number of factors and as a consequence results can vary. The success in meeting the aims and objectives of a survey is, therefore, often impossible to predetermine.

1.3 *Standards, guidance and recommendations for the use of this report*

- 1.3.1 Archaeological Surveys Ltd is a Registered Organisation with the Chartered Institute for Archaeologists (CIfA) and both company directors are Members of the Chartered Institute for Archaeologists (MCIfA) and have therefore been assessed for their technical competence and ethical suitability and abide by the CIfA Codes of Conduct. The survey and report follow the recommendations set out by: European Archaeological Council (2015) Guidelines for the Use of Geophysics in Archaeology; 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, updated 2020) Standard and Guidance for
Archaeological Geophysical Survey.

- 1.3.2 Archaeological Surveys Ltd provide a detailed geophysical survey report and it is recommended that where possible the contents should be considered in full. The Summary provides a brief overview of the results with more detail available in the Discussion and/or Conclusion. The *List of anomalies* within the Results provides a detailed assessment of the anomalies within separate categories which can be useful in inferring a level of confidence to the interpretation. Quality and factors influencing the interpretation of anomalies is also set out within the results.
- 1.3.3 It is recommended that the full report should always be considered when using data and interpretation plots; where this is not possible, in the field for example, the abstraction and interpretation plots should retain their colour coding and be used with a corresponding legend.
- 1.3.4 Where targeting of anomalies by excavation is to be carried out, care should be taken to place trenches over solid lines or features visible on the abstraction and interpretation plots. Archaeological Surveys abstraction and interpretation avoids the use of dashed or dotted line formats, and broken or fragmented lines used in interpretive plots may well correspond closely with truncation of archaeological features.
- 1.3.5 Magnetic anomalies may relate to features within the topsoil, subsoil or within the underlying solid or superficial geology. Anomalies are created by contrasting magnetic susceptibility; however, this is not necessarily consistent with changes in soil texture or colour and may not be contained within well defined features. Magnetic contrast and the magnitude of anomalies does not necessarily correlate with the volume or thickness of magnetic material present. The vertical component of the magnetic field is measured by the magnetometer and this falls rapidly with distance from the sensor, it may not be possible to distinguish weak features within the topsoil from deeper features containing more magnetic material.
- 1.3.6 Interpretation of anomalies relies on detailed analysis of the data. The morphology of anomalies and their magnitude are important factors in the interpretation process. Wherever possible, supporting information is used, e.g. LiDAR, aerial photographs, early mapping and desk-based assessments. However, anomalies often cannot be confidently interpreted without intrusive investigation and as such are categorised as of uncertain origin; this classification may include anomalies relating to archaeological features.

1.4 *Site location, description and survey conditions*

- 1.4.1 The site comprises two survey areas: Area 1 lies within a pasture field to the north of Chelworth Road, on the south eastern side of Cricklade, and is centred on Ordnance Survey National Grid Reference (OS NGR) SU 09345

93085; Area 2 comprises a small land parcel, immediately south of The Forty, that was sub-divided into horse paddocks, with a larger pasture field to the south west, see Figs 01 and 02. The geophysical survey covers approximately 4.5ha with the two survey areas.

- 1.4.2 Area 1 slopes down gently to the east from approximately 86m AODN at the western corner to approximately 83m AODN near the south eastern corner. At the time of survey the ground was waterlogged. Areas of standing water and very rutted ground near the south eastern corner prevented survey over a very small zone. Area 2 slopes down very slightly towards the north east, the majority of the area is just over 80m AODN. The larger field within Area 2 contains ridge and furrow earthworks cut by a ditch orientated north east to south west. Both the furrows and ditch contained water at the time of survey with some small sections unsurveyable due to its depth, the western side of the field was flooded. The furrows also contained occasional thick and tall clumps of vegetation that impeded survey. The field is also crossed by electricity cables running north west to south east and there are several supporting poles. The smaller field forming the northern part of Area 2 was subdivided into three paddocks with electric fencing and wire netting, a small stable is located near the southern boundary. The land was very wet with waterlogged ground in the eastern paddock.
- 1.4.3 The ground conditions across the site were variable and frequently difficult to traverse due to waterlogged ground, areas of standing water, ruts, boggy ground and clumps of vegetation. Weather conditions during the survey were fine. A number of sources of magnetic disturbance were identified and include steel gates, wire fencing, electricity poles with associated steel fixings, troughs and a steel pipeline crossing the western part of Area 1.



Plate 1: Area 1 (western area) looking north west

1.5 *Site history and archaeological potential*

- 1.5.1 The survey areas do not contain any designated or undesignated heritage assets, although ridge and furrow is extant within the eastern part of the site (Area 2). This is bounded to the west by a branch of the Wilts & Berks Canal (MWI9472) and a drainage ditch cuts the ridge and furrow and extends towards the canal. A Romano-British ditch was identified through geophysical survey and excavation approximately 100m to the east of Area 2 (MWI74372), with a number of ditches (MWI75837, MWI75839) and a platform containing medieval or post medieval buildings (MWI75239) located 100m east of the northern part of Area 2. Immediately north of Area 2 was a post medieval cobbled floor associated with a 19th century farmstead (MWI75665 / MWI67518). Within the western survey area (Area 1) fragments of medieval pottery were recovered during work on the Esso Pipeline in 1985 (MWI9590).

1.6 *Geology and soils*

- 1.6.1 The underlying geology is mudstone from the Oxford Clay Formation (BGS, 2023).
- 1.6.2 The overlying soil in the western part of the site (Area 1) is from the Wickham 2 association (711f) and is a typical stagnogley soil. Within the eastern part of the site (Area 2) the soil is from the Denchworth Association (712b) which is a pelo-stagnogley and slowly permeable, seasonally waterlogged and clayey (Soil Survey of England and Wales, 1983).
- 1.6.3 The underlying geology and soils are frequently associated with low magnetic contrast and low levels of magnetic susceptibility. However, cut features of archaeological potential may be located where human activity has altered the magnetic characteristics of the soil sufficiently. 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 (also known as thermoremanence) are factors associated with the formation of localised magnetic fields.
- 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 positive magnetic anomalies that can be mapped by magnetic prospection. In addition, where soil is

displaced by material of comparatively low magnetic susceptibility, such as many types of sedimentary rock, anomalies of negative value may occur which could be indicative of structural remains.

- 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). Additional details are set out in 2.2 below and within Appendix A.

2.2 *Equipment configuration, data collection and survey detail*

- 2.2.1 The detailed magnetic survey was carried out using a SENSYS MAGNETO® MX V3 6 channel cart-based system. The instrument has 6 fluxgate gradiometers (FGM650) spaced 0.5m apart with readings recorded at 20Hz. The cart is pushed at walking speed and not towed. Each sensor is not zeroed in the field as the vertical axis alignment is precisely fixed leaving sensor offsets that are removed during data processing. The fixing of the vertical alignment ensures the sensors are not unduly influenced by localised magnetic fields and that the vertical component of a magnetic anomaly is measured. The gradiometers have a recorded range of ± 3000 nT, and resolution is approximately 0.1nT. They are linked to a Leica GS10 RTK GNSS with data recorded by SENSYS MonMX software on a rugged notebook computer system.
- 2.2.2 Due to the fixed offsets within the fluxgate sensors, as a result of the manufacturing and tensioning process, the survey data do not provide a visually useful dataset until a zero median traverse algorithm is applied. It is recognised that this has the potential to affect some anomalies detrimentally by removing linear features orientated parallel to survey transects. However, this has not been noted as a particular problem with the system due to the high resolution data collection, generally long length of traverses and variability within the magnetic characteristics of a linear anomaly.
- 2.2.3 Data are collected along a series of parallel survey transects to achieve 100% coverage of the surveyable land. 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. 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).

- 2.2.4 Fluxgate sensors are highly sensitive to temperature change and this manifests as drift during the course of a survey. This can be particularly noticeable during the morning as temperatures rise and the equipment warms or cools. Sensor drift within the course of a traverse will appear as a line trending from negative to positive after processing with a zero median traverse algorithm. To remove the potential for temperature drift, data were collected after a 20 minute stabilisation period and traverses were limited to a time of generally <100s.

2.3 *Data processing and presentation*

- 2.3.1 Magnetic data collected by the MAGNETO® MX V3 cart-based system are initially prepared using SENSYS MAGNETO® DLMGPS software. The software effectively allocates a geographic position for each data point and can compensate for fixed offsets present within the FGM650 sensors. The offsets are positive or negative values present on all fluxgate gradiometer sensors. Some systems use manual or electronic balancing to effectively zero the sensors; however, this is a short term measure that is prone to drift through temperature changes and vibration and can easily be incorrectly set due to localised magnetic fields. The FGM650 sensors are very accurately aligned to the vertical magnetic gradient and are highly stable showing negligible drift on long traverses. The offset values are removed using TerraSurveyor software.
- 2.3.2 Survey tracks are analysed and georeferenced raw data (UTM Z30N) are then exported in ASCII format for further analysis and display within TerraSurveyor. The removal of the offset values (compensation) of the sensors is also carried out in TerraSurveyor using a zero median traverse function. Data are then considered to be minimally processed. Note: without the zero median traverse function it is not possible to create a meaningful data plot as all sensors have a different offset value. 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 The minimally processed data are collected between limits of $\pm 3000\text{nT}$ and clipped for display at $\pm 3\text{nT}$. Data are interpolated to a resolution of effectively 0.5m between tracks and 0.15m along each survey track.
- 2.3.4 Additional data processing has been carried out in the form of high pass filtering. This effectively removes low frequency variation along a traverse that has been caused by large magnetic bodies, cultivation or rapid temperature change. Data treated to additional processing have been compared to unprocessed data to ensure that no significant anomalies have been removed.
- 2.3.5 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 processing.

- 2.3.6 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 minimally processed greyscale plot. Minimally processed data are considered by the manufacturer to be data that are compensated by SENSYS MAGNETO DLMGPS software, see 2.3.1 and 2.3.2. Note: traceplots are not considered to be appropriate as they do not provide an accurate or useful assessment of the magnetic anomalies due to the very high density of data collection. In addition, traceplots cannot be meaningfully plotted against base mapping and in areas of complexity traces may be lost or highly confused. Traceplots may be used to demonstrate characteristic magnetic profiles across discrete features where it is considered beneficial.
- 2.3.7 The raster images are combined with base mapping using ProgeCAD Professional 2021, creating DWG (2018) 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 GNSS, resection method, etc.
- 2.3.8 An abstraction and interpretation is drawn and plotted 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. Appendix E sets out CAD layer names with colour and graphic content for each interpretation category, see 3.3.
- 2.3.9 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.
- 2.3.10 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 4.5ha.
- 3.1.2 Magnetic anomalies located can be generally classified as positive and negative anomalies of an uncertain origin, anomalies associated with land management, linear anomalies of an agricultural origin, 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 in 3.4 and 3.5 below.

3.2 Data quality and factors affecting the interpretation or formation of anomalies

- 3.2.1 Data are considered representative of the magnetic anomalies present within the site. High magnitude magnetic anomalies have caused noise and disturbance to the data, predominantly within the vicinity of a large steel pipeline in Area 1. Additional high pass filtering has been used to suppress the disturbance and allow analysis of data recorded in close proximity to the pipe. Both filtered and unfiltered data are analysed and compared in order to ensure that the additional filtering has not obscured or altered archaeologically significant anomalies.
- 3.2.2 The survey located very few anomalies from which to make an informed assessment of the suitability of the soil and underlying geology for archaeological prospection. However, a number of anomalies of uncertain origin were located along with a response to former ridge and furrow cultivation; these anomalies infer some potential for useful magnetic contrast, although generally the conditions are likely to be poor.

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 general explanation of the characteristics of the magnetic anomalies is set out for each category in order to justify interpretation, see Table 1.

Interpretation category	Description and origin of anomalies
Anomalies with an uncertain origin	The category applies to a range of anomalies where <u>there is not enough evidence to confidently suggest an origin</u> . Anomalies in this category <u>may well be related to archaeologically significant features, but equally relatively modern features, geological/pedological features and agricultural features should be considered</u> . Morphology may be unclear or uncharacteristic and there may be a lack of additional supporting information. 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	Negative linear anomalies generally indicative of extant linear depressions and ditches associated with drainage.
Anomalies with an agricultural origin	The anomalies are often linear and form a series of parallel responses or are parallel to extant land boundaries. Where the response is broad, former ridge and furrow is likely; narrow response is often related to modern ploughing. This category <u>does not include</u> agricultural features of early date or considered to be of archaeological potential (e.g. animal stockades, enclosures, farmsteads, etc).
Anomalies associated with magnetic debris	Magnetic debris often appears as areas containing many small dipolar anomalies that may range from weak to very strong in magnitude. They often occur where there has been dumping or ground make-up and are related to magnetically thermoremanent materials such as brick or tile or other small fragments of ferrous material. This type of response is occasionally associated with kilns, furnace structures, hearths and nail spreads from former wooden structures or rooves and <u>may, therefore, be archaeologically significant</u> . Strong discrete dipolar anomalies are responses to ferrous objects within the topsoil.
Anomalies with a modern origin	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 these 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 adjacent to strong magnetic sources. Buried services may produce characteristic multiple dipolar anomalies dependant upon their construction.

Table 1: List and description of interpretation categories

3.4 List of anomalies - Area 1 (western area)

Area centred on OS NGR 409345 193085, see Figs 03 – 05.

Anomalies with an uncertain origin

(1) – Two parallel linear anomalies are located within the north western part of Area 1. They are close to, but at a slightly different orientation to, a zone of magnetic disturbance derived from the overhead electricity cables (6), and although it is possible that they relate to cut features, a linear feature, seen on LiDAR imagery extends through this part of the site and continues south westwards towards the row of late 20th century houses just to the north of the Chelworth Road. This indicates that they could be associated with a modern service, but this is uncertain.

(2) – The northern part of Area 1 contains a number of discrete positive responses, as well as several short, weakly positive linear responses and a negative linear anomaly. They do not have a clearly defined morphology, but it is possible that the discrete anomalies relate to cut, pit-like features.

Anomalies associated with land management

(3) – A negative linear anomaly extends across the south eastern part of Area 1. It has truncated the ridge and furrow and is associated with a shallow linear depression. It is possible that it is associated with land drainage or a possible buried service.

Anomalies with an agricultural origin

(4) – Area 1 contains a series of parallel linear anomalies relating to former ridge and furrow.

Anomalies with a modern origin

(5) – A strong, multiple dipolar, linear anomaly extends along the western part of the survey area. It has widespread associated magnetic disturbance and it is a response to the 1985 Esso oil pipeline.

(6) – A narrow linear zone of magnetic disturbance is associated with the overhead power cables that cross the north western corner of the survey area.

3.5 List of anomalies - Area 2 (eastern area)

Area centred on OS NGR 409615 193035, see Figs 03 – 05.

Anomalies with an uncertain origin

(7) – A small number of weakly positive linear anomalies are located within the northern part of the southern field. Although they are poorly defined, it is possible that they relate to former cut features.

(8) – A small number of discrete positive responses are located at the northern end of the area. There is widespread modern magnetic debris, and although it is possible that these are modern in origin, an association with cut features with some antiquity is possible.

(9) – A group of positive linear anomalies with some rectilinear elements may relate to a patch of magnetic debris. It appears that this could be associated with an area of modern dumping and/or burning identified on aerial photographs; however, the rectilinear elements may suggest a more defined feature.

(10) – A number of positive curvilinear anomalies can be seen in the southern field. Many are complete rings, others more penannular. There are at least 22 of these features, all are generally 4m in diameter, encircling an area 3m across and are situated centrally on the ridges of the ridge and furrow, 20-30m apart. It is possible that the anomalies are associated with the former positions of animal feeders; however, only one feeding area can be seen on recent Google Earth images and that appears to relate to a patch of magnetic debris (14). The positive anomaly indicates a response to magnetic enhancement which could relate to bacterial activity associated with animal manure over time, although it is not clear if the response is purely within the topsoil or if it relates to a deeper feature.

Anomalies associated with land management

(11) – A negative linear anomaly relates to a linear ditch or gully in the northern part of the survey area.

Anomalies with an agricultural origin

(12) – Parallel linear anomalies relate to ridge and furrow. The negative responses have been abstracted and these relate to the extant furrows.

Anomalies associated with magnetic debris

(13) – A group of very strongly magnetic anomalies are located towards the southern edge of the survey area. This relates to a number of buried ferrous objects.

(14) – A small, circular patch of magnetic debris appears to be associated with former animal feeding.

(15) – The northern part of the site contains widespread magnetic debris probably associated with former dumping and/or made ground.

4 CONCLUSION

- 4.1.1 The geophysical survey within both parts of the site located a number of positive linear and discrete anomalies of uncertain origin, along with former ridge and furrow cultivation. Within the eastern part of the site over 20 positive curvilinear anomalies were recorded, and while it is possible that they could be associated with the former locations of animal feeders, the origin of the magnetic response is uncertain.

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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 thermoremanent 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. Thermoremanent 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. Thermoremanent features include ovens, hearths, and kilns. In addition thermoremanent 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 magnetic field. The difference between the two sensors will relate to the strength of 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. Different ranges are applied to data in order to determine the most suitable for anomaly abstraction and display.

High Pass Filter

Removes low frequency anomalies within the data that are not considered to be archaeologically significant and may be natural in origin. A window passes over the data, the mean of all the data within the window is subtracted from the centre value. The size of the window is adjusted as is the weighting which may be uniform or Gaussian. The process is used to improve the visibility of anomalies of interest.

Zero Median/Mean Traverse

The median (or mean) of data from 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 offset values of the gradiometer sensors. The process can remove archaeological features that run along a traverse but with the high resolution datasets created by the Sensys FGM650 sensors and the method of data collection this has not been a notable problem. In fact, the removal of offsets using software avoids carrying out a balancing procedure on site, which inevitably can never be done in magnetically clean

conditions and results in improperly aligned fluxgate sensors and/or electronic adjustment values.

Appendix C – survey and data information

Area 1 minimally processed data	3 DeStripe Median Traverse:	Min:	-3.30
Filename: J978-mag-Area1-proc.xcp	4 Clip from -3.00 to 3.00 nT	Std Dev:	1.02
Units: nT		Mean:	0.03
UTM Zone: 30U	Area 1 filtered data	Median:	0.02
Survey corner coordinates (X/Y): OSGB36	Stats	Composite Area:	5.3799 ha
Northwest corner: 409242.050, 193148.94 m	Max:	Surveyed Area:	2.6563 ha
Southeast corner: 409427.75, 193022.64m	Min:	GPS based Proce4	
Collection Method: Randomised	Std Dev:	1 Base Layer.	
Sensors: 6	Mean:	2 Unit Conversion Layer (UTM to OSGB36).	
Dummy Value: 32702	Median:	3 DeStripe Median Traverse:	
Dimensions	0.00	4 Clip from -3.00 to 3.00 nT	
Survey Size (meters): 186 m x 126 m	GPS based Proce5	Area 2 filtered data	
X&Y Interval: 0.15 m	1 Base Layer.	Stats	
Source GPS Points: Active: 454511, Recorded: 454517	2 Unit Conversion Layer (UTM to OSGB36).	Max:	3.32
Stats	3 DeStripe Median Traverse:	Min:	-3.30
Max:	4 High pass Uniform (median) filter: Window dia: 203	Std Dev:	0.89
Min:	5 Clip from -3.00 to 3.00 nT	Mean:	0.02
Std Dev:		Median:	0.01
Mean:	Area 2 minimally processed data		
Median:	Filename: J978-mag-Area2-proc.xcp		
Composite Area: 2.3454 ha	Northwest corner: 409525.03, 193163.14 m	GPS based Proce5	
Surveyed Area: 1.3482 ha	Southeast corner: 409736.38, 192908.59m	1 Base Layer.	
PROGRAM	Dimensions	2 Unit Conversion Layer (UTM to OSGB36).	
Name: TerraSurveyor	Survey Size (meters): 211 m x 255 m	3 DeStripe Median Traverse:	
Version: 3.0.37.0	X&Y Interval: 0.15 m	4 High pass Uniform (median) filter: Window dia: 203	
GPS based Proce4	Source GPS Points: Active: 1023094, Recorded: 1023100	5 Clip from -3.00 to 3.00 nT	
1 Base Layer.	Stats		
2 Unit Conversion Layer (UTM to OSGB36).	Max:		
	3.32		

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 PDF copy will be supplied to the Wiltshire Historic Environment Record with greyscale images and abstraction layers made available on request. The report will also be uploaded to OASIS, the online system for reporting archaeological investigations and linking research outputs and archives and the digital data archived with the Archaeology Data Service.

Archive contents:

File type	Naming scheme	Description
Data	J978-mag-[area number/name].asc J978-mag-[area number/name].xcp J978-mag-[area number/name]-proc.xcp J978-mag-[area number/name]-proc-hpf.xcp	Raw data as ASCII CSV TerraSurveyor raw data TerraSurveyor minimally processed data TerraSurveyor filtered data
Graphics	J978-mag-[area number/name]-proc.tif J978-mag-[area number/name]-proc-hpf.tif	Image in TIF format
Drawing	J978-[version number].dwg	CAD file in 2018 dwg format
Report	J978 report.odt	Report text in LibreOffice odt format

Table 2: Archive metadata

Appendix E – CAD layers for abstraction and interpretation plots

The table below sets out Archaeological Surveys Ltd CAD layer names with associated colours and graphical content. Where CAD files are available layers may be extracted for further CAD/GIS use. Note: hatched polygon boundaries are contained within layers with the RGB colour code 254, 255, 255 (near white) in order to prevent their visibility.

Report sub-heading and associated CAD layer names	Colour with RGB index	Layer content
Anomalies with an uncertain origin		
AS-ABST MAG POS LINEAR UNCERTAIN	Orange 255,127,0	Line, polyline or polygon (solid)
AS-ABST MAG NEG LINEAR UNCERTAIN	Blue 0,0,255	Line, polyline or polygon (solid)
AS-ABST MAG POS DISCRETE UNCERTAIN	Orange 255,127,0	Solid donut, point or polygon (solid)
Anomalies relating to land management		
AS-ABST MAG EXTANT DITCH	Light blue 0, 153,204	Line, polyline or polygon (solid)
Anomalies with an agricultural origin		
AS-ABST MAG RIDGE AND FURROW	Green 0,127,63	Line, polyline or polygon (cross hatched ANSI37)
Anomalies associated with magnetic debris		
AS-ABST MAG DEBRIS	Grey 132, 132, 132	Polygon (cross hatched ANSI37)
AS-ABST MAG STRONG DIPOLAR	Grey 132, 132, 132	Solid donut, point or polygon (solid)
Anomalies with a modern origin		
AS-ABST MAG DISTURBANCE	Grey 132, 132, 132	Polygon (hatched ANSI31)
AS-ABST MAG SERVICE	Grey 132, 132, 132	Line or polyline

Table 3: CAD layering

Appendix F – copyright and intellectual property

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**Geophysical Survey
Land off The Forty/
Chelworth Road
Cricklade
Wiltshire**

Map of survey area



● Survey location

Site centred on OS NGR
SU 09345 93085 & SU 09615 93035

SCALE 1:25 000



SCALE TRUE AT A3

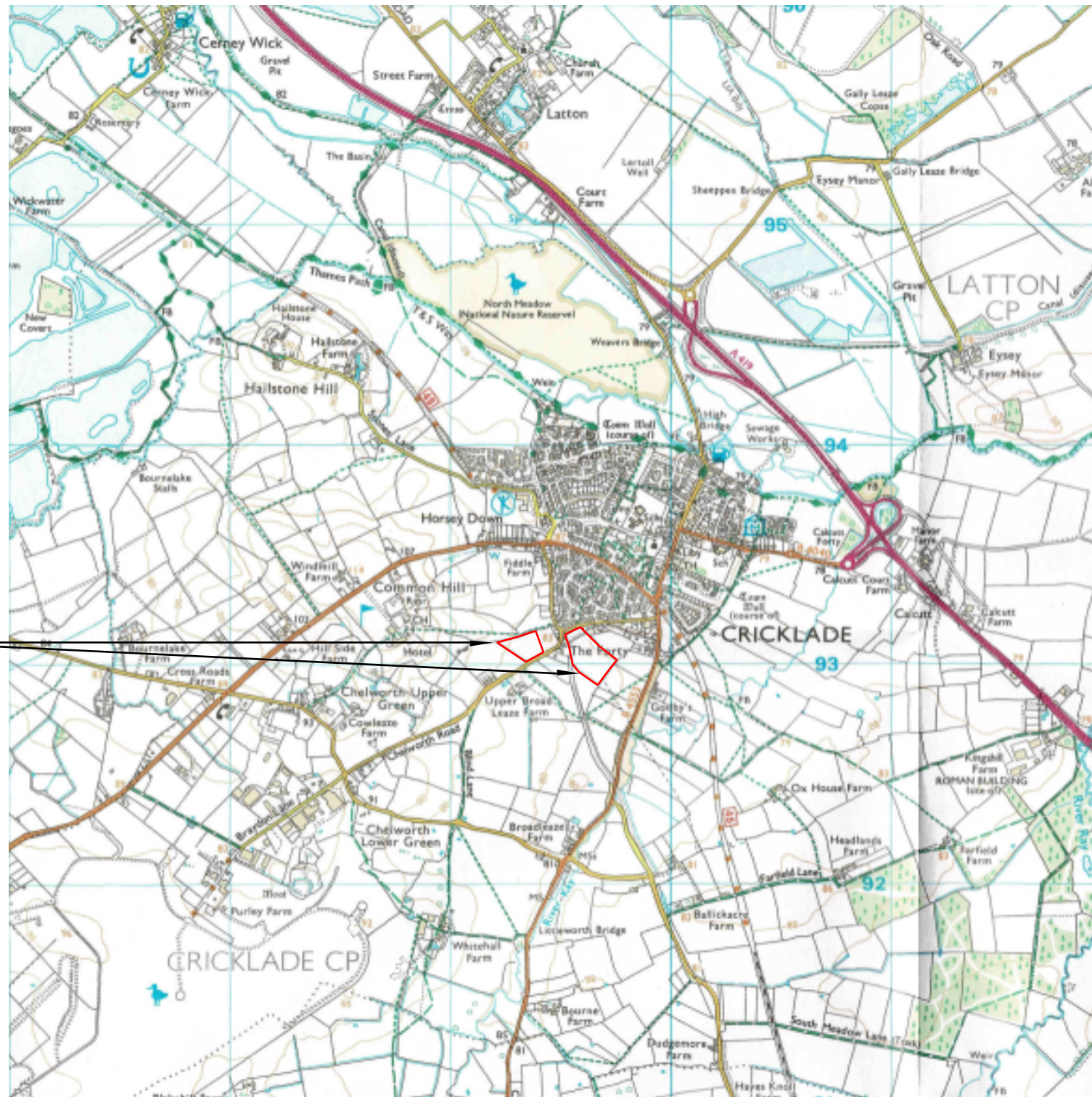
DRAWN BY
KTD

CHECKED BY
DJS

FIG 01



Survey location





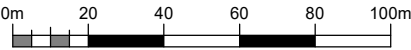
**Geophysical Survey
Land off The Forty/
Chelworth Road
Cricklade
Wiltshire**

Referencing information

Referencing grid to OSGB36 datum at 50m intervals

- 409550 193050
- Survey tracks
- ... Survey track start
- ... Survey track stop

SCALE 1:2000

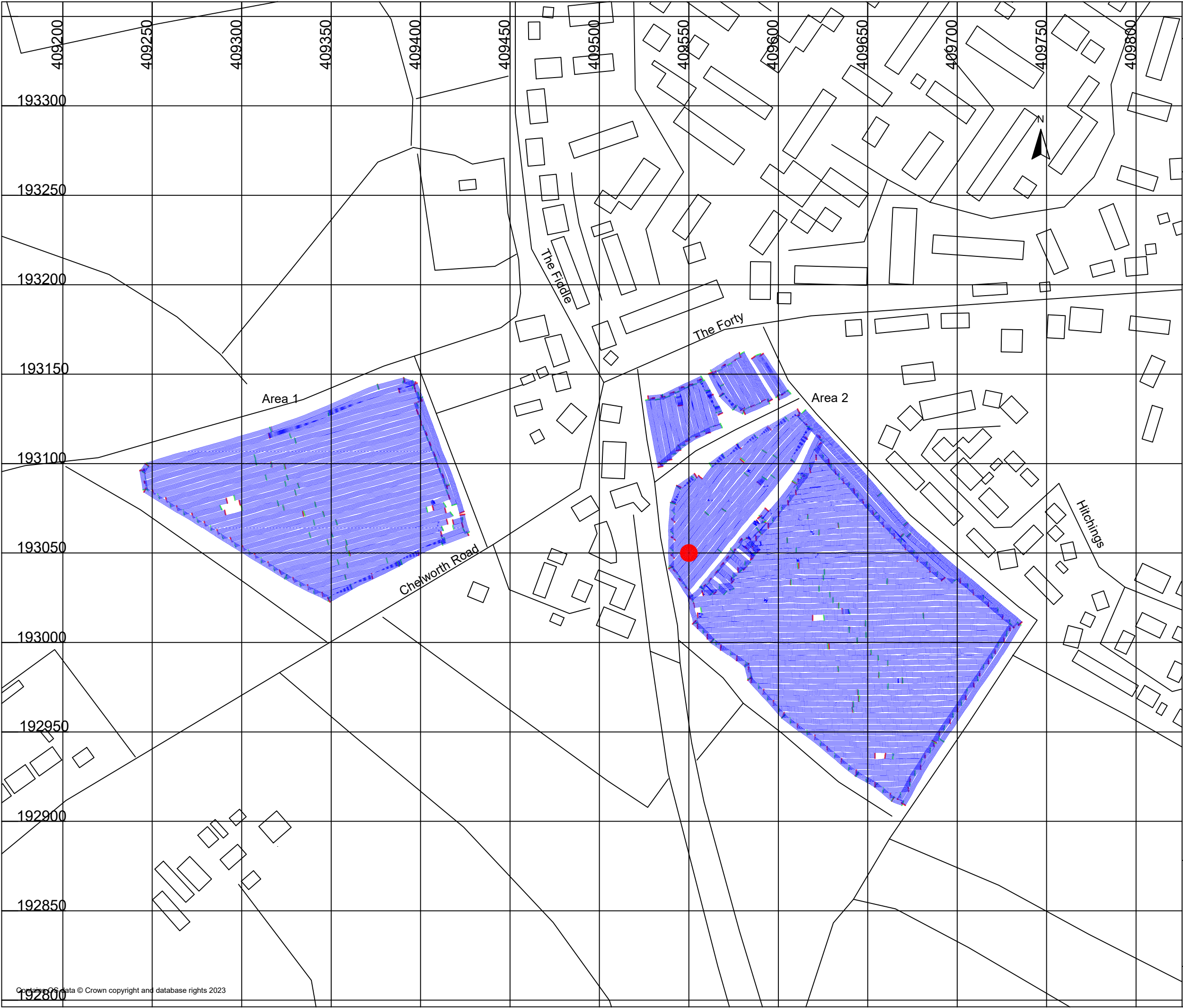


SCALE TRUE AT A3

DRAWN BY
KTD

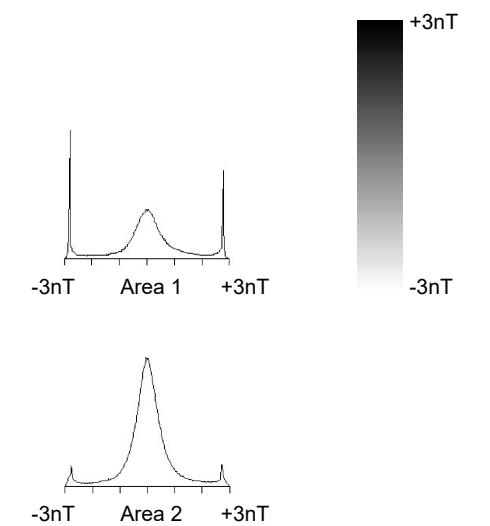
CHECKED BY
DJS

FIG 02

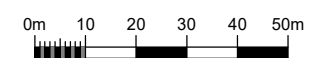


**Geophysical Survey
Land off The Forty/
Chelworth Road
Cricklade
Wiltshire**

**Greyscale plot of minimally
processed magnetometer data**



SCALE 1:1500



SCALE TRUE AT A3

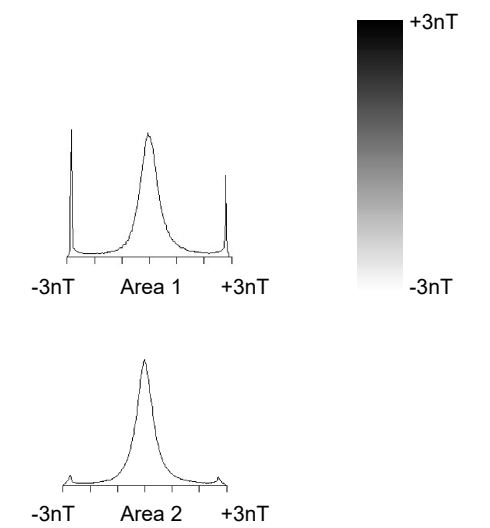
DRAWN BY
KTD

CHECKED BY
DJS

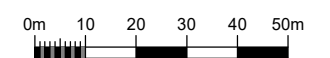
FIG 03

**Geophysical Survey
Land off The Forty/
Chelworth Road
Cricklade
Wiltshire**

**Greyscale plot of
filtered magnetometer data**



SCALE 1:1500



SCALE TRUE AT A3

DRAWN BY
KTD

CHECKED BY
DJS

FIG 04

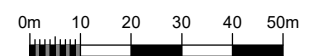


**Geophysical Survey
Land off The Forty/
Chelworth Road
Cricklade
Wiltshire**

**Abstraction and interpretation of
magnetic anomalies**

-  Positive linear anomaly - magnetic enhancement of uncertain origin
-  Negative linear anomaly - material of low magnetic susceptibility
-  Negative linear anomaly - extant ditch/drain
-  Linear anomaly - ridge and furrow
-  Discrete positive response - possible pit-like feature
-  Magnetic debris - spread of magnetically thermoremanent/ferrous material
-  Magnetic disturbance from ferrous material
-  Strong multiple dipolar linear anomaly - pipeline / cable / service
-  Strong dipolar anomaly - ferrous object

SCALE 1:1500



SCALE TRUE AT A3

DRAWN BY
KTD

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DJS

FIG 05

