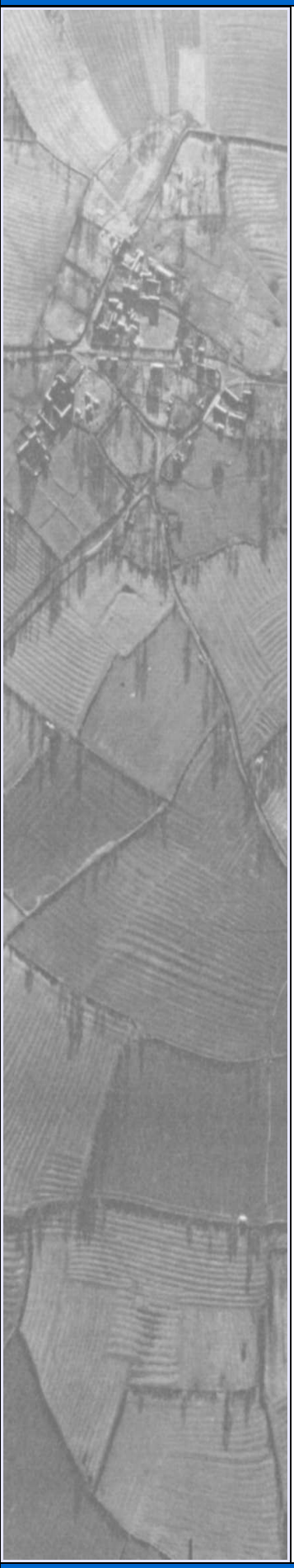

Swindon Eastern Villages
Wanborough
Swindon

MAGNETOMETER AND EARTH RESISTANCE SURVEY REPORT

for

Ainscough Strategic Land

David Sabin and Kerry Donaldson

July 2013

Ref. no. 481

ARCHAEOLOGICAL SURVEYS LTD

Swindon Eastern Villages
Wanborough
Swindon

Magnetometer and Earth Resistance Survey Report

for

Ainscough Strategic Land

Fieldwork by David Sabin, Kerry Donaldson & Richard Grove
Report by David Sabin BSc (Hons) MIFA and Kerry Donaldson BSc (Hons)

Survey dates – 28th to 30th May, 11th to 14th June 2013
Ordnance Survey Grid Reference – **SU 197 855**

Archaeological Surveys Ltd
1 West Nolands, Nolands Road, Yatesbury, Calne, Wiltshire, SN11 8YD
Tel: 01249 814231 Fax: 0871 661 8804
Email: info@archaeological-surveys.co.uk
Web: www.archaeological-surveys.co.uk

CONTENTS

LIST OF FIGURES

LIST OF TABLES

SUMMARY

A geophysical survey covering approximately 16ha, was carried out by Archaeological Surveys Ltd at Lotmead Farm, Wanborough, Swindon. This was at the request of the Environmental Dimension Partnership (EDP) on behalf of Ainscough Strategic Land as part of the Swindon Eastern Villages proposal. The site contains the remains of the Roman town of *Durocornovium* (Scheduled Monument 888) with evidence for roads, streets and buildings, including a *mansio* and bath house. Some of the site was unsuitable for geophysical survey due to the presence of soft fruit on rows of stands or on wire supports. The magnetometer survey was carried out over accessible parts of the site and revealed evidence of several phases, with a large number of positive anomalies that relate to ditches associated with enclosures, boundaries and roads or tracks within the town and flanking the Roman road of Ermin Street. Away from the core of the settlement, fewer responses were visible suggesting the scheduled boundary encloses the majority of the Roman remains. In the area containing the *mansio* (Area 6), the magnetometer survey located a large number of cut features, but no anomalies could be identified as associated with structural remains. An earth resistance survey was carried out within this area to establish the location and extent of the remains of the *mansio* and bath house. The results demonstrate substantial structural remains, with the *mansio* building being some 50m by 34m, containing a courtyard surrounded by an ambulatory corridor and small rooms. It appears that the north eastern side of the *mansio* may have been truncated and there is evidence for wall foundations linking the *mansio* to the bath house further to the south west. The layout of the bath house is less clear; however, the results show a complex of high resistance anomalies relating to structural remains, and a low resistance response, that may be associated with a depression.

1 INTRODUCTION

1.1 Survey background

1.1.1 Archaeological Surveys Ltd was commissioned by the Environmental Dimension Partnership (EDP), on behalf of Ainscough Strategic Land, to undertake a magnetometer survey at Lotmead Farm, Wanborough, Swindon. The survey was undertaken to gain information on the archaeological potential of the site.

1.1.2 The survey area contains part of the scheduled zone of the Roman town of *Durocornovium (*SM 888) and a licence under Section 42 of the 1979 Ancient Monuments and Archaeological Areas Act (as amended by the National Heritage Act 1983) was obtained from English Heritage prior to commencing the fieldwork. The geophysical survey was carried out in accordance with a Written Scheme of Investigation (WSI) produced by Archaeological Surveys (2013) and issued to English Heritage as part of the application for the Section 42 licence. As part of the permission to survey the scheduled area, the licence requires that reports are sent to English Heritage and the Wiltshire

Historic Environment Record within three months of completing the fieldwork.

1.2 Survey objectives and techniques

1.2.1 The geophysical survey aims to assess the nature and extent of the archaeological resource within and immediately adjacent to the scheduled area. Magnetometry was conducted across all accessible parts of the site and is considered the primary geophysical technique. Earth resistance survey (resistivity) was used to sample and target small areas in order to complement the magnetometry and assess the nature and preservation of any structural remains. 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 Institute for Archaeologists (2011) *Standard and Guidance for Archaeological Geophysical Survey.* Archaeological Surveys Ltd is a Registered Organisation with the Institute for Archaeologists (IfA) and carries out its work according to the standards, guidance, by-laws and codes of conduct issued by the IfA.

1.3 Site location, description and survey conditions

1.3.1 The site is located at Lotmead Farm, Wanborough and is centred on OS NGR SU 197 855. The survey area covers approximately 16ha, 6.2ha of which lies within the Scheduled Roman town of *Durocornovium* (SM 888) see Figures 01 and 02.

1.3.2 The geophysical survey covers approximately 16ha within nine separate land parcels. Each parcel has been allocated an area number (1-9) that represents the order in which the work was carried out and is for the purposes of this report only. Areas 1, 3, 4, 5 and 8 lie to the north and east of the scheduled area. All of Area 6 and the majority of Area 7 lie within the scheduled zone. Only approximately 60m of the southern ends of Areas 2 and 9 lie within the scheduled zone.

1.3.3 Area 1 is generally flat although contains low ridge and furrow earthworks. It is grazed pasture surrounded mainly by hedgerows, with the exception of the southern boundary which is new fencing separating it from Area 9 to the south. The access road to Lotmead Farm runs immediately beyond its western boundary.

1.3.4 Area 2 is also generally flat with some evidence for very low ridge and furrow cultivation. It is grazed pasture and there is some evidence of modern ground consolidation and disturbance immediately adjacent to the eastern boundary and also some ground disturbance and modern debris in the southern part of

the area. The Dorcan Stream runs north easterly along the western boundary. The access road to Lotmead Farm lies immediately beyond its eastern boundary.

1.3.5 Areas 3 and 5 are small pasture fields located to the west and east of the Lotmead Farm access road respectively.

1.3.6 Area 4 is a small pasture field surrounded by hedgerows, although there is a small compound containing a steam powered saw and wood close to its south eastern corner. Although the ground cover was quite long during the course of the survey, earthworks were visible close to the western boundary where the Dorcan Stream is located. It is likely that these earthworks represent alterations to the course of the stream that appear from mapping evidence to have been carried out in the 1970s.

1.3.7 Area 6 is located in the western part of the site. Although the field has been subdivided into two by a recently planted hedgerow, it is considered as one survey area as it is known to contain a possible *mansio* and other associated Roman buildings. The southern part of the area appears to contain a denuded earthwork or platform with land sloping down toward the north and east. The field contains a mix of raspberries and small zones of horticultural cultivation. Raspberries supported by wires in the south eastern part of the field prevented survey. Cultivated soil was present in the northern and southern parts of the field and Roman cultural material was frequently noted during the survey.

1.3.8 Area 7 forms the bulk of the western part of the site. It is a mixture of grassed zones, cultivated plots and fruit bushes. Raspberries and other soft fruit supported by wires in the southern part of the area impeded survey. Survey was not possible in the north eastern part of the field due to agricultural implements and a small playground. Low earthworks were visible in the southern part of the area and a large amount of Roman pottery, tile and stone was visible on the ground surface. In contrast, no Roman material was noted in soil at the northern end of the field where potatoes had been mounded up.

1.3.9 Area 8 lies to the north of Area 7 and is separated from it by mature poplar trees. Survey was impeded by soft fruit and vegetable cultivation and was restricted to a small zone across a potato crop. No Roman cultural material was visible on the soil surface.

1.3.10 Area 9 forms the south eastern part of the site and has been separated from Area 1 recently. It lies immediately east of the access road to Lotmead Farm. The area contains grazed grass and survey was initially delayed by the presence of cattle.

1.3.11 The ground conditions across the site were very variable although data were collected wherever possible. Weather conditions during the survey were frequently cool and wet.

1.4 Site history and archaeological potential

1.4.1 The site contains the Scheduled Monument (No 888) – Site of Roman Town, West of Wanborough House, Wiltshire. Past investigations have indicated that this is the Roman town of *Durocornovium,* as listed in the Antonine Itinerary in the 3rd century. The scheduled area covers at least 24.6ha in pockets around Covingham, Lotmead and Nythe Farms to the north of Wanborough. The Roman road, Ermin Street, runs through the Roman town with parts of the scheduled area either side of the road. The site has been subject to interest since antiquarian times, with investigations during the 20th century identifying occupation layers, cut features, building materials and roads as well as numerous small finds. Aerial photography during the 1970s included discoveries of a *mansio* and linked bath house (Phillips and Walters, 1977), as well as further buildings and roads and the gridded street layout of the town (Wiltshire County Archaeology Service, 2004).

1.4.2 The investigations and aerial photographs indicate that there is a high potential for the geophysical survey to locate archaeological features, both within, and outside of the scheduled area.

1.5 Geology and soils

1.5.1 The underlying solid geology across the site is mudstone from the Ampthill and Kimmeridge Clay Formation with some possible alluvial deposits in the centre of the site (BGS, 2013).

1.5.2 The overlying soil across the survey area is from the Denchworth association, which are typical pelo stagnogley soils. These consist of slowly permeable, seasonally waterlogged clayey soils (Soil Survey of England and Wales, 1983).

1.5.3 Magnetometer surveys carried out on similar soils and geologies have demonstrated that there can be a good contrast between the fill of cut features and the material into which they are cut. However, magnetic susceptibility may be very low in damp zones and in areas of less intense activity and this may result in very weak anomalies. Natural features within the underlying soils and geology, such as tree throw pits and fluvial and periglacial features, can also be visible within the data.

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).

2.1.5 The electrical resistance or resistivity of the soil depends upon the moisture content and distribution within the soil. Buried features such as walls can affect the moisture distribution and are usually more moisture resistant than other features such as the infill of a ditch. A stone wall will generally give a high resistance response and the moisture retentive content of a ditch can give a low resistance response. Localised variations in resistance are measured in ohms (Ω) which is the SI unit for electrical impedance or resistance.

2.1.6 The Twin Probe configuration used in this survey is favoured for archaeological prospection and can give a response to features up to 1m in depth with a mobile probe separation of 0.5m.

2.2 Equipment configuration, data collection and survey detail

2.2.1 The detailed magnetic survey was carried out using a Bartington Grad 601-2 gradiometer. The instrument effectively measures a magnetic gradient between two fluxgate sensors mounted vertically 1m apart. Two sets of sensors are mounted on a single frame 1m apart horizontally.

2.2.2 The instrument is extremely sensitive and is able to measure magnetic variation to 0.01nanoTesla (nT), with an effective resolution of 0.03nT. The data are limited to ±100nT when surveying with the highest sensitivity. All readings are saved to an integral data logger for analysis and presentation.

2.2.3 The instrument is operated according to the manufacturer's instructions with consideration given to the local conditions. An adjustment procedure is required, prior to collection of data, in order to balance the sensors and remove the effects of the Earth's magnetic field; further adjustment is required during the survey due to

instrument drift often associated with temperature change.

2.2.4 It can be very difficult to obtain optimum balance for the sensors due to localised magnetic vectors that may be associated with large ferrous objects, geological/pedological features, 'magnetic debris' within the topsoil and natural temperature fluctuations. Imperfect balance results in a heading error often visible as striping within the data; this can be effectively removed by software processing and generally has little effect on the data unless extreme.

2.2.5 The Bartington gradiometer undergoes regular servicing and calibration by the manufacturer. A current assessment of the instruments is shown in Table 1 below.

Sensor type and serial numbers	Bartington Grad - 01 – 1000 Nos. 084, 085
Date of certified calibration/service	Sensors 084 and 085 - 17th August 2012 (due Aug 2014)
Bandwidth	12Hz (100nT range) both sensors
Noise	<100pT peak to peak
Adjustable errors	<2nT

Table 1: Bartington fluxgate gradiometer sensor calibration results

The instrument was considered to be in good working order prior to the survey, with no known faults or defects.

2.2.6 Data were collected at 0.25m centres along traverses 1m apart. The survey area was separated into 30m by 30m grids (900m²) giving 3600 recorded measurements per grid. This sampling interval is very effective at locating archaeological features and is the recommended methodology for archaeological prospection (English Heritage, 2008).

2.2.7 The earth resistance survey was carried out using Geoscan Research Ltd RM85 resistance meter using a mobile parallel twin probe array with a 0.5m electrode separation. Data were recorded at 1m intervals along traverses separated by 1m across the *mansio* and bath house in Area 6. The instrument was set to filter stray earth currents which can cause errors within the resistance measurements.

2.2.8 The survey grids were set out to the Ordnance Survey OSGB36 datum using a Leica GS10 RTK GPS. The GPS is used in conjunction with Leica's SmartNet service, where positional corrections are sent via a mobile telephone link. Positional accuracy of around 10 – 20mm is possible using the system. The instrument is regularly checked against the ETRS89 reference framework using Ordnance Survey ground marker C1ST7784 (Horton).

2.3 Data processing and presentation

2.3.1 Magnetometry data downloaded from the Grad 601-2 data logger are

analysed and processed in specialist software known as ArcheoSurveyor. The software allows greyscale and trace plots to be produced for presentation and display. Survey grids are assembled to form an overall composite of data (composite file) creating a dataset of the complete survey area. Appendix C contains specific information concerning the survey and data attributes and is derived directly from ArcheoSurveyor; this should be used in conjunction with information provided by Figure 02.

2.3.2 Only minimal processing is carried out in order to enhance the results of the survey for display. Raw data are always analysed, as processing can modify anomalies. The following schedule sets out the data and image processing used in this survey:

- clipping of the raw data at ±30nT to improve greyscale resolution,
- clipping of processed data at ±3nT to enhance low magnitude anomalies,
- zero median/mean traverse is applied in order to balance readings along each traverse.
- data in Area 6 has been despiked in order to remove highly magnetic anomalies in the area of the *mansio* that are associated with raspberry canes.

Reference should be made to Appendix B for further information on the specific processes carried out on the data. Appendix C metadata includes details on the processing sequence used for each survey area.

2.3.3 Data logged by the resistance meter are downloaded and processed within ArcheoSurveyor software. Raw data are analysed and displayed within the report as well as processed data. The following processing has been carried out on data in this survey:

- raw earth resistance data have been shown clipped to 1SD of between 0.52Ω and 14.7Ω,
- processed data have been clipped between 3Ω and 11Ω to enhance any possible archaeological anomalies and shown with a graduated shade which smooths the image.

2.3.4 An abstraction and interpretation is offered for all geophysical anomalies located by the survey. 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. Where further interpretation is possible, or where a number of possible origins should be considered, more subjective discussion is set out in Section 4.

2.3.5 The main form of data display prepared for this report is the greyscale plot. Both 'raw' and 'processed' data have been shown followed by an abstraction and interpretation plot. Anomalies are abstracted using colour coded points, lines and polygons. All plots are scaled to landscape A3 for paper printing.

2.3.6 Graphic raster images in bitmap format (.BMP) are initially prepared in

ArcheoSurveyor. Regardless of survey orientation, data captured along each traverse are displayed and processed by ArcheoSurveyor from left to right; this corresponds to a direction of south to north in the field. Prior to displaying against base mapping, raster graphics require a rotation of 59° anticlockwise for Areas 1-4 & 9, 70° anticlockwise for Area 5 and 54° anticlockwise for Areas 6-8 to restore north to the top of the image upon insertion into AutoCAD.

2.3.7 The raster images are combined with base mapping using ProgeCAD Professional 2009 and AutoCAD LT 2007, creating DWG file formats. All images are externally referenced to the CAD drawing in order to maintain good graphical quality. Quality can be compromised by rotation of graphics in order to allow the data to be orientated with respect to grid north; this is considered acceptable as the survey results are effectively georeferenced allowing relocation of features using GPS, resection method etc.

2.3.8 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 - magnetometry

3.1.1 The detailed magnetic survey was carried out over a total of nine survey areas covering approximately 16ha.

3.1.2 Magnetic anomalies located can be generally classified as positive responses of archaeological potential, positive and negative anomalies of an uncertain origin, linear anomalies associated with land management, areas associated with natural features, 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.

3.1.3 Anomalies located within each survey area have been numbered and are described below with subsequent discussion in Section 4.

3.2 Statement of data quality - magnetometry

3.2.1 Data are considered representative of the magnetic anomalies present within the site. Localised zones of magnetic disturbance have the potential to obscure weaker anomalies of archaeological potential. Slight positional errors caused by variable ground conditions and ground cover have been corrected for during data processing and are unlikely to have significantly degraded results.

3.3 Data interpretation - magnetometry

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 archaeological potential AS-ABST MAG POS LINEAR ARCHAEOLOGY AS-ABST MAG POS DISCRETE ARCHAEOLOGY AS-ABST MAG POS ARCHAEOLOGY AS-ABST MAG VARIABLE ARCHAEOLOGY	Anomalies have the characteristics (mainly morphological) of a range of archaeological features such as pits, ring ditches, enclosures, etc.. Zones of magnetically variable responses or magnetic debris can relate to spread of magnetic material with an archaeological origin and may indicate structural remains, burning, or possible industrial activity.
Anomalies with an uncertain origin AS-ABST MAG POS LINEAR UNCERTAIN AS-ABST MAG NEG LINEAR UNCERTAIN AS-ABST MAG POS DISCRETE 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 LAND DRAIN	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 2: List and description of interpretation categories

3.4 General assessment of survey results - resistivity

3.4.1 The earth resistance survey was carried out within Area 6 over the site of the *mansio* and covering approximately 0.75ha.

3.4.2 Resistive anomalies located can be generally classified as high resistance anomalies associated with structural remains, high and low resistance anomalies of archaeological potential and high resistance linear anomalies associated with modern cultivation.

3.5 Statement of data quality - resistivity

3.5.1 Data are considered representative of the resistive anomalies present within the site. The ground conditions within the area of resistance survey were very poor due to tall patches of unchecked wild vegetation and the presence of fruit bushes. Minor positional errors may have occurred during data collection as a result although these are very unlikely to have affected or degraded the dataset.

3.6 Data interpretation - resistivity

3.6.1 The listing of sub-headings below attempts to define a number of separate categories that reflect the range and type of features located during the earth resistance survey. A basic explanation of the characteristics of the anomalies is set out for each category in order to justify interpretation, a basic key is indicated to allow cross reference to the abstraction and interpretation plot. Sub-headings are then used to group anomalies with similar characteristics.

Report sub-heading CAD layer names and plot colour	**Description and origin of anomalies**
Anomalies with archaeological potential AS-ABST RES HIGH LINEAR ARCHAEOLOGY  AS-ABST RES HIGH STRUCTURAL ARCHAEOLOGY  AS-ABST RES HIGH AREA ARCHAEOLOGY AS-ABST RES LOW AREA ARCHAEOLOGY 	Anomalies have the characteristics (mainly morphological) of a range of archaeological features such as enclosures, structures, ring ditches, etc.. High resistance may indicate structural material (e.g. stone); low resistance may relate to the moisture retentive fill of cut features.
Anomalies with an agricultural origin AS-ABST RES AGRICULTURAL 	The anomalies are often linear and form a series of parallel responses or are parallel to extant land boundaries. They can be a response to current or former cultivation edges.

Anomalies with an uncertain origin AS-ABST RES HIGH LINEAR 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. High resistance anomalies are indicative of comparatively low moisture and may indicate stone, compacted soil, changes in drainage, etc.

Table 3: List and description of resistivity interpretation categories

3.7 List of anomalies – magnetometry Area 1

Area centred on OS NGR 419842 185253, see Figures 06 & 07.

Anomalies with an uncertain origin

(1) – The survey area contains a number of very weakly positive linear and discrete anomalies. The low response (<1nT) and lack of coherent form prevent interpretation.

Anomalies associated with magnetic debris

(2) – The survey area contains numerous and widespread strong, discrete dipolar anomalies which are likely to be a response to ferrous and other magnetically thermoremnant objects within the topsoil. All of the survey areas contains them; however, those on the eastern side of the site contain a large amount which may indicate modern contamination through manuring.

Anomalies with a modern origin

(3) – Magnetic disturbance along the edges of the survey area has been caused by ferrous fencing and a water trough.

3.8 List of anomalies – magnetometry Area 2

Area centred on OS NGR 419713 185273, see Figures 06 & 07.

Anomalies of archaeological potential

(4) – A group of positive linear and rectilinear anomalies is located close to the western field boundary. There are also some negative linear responses which may indicate structural remains and the anomalies are on the general north west to south east orientation of the majority of anomalies within the Roman town to the west. It is possible that these anomalies relate to a former building associated with the Roman town.

(5) – A short positive linear anomaly is located at the southern edge of the survey area. It can be seen as an extension of another linear anomaly associated with an enclosure within Area 9 to the east.

Anomalies with an uncertain origin

(6) – The southern part of the survey area contains a number of weakly positive linear anomalies that appear to form a series of ditches or enclosures. It is difficult to confidently determine their origin, as they are very weak (<1nT) and also on a slightly different orientation to the series of enclosures seen within Area 9 to the south east.

Anomalies associated with magnetic debris

(7) – A linear band of magnetic debris extends parallel with the track to the east of the survey area. Much of the survey area contains strong discrete dipolar anomalies and this material is likely to relate to a spread of modern magnetic debris.

Anomalies with a modern origin

(8) – A zone of magnetic disturbance at the eastern edge of the survey area is a response to a buried service or pipe running along the edge of the track to Lotmead Farm. Magnetic disturbance is also evident surrounding the survey area and is a response to fencing material.

3.9 List of anomalies – magnetometry Area 3

Area centred on OS NGR 419839 185454, see Figures 08 & 09.

Anomalies with an uncertain origin

(9) – A positive linear anomaly extends across the northern part of the survey area. It is a continuation of anomaly (12) seen within Area 4 to the west.

(10) – The survey area contains a number of weakly positive linear anomalies which cannot be easily categorised.

Anomalies with a modern origin

(11) – A strong, multiple dipolar, linear anomaly extends through the survey area and is a continuation of the service to Lotmead Farm that runs just to the east of Area 2 to the south (8).

3.10 List of anomalies – magnetometry Area 4

Area centred on OS NGR 419779 185496, see Figures 08 & 09.

Anomalies with an uncertain origin

(12) – A positive linear anomaly extends across the survey area from Area 3 to the north east (9). It continues beyond the line of an infilled section of a previous course of the Dorcan Stream in a south westerly direction. It is not possible to determine if this is a cut feature with archaeological potential, or if it relates to a service, pipe or drain extending to/from Lotmead Farm.

(13) – The eastern part of the survey area contains a number of positive linear and a rectilinear anomaly that are parallel with anomaly (12). Although there is some potential that they relate to cut features, their origin is uncertain

Anomalies associated with natural features

(14) – A former channel of the Dorcan Stream can be seen as a sinuous positive anomaly and zones of magnetic debris. These relate to material used to infill the stream when it was canalised in the early 1970s.

3.11 List of anomalies – magnetometry Area 5

Area centred on OS NGR 419888 185456, see Figures 08 & 09.

Anomalies with an uncertain origin

(15) – The survey area contains some very weakly positive linear anomalies, their origin cannot be determined.

3.12 List of anomalies – magnetometry Area 6

Area centred on OS NGR 419548 185385, see Figures 10 & 11.

Anomalies of archaeological potential

(16) – The survey area contains a number of positive linear and rectilinear anomalies that relate to ditches defining enclosures, trackways and other cut features. There is a general north west to south east and north east to south west orientation to the features, although some have a slightly different orientation. These features do not generally correspond with any anomalies seen within the

resistivity data.

(17) – A positive curvilinear anomaly extends from the southern part of the survey area, just into the northern part, which contains the *mansio*. It appears to relate to a cut feature with archaeological potential, but it does not correspond to any anomalies seen within the resistivity data that relate to structural remains.

(18) – A zone containing positive and negative responses may indicate structural remains, although these appear to be located within a trackway.

Anomalies with an uncertain origin

(19) – A positive linear anomaly is located close to the field boundary that separates the two parts of the survey area. It lies just outside the possible south western wall of the *mansio* (see resistance anomaly (36), or it is possible that it is a boundary ditch associated with the Roman road that has been suggested to lie in this area. The anomaly may relate to former agricultural/horticultural activity.

(20) – The survey area contains a number of positive linear and discrete responses that may relate to cut features. They are located in the area of a possible bath house which can be seen within the resistance data and are parallel with other cut features within the site; however, they lack clear definition and morphology and may relate to agricultural/horticultural activity.

3.13 List of anomalies – magnetometry Area 7

Area centred on OS NGR 419488 185495, see Figures 10 – 13.

Anomalies of archaeological potential

(21) – The survey area contains a large number of positive linear, rectilinear and discrete anomalies that relate to cut features defining enclosures and roads/trackways in a dense zone of occupation. There is evidence for phases of recutting of the features, with some repositioning of roads or tracks and evidence of building debris across them.

(22) – Two positive linear anomalies define a Roman road or track that extends north westwards beyond the main extent of the defined archaeological features (21). It is possible that this extends northwards beyond the limits of the survey area.

(23) – The survey area contains zones of magnetically variable responses which may indicate former structural remains that have been greatly disturbed by ploughing and agricultural activity.

Anomalies with an uncertain origin

(24) – The survey area contains a number of positive linear anomalies that are not oriented similarly to the majority of archaeological features, and in places appear to cut through them. It is possible that these anomalies are associated with land drainage.

(25) – A negative linear anomaly is parallel with archaeological features to the south of it. It is possible that it is associated with a Roman road or track.

(26) – Two negative linear anomalies extend across the central part of the survey area and they appear to cut through archaeological features. Although uncertain in origin, it is possible that the anomalies are associated with drainage or a service/pipe.

Anomalies associated with land management

(27) – A series of parallel, multiple dipolar, linear anomalies extends across much of the survey area and relates to land drainage.

Anomalies associated with magnetic debris

(28) – A broad linear zone of magnetic debris extends across the northern part of the survey area. It does not correspond to any modern trackway, although may be associated with ground consolidation. Magnetic debris is also evident within the modern track that extends along the western field boundary and into the northern part of the field.

(29) – Two zones of very strongly magnetic debris are located in the south eastern part of the survey area and are likely to be modern in origin.

3.14 List of anomalies – magnetometry Area 8

Area centred on OS NGR 419573 185705, see Figures 12 & 13.

Anomalies with an uncertain origin

(30) – A negative linear anomaly extends across the northern part of the survey area. Although the response indicates material with low magnetic susceptibility, it is not possible to determine its origin.

(31) – A short positive linear and a parallel negative linear anomaly cross the western half of the survey area towards a discrete positive response. Although it is possible that these relate to features with an archaeological origin, it is not possible to provide a confident interpretation.

(32) – A series of parallel positive linear anomalies can be seen within the survey area. It is possible that they relate to land drains.

3.15 List of anomalies – magnetometry Area 9

Area centred on OS NGR 419739 185120, see Figures 14 & 15.

Anomalies of archaeological potential

(33) – The southern part of the survey area contains a number of positive linear and rectilinear anomalies that relate to a series of ditches and enclosures. They have a response of 2-3nT and relate to a zone of Roman occupation that straddles Ermin Street.

Anomalies with an uncertain origin

(34) – A number of fragmented weakly positive linear anomalies can be seen to the north of anomalies (33). They have a response of generally <1nT, but are on a similar orientation to anomalies (6) seen to the west within Area 2. It is possible that these relate to cut features with some archaeological potential, with their weak response possibly indicating that they are away from the core of occupation.

Anomalies associated with magnetic debris

(35) – A linear band of weakly magnetic debris extends through the centre of the site. It is not possible to determine the origin of the anomaly, no field boundary or track is marked on any former Ordnance Survey mapping. A zone of magnetic debris also extends along the eastern field boundary.

3.16 List of anomalies – resistivity Area 6

Area centred on OS NGR 419549 185380, see Figure 16.

Anomalies of archaeological potential

(36) – A complex of high resistance linear anomalies relates to the structural remains of a Roman building discovered by aerial photography in 1975 and interpreted as a *mansio*. The results show a building some 50m by 34m containing a complex of small rooms and an ambulatory surrounding a central courtyard. It appears that the north eastern edge of the building has been truncated by agricultural activity and the south western edge appears to lie just beyond the boundary that divides the survey area (37).

(37) – High resistance anomalies that appear to be associated with the south

western wall of the *mansio* and further structural remains extending south westwards towards another building (38).

(38) – A number of high resistance anomalies that relate to a building complex that has been interpreted as a bath house associated with the *mansio*. In the centre are a rectangular area of low resistance and a sub-circular zone of high resistance which are likely to be associated.

(39) – On the north western side of anomaly (36) are a group of high resistance linear and rectilinear anomalies, with further anomalies seen to the north east. They may have archaeological potential.

(40) – An area of low resistance is located immediately north west of anomaly (39). It lies between two linear ditches within the magnetometer data and it is possible that this anomaly is associated with a Roman road or trackway.

Anomalies with an agricultural origin

(41) – A high resistance linear can be seen within the northern part of the survey area and relates to the edge of the modern cultivation. A second fragmented high resistance linear can be seen parallel with it to the east.

Anomalies with an uncertain origin

(42) – A high resistance curvilinear anomaly extends from the southern part of the *mansio* building (36) towards the east. It is not possible to determine if this has an archaeological or agricultural origin.

4 DISCUSSION

4.1.1 The detailed magnetometer survey was carried out within areas that were accessible and the results demonstrate that there are very few anomalies of archaeological potential outside of the main core of the scheduled area. The results indicate Roman settlement located just to the north of Ermin Street in the most south easterly part of the site (Areas 2 and 9), with further possible features to the north, although the majority of these are very weak and indistinct. Area 2 does contain some evidence for a group of isolated cut features, and potential structural remains close to its western edge.

4.1.2 The main zone of the Roman town lies within the western parts of the site, within Areas 6 and 7. Area 6 contains the site of the *mansio* and bath house which were identified and interpreted from aerial photographs (Phillips and Walters, 1977). Although many cut features were located in this area with the magnetometer, indicating several possible phases, the structural remains of the buildings are only evident within the resistivity data. The clear outline of the walls or foundations of the *mansio* can be seen with a central courtyard

surrounded by an ambulatory and small rooms. The south western wall appears to be located just beyond a field boundary hedge that has been planted in recent times. A number of walls appear to extend south westwards from the *mansio* to another building, which has been interpreted as a bath house.

4.1.3 The north eastern wall of the *mansio* disappears where cultivation begins, and although it is possible that there is some masking by the disturbance of the topsoil from recent cultivation, the complete truncation of part of the *mansio* building is possible. If truncation has occurred, it would appear to have happened since the occurrence of cropmarks photographed in 1976. There may also be implications for the survival of other structural remains within the scheduled area where cultivation is carried out. During the course of the survey, surface observations noted the presence of much cultural material in the form of pottery, tile and stone. The presence of clusters of large stones on the surface, some with fresh chips and marks, would suggest that disturbance to structural remains is ongoing but probably occasional due to the nature of the horticultural land use across a large part of the scheduled area.

4.1.4 The core of the town shows a complex of cut features relating to ditches defining boundaries, enclosures and tracks/roads. There is evidence for a gridded street pattern; however, there is also evidence for repositioning of some of the roads, with possible indications of buildings either lying on earlier roads, or underneath later roads. Structural remains are not apparent within the magnetometer data although zones with a magnetically variable response could indicate the position of former buildings.

5 CONCLUSION

5.1.1 The detailed magnetometer survey located a large number of cut features that include ditches associated with boundaries, enclosures and roads or tracks within the core area of the Roman town. The results show that although there is some structure to a gridded street pattern, there is evidence for different phases of activity and construction. The magnetometer survey located a number of patches of magnetically variable responses which may indicate the position of former buildings. The magnetometer survey within the area known to contain the *mansio* did not locate any anomalies that could be readily identified as structural remains. It did, however, locate a large number of cut features, either side of the building, and also a curvilinear cut feature that may underlie the building.

5.1.2 The earth resistance survey over the area containing the *mansio* proved effective at locating high resistance anomalies associated with this building and a former bath house located to the south west. There is also evidence for

structural remains linking the two buildings. The survey did not locate many anomalies that could be identified as associated with the north eastern wall of the *mansio,* and it may indicate that this has been truncated by agricultural activity. There was not a correlation between the magnetometer and earth resistance anomalies as each technique revealed different features, but it proved that both techniques complemented each other well.

5.1.3 Away from the core area of the known Roman town, the magnetometer survey located few anomalies that could be interpreted as of archaeological potential. Generally, it is clear from the magnetic data that the scheduled monument boundary encloses the bulk of the Roman town as there are very few anomalies beyond.

6 REFERENCES

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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 gradiometer is a passive instrument consisting of two fluxgate sensors mounted vertically 1m apart. The instrument is carried about 30cm 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. If no enhanced feature is present the field measured by both sensors will be similar and the difference close to zero.

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 ±5nT and ±1nT 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 Median/Mean Traverse (magnetometry only)

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 slight differences between the set-up and stability of gradiometer sensors and can remove striping. The process can remove archaeological features that run along a traverse so data analysis is also carried out prior its application.

De-stagger (magnetometry only)

Compensates for small positional errors within data collection by shifting the position of the readings along each traverse by a specified amount. Data lost at the end of each traverse are extrapolated from adjacent value in the same row.

Deslope (magnetometry only)

Corrects for striping and distortion caused by metal objects/services etc.. The process calculates a curve based on a polynomial best fit mathematical function for each traverse. This curve is then subtracted from the actual data.

Edge Match

Calculates the mean of the 2 lines (rows or columns) of data either side of the edge to match. It then subtracts the difference between the means from all datapoints in the selected area.

FFT (Fast Fourier Transform) spectral filtering

A mathematical process used to determine the frequency components of a traverse. Repetitive features, such as plough marks, produce characteristic spectral zones that can be suppressed allowing greyscale images to appear clearer.

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.

Appendix C – survey and data information

Area 1 raw magnetometer data

COMPOSITE
Filename: J481-mag-Area1-raw.xcp
Instrument Type: Bartington (Gradiometer)
Units: nT
Surveyed by: on 29/05/2013
Assembled by: on 29/05/2013
Direction of 1st Traverse: 45 deg
Collection Method: ZigZag
Sensors: 2 @ 1.00 m spacing.
Dummy Value: 32702

Dimensions
Composite Size (readings): 840 x 150
Survey Size (meters): 210 m x 150 m
Grid Size: 30 m x 30 m
X Interval: 0.25 m
Y Interval: 1 m

Stats
Max: 30.00
Min: -30.00
Std Dev: 2.41
Mean: -0.10
Median: -0.02
Composite Area: 3.15 ha
Surveyed Area: 1.8695 ha

PROGRAM
Name: TerraSurveyor
Version: 3.0.19.22

Processes: 2
1 Base Layer
2 Clip from -30.00 to 30.00 nT

Source Grids: 29
1 Col:0 Row:0 grids\26.xgd
2 Col:0 Row:1 grids\27.xgd
3 Col:0 Row:2 grids\28.xgd
4 Col:0 Row:3 grids\29.xgd
5 Col:1 Row:0 grids\22.xgd
6 Col:1 Row:1 grids\23.xgd
7 Col:1 Row:2 grids\24.xgd
8 Col:1 Row:3 grids\25.xgd
9 Col:2 Row:0 grids\17.xgd
10 Col:2 Row:1 grids\18.xgd
11 Col:2 Row:2 grids\19.xgd
12 Col:2 Row:3 grids\20.xgd
13 Col:2 Row:4 grids\21.xgd
14 Col:3 Row:0 grids\12.xgd
15 Col:3 Row:1 grids\13.xgd
16 Col:3 Row:2 grids\14.xgd
17 Col:3 Row:3 grids\15.xgd
18 Col:3 Row:4 grids\16.xgd
19 Col:4 Row:0 grids\07.xgd
20 Col:4 Row:1 grids\08.xgd
21 Col:4 Row:2 grids\09.xgd
22 Col:4 Row:3 grids\10.xgd
23 Col:4 Row:4 grids\11.xgd
24 Col:5 Row:0 grids\03.xgd
25 Col:5 Row:1 grids\04.xgd
26 Col:5 Row:2 grids\05.xgd
27 Col:5 Row:3 grids\06.xgd
28 Col:6 Row:0 grids\01.xgd
29 Col:6 Row:1 grids\02.xgd

Area 1 processed magnetometer data

COMPOSITE
Filename: J481-mag-Area1-proc.xcp

Stats
Max: 3.00
Min: -3.00
Std Dev: 0.76
Mean: -0.03
Median: 0.00
Composite Area: 3.15 ha
Surveyed Area: 1.8695 ha

Processes: 4
1 Base Layer
2 Clip from -10.00 to 10.00 nT
3 DeStripe Median Traverse: Grids: All
4 Clip from -3.00 to 3.00 nT

Area 2 raw magnetometer data

COMPOSITE
Filename: J481-mag-Area2-raw.xcp
Instrument Type: Grad 601 (Gradiometer)
Units: nT
Surveyed by: on 13/06/2013
Assembled by: on 13/06/2013
Direction of 1st Traverse: 45 deg
Collection Method: ZigZag
Sensors: 2 @ 1.00 m spacing.
Dummy Value: 32702

Dimensions
Composite Size (readings): 1200 x 120
Survey Size (meters): 300 m x 120 m
Grid Size: 30 m x 30 m
X Interval: 0.25 m
Y Interval: 1 m

Stats
Max: 30.00
Min: -30.00
Std Dev: 4.95
Mean: -0.23
Median: 0.02
Composite Area: 3.6 ha
Surveyed Area: 1.7679 ha

Processes: 2
1 Base Layer
2 Clip from -30.00 to 30.00 nT

Source Grids: 33
1 Col:0 Row:1 grids\23.xgd
2 Col:0 Row:2 grids\24.xgd
3 Col:0 Row:3 grids\25.xgd
4 Col:1 Row:0 grids\26.xgd
5 Col:1 Row:1 grids\27.xgd
6 Col:1 Row:2 grids\28.xgd
7 Col:1 Row:3 grids\29.xgd
8 Col:2 Row:0 grids\30.xgd
9 Col:2 Row:1 grids\31.xgd
10 Col:2 Row:2 grids\32.xgd
11 Col:2 Row:3 grids\33.xgd
12 Col:3 Row:0 grids\19.xgd
13 Col:3 Row:1 grids\20.xgd
14 Col:3 Row:2 grids\21.xgd
15 Col:3 Row:3 grids\22.xgd
16 Col:4 Row:0 grids\16.xgd
17 Col:4 Row:1 grids\17.xgd
18 Col:4 Row:2 grids\18.xgd
19 Col:5 Row:0 grids\13.xgd
20 Col:5 Row:1 grids\14.xgd
21 Col:5 Row:2 grids\15.xgd
22 Col:6 Row:0 grids\10.xgd
23 Col:6 Row:1 grids\11.xgd
24 Col:6 Row:2 grids\12.xgd
25 Col:7 Row:0 grids\07.xgd
26 Col:7 Row:1 grids\08.xgd
27 Col:7 Row:2 grids\09.xgd
28 Col:8 Row:0 grids\04.xgd
29 Col:8 Row:1 grids\05.xgd
30 Col:8 Row:2 grids\06.xgd
31 Col:9 Row:0 grids\01.xgd
32 Col:9 Row:1 grids\02.xgd
33 Col:9 Row:2 grids\03.xgd

Area 2 processed magnetometer data

COMPOSITE

Filename: J481-mag-Area2-proc.xcp

Stats
Max: 3.00
Min: -3.00
Std Dev: 1.27
Mean: -0.07
Median: -0.01
Composite Area: 3.6 ha
Surveyed Area: 1.742 ha

Processes: 12
1 Base Layer
2 Search & Replace From: -100 To: 100 With: Dummy (Area: Top 33, Left 117, Bottom 41, Right 154)
3 Search & Replace From: -100 To: 100 With: Dummy (Area: Top 27, Left 145, Bottom 36, Right 181)
4 Search & Replace From: -100 To: 100 With: Dummy (Area: Top 54, Left 32, Bottom 64, Right 59)
5 Search & Replace From: -100 To: 100 With: Dummy (Area: Top 62, Left 14, Bottom 72, Right 48)
6 Search & Replace From: -100 To: 100 With: Dummy (Area: Top 71, Left 18, Bottom 79, Right 40)
7 Search & Replace From: -100 To: 100 With: Dummy (Area: Top 38, Left 92, Bottom 45, Right 139)
8 DeStripe Mean Traverse: Grids: All Threshold: 0.5 SDs

9 Clip from -3.00 to 3.00 nT
10 Edge Match (Area: Top 30, Left 1080, Bottom 59, Right 1199) to Left edge
11 Edge Match (Area: Top 60, Left 1080, Bottom 89, Right 1199) to Left edge
12 Clip from -3.00 to 3.00 nT

Area 3 raw magnetometer data

COMPOSITE
Filename: J481-mag-Area3-raw.xcp
Instrument Type: Bartington (Gradiometer)
Units: nT
Surveyed by: on 30/05/2013
Assembled by: on 30/05/2013
Direction of 1st Traverse: 45 deg
Collection Method: ZigZag
Sensors: 2 @ 1.00 m spacing.
Dummy Value: 32702

Dimensions
Composite Size (readings): 720 x 60
Survey Size (meters): 180 m x 60 m
Grid Size: 30 m x 30 m
X Interval: 0.25 m
Y Interval: 1 m

Stats
Max: 30.00
Min: -30.00
Std Dev: 11.26
Mean: -0.69
Median: -0.41
Composite Area: 1.08 ha
Surveyed Area: 0.48365 ha

Processes: 2
1 Base Layer
2 Clip from -30.00 to 30.00 nT

Source Grids: 11
1 Col:0 Row:0 grids\10.xgd
2 Col:0 Row:1 grids\11.xgd
3 Col:1 Row:0 grids\08.xgd
4 Col:1 Row:1 grids\09.xgd
5 Col:2 Row:0 grids\06.xgd
6 Col:2 Row:1 grids\07.xgd
7 Col:3 Row:0 grids\04.xgd
8 Col:3 Row:1 grids\05.xgd
9 Col:4 Row:0 grids\02.xgd
10 Col:4 Row:1 grids\03.xgd
11 Col:5 Row:0 grids\01.xgd

Area 3 processed magnetometer data

COMPOSITE
Filename: J481-mag-Area3-proc.xcp

Stats
Max: 3.00
Min: -3.00
Std Dev: 2.16
Mean: -0.08
Median: -0.07
Composite Area: 1.08 ha
Surveyed Area: 0.48365 ha

Processes: 4
1 Base Layer
2 Clip from -10.00 to 10.00 nT
3 DeStripe Mean Traverse: Grids: All Threshold: 1 SDs
4 Clip from -3.00 to 3.00 nT

Area 4 raw magnetometer data

COMPOSITE
Filename: J481-mag-Area4-raw.xcp
Instrument Type: Bartington (Gradiometer)
Units: nT
Surveyed by: on 30/05/2013
Assembled by: on 30/05/2013
Direction of 1st Traverse: 45 deg
Collection Method: ZigZag
Sensors: 2 @ 1.00 m spacing.
Dummy Value: 32702

Dimensions
Composite Size (readings): 600 x 120
Survey Size (meters): 150 m x 120 m
Grid Size: 30 m x 30 m
X Interval: 0.25 m
Y Interval: 1 m

Stats
Max: 30.00
Min: -30.00
Std Dev: 6.02
Mean: -1.41
Median: -1.12
Composite Area: 1.8 ha
Surveyed Area: 0.878 ha

Processes: 2
1 Base Layer
2 Clip from -30.00 to 30.00 nT

Source Grids: 15
1 Col:0 Row:1 grids\01.xgd
2 Col:0 Row:2 grids\02.xgd
3 Col:0 Row:3 grids\03.xgd
4 Col:1 Row:1 grids\04.xgd
5 Col:1 Row:2 grids\05.xgd
6 Col:1 Row:3 grids\06.xgd
7 Col:2 Row:0 grids\07.xgd
8 Col:2 Row:1 grids\08.xgd
9 Col:2 Row:2 grids\09.xgd
10 Col:2 Row:3 grids\10.xgd
11 Col:3 Row:0 grids\11.xgd
12 Col:3 Row:1 grids\12.xgd
13 Col:3 Row:2 grids\13.xgd
14 Col:3 Row:3 grids\14.xgd
15 Col:4 Row:3 grids\15.xgd

Area 4 processed magnetometer data

COMPOSITE
Filename: J481-mag-Area4-proc.xcp

Stats
Max: 3.00
Min: -3.00
Std Dev: 1.32
Mean: 0.01
Median: 0.00
Composite Area: 1.8 ha
Surveyed Area: 0.878 ha

Processes: 4
1 Base Layer
2 Clip from -10.00 to 10.00 nT
3 DeStripe Median Traverse: Grids: All
4 Clip from -3.00 to 3.00 nT

Area 5 raw magnetometer data

COMPOSITE
Filename: J481-mag-Area5-raw.xcp
Instrument Type: Bartington (Gradiometer)
Units: nT
Surveyed by: on 30/05/2013
Assembled by: on 30/05/2013
Direction of 1st Traverse: 45 deg
Collection Method: ZigZag
Sensors: 2 @ 1.00 m spacing.
Dummy Value: 32702

Dimensions
Composite Size (readings): 600 x 60
Survey Size (meters): 150 m x 60 m
Grid Size: 30 m x 30 m
X Interval: 0.25 m
Y Interval: 1 m

Stats
Max: 30.00
Min: -30.00
Std Dev: 3.79
Mean: -0.90
Median: -0.85
Composite Area: 0.9 ha
Surveyed Area: 0.3268 ha

Processes: 2
1 Base Layer
2 Clip from -30.00 to 30.00 nT

Source Grids: 8
1 Col:0 Row:1 grids\08.xgd
2 Col:1 Row:1 grids\07.xgd
3 Col:2 Row:0 grids\05.xgd
4 Col:2 Row:1 grids\06.xgd
5 Col:3 Row:0 grids\03.xgd
6 Col:3 Row:1 grids\04.xgd
7 Col:4 Row:0 grids\01.xgd
8 Col:4 Row:1 grids\02.xgd

Area 5 processed magnetometer data

COMPOSITE
Filename: J481-mag-Area5-proc.xcp

Stats
Max: 3.00
Min: -3.00
Std Dev: 1.12
Mean: 0.02
Median: 0.00
Composite Area: 0.9 ha

Surveyed Area: 0.3268 ha

Processes: 4
1 Base Layer
2 Clip from -10.00 to 10.00 nT
3 DeStripe Median Traverse: Grids: All
4 Clip from -3.00 to 3.00 nT

Area 6 raw magnetometer data

COMPOSITE
Filename: J481-mag-Area6-raw.xcp
Instrument Type: Bartington (Gradiometer)
Units: nT
Surveyed by: on 11/06/2013
Assembled by: on 11/06/2013
Direction of 1st Traverse: 45 deg
Collection Method: ZigZag
Sensors: 2 @ 1.00 m spacing.
Dummy Value: 32702

Dimensions
Composite Size (readings): 960 x 120
Survey Size (meters): 240 m x 120 m
Grid Size: 30 m x 30 m
X Interval: 0.25 m
Y Interval: 1 m

Stats
Max: 30.00
Min: -30.00
Std Dev: 4.89
Mean: 0.69
Median: 0.57
Composite Area: 2.88 ha
Surveyed Area: 1.2564 ha

Processes: 2
1 Base Layer
2 Clip from -30.00 to 30.00 nT

Source Grids: 25
1 Col:0 Row:1 01.xgd
2 Col:1 Row:1 02.xgd
3 Col:2 Row:1 03.xgd
4 Col:2 Row:2 04.xgd
5 Col:2 Row:3 05.xgd
6 Col:3 Row:0 09.xgd
7 Col:3 Row:1 06+10.xgd
8 Col:3 Row:2 07+11.xgd
9 Col:3 Row:3 08+12.xgd
10 Col:4 Row:0 13.xgd
11 Col:4 Row:1 14.xgd
12 Col:4 Row:2 15.xgd
13 Col:4 Row:3 16.xgd
14 Col:5 Row:0 17.xgd
15 Col:5 Row:1 18.xgd
16 Col:5 Row:2 19.xgd
17 Col:5 Row:3 20.xgd
18 Col:6 Row:0 21.xgd
19 Col:6 Row:1 22.xgd
20 Col:6 Row:2 23.xgd
21 Col:6 Row:3 24.xgd
22 Col:7 Row:0 25.xgd
23 Col:7 Row:1 26.xgd
24 Col:7 Row:2 27.xgd
25 Col:7 Row:3 28.xgd

Area 6 processed magnetometer data

COMPOSITE
Filename: J481-mag-Area6-proc.xcp

Stats
Max: 3.00
Min: -3.00
Std Dev: 1.57
Mean: 0.08
Median: 0.00
Composite Area: 2.88 ha
Surveyed Area: 1.2564 ha

Processes: 4
1 Base Layer
2 DeStripe Median Traverse: Grids: All
3 Clip from -3.00 to 3.00 nT
4 Despike Threshold: 0.5 Window size: 3x3

Area 7 raw magnetometer data

COMPOSITE
Filename: J481-mag-Area7-raw.xcp
Instrument Type: Bartington (Gradiometer)
Units: nT
Surveyed by: on 13/06/2013
Assembled by: on 13/06/2013
Direction of 1st Traverse: 45 deg
Collection Method: ZigZag
Sensors: 2 @ 1.00 m spacing.
Dummy Value: 32702

Dimensions
Composite Size (readings): 1440 x 150
Survey Size (meters): 360 m x 150 m
Grid Size: 30 m x 30 m
X Interval: 0.25 m
Y Interval: 1 m

Stats
Max: 30.00
Min: -30.00
Std Dev: 4.11
Mean: 0.12
Median: 0.15
Composite Area: 5.4 ha
Surveyed Area: 4.1296 ha

Processes: 2
1 Base Layer
2 Clip from -30.00 to 30.00 nT

Source Grids: 57
1 Col:0 Row:0 grids\57.xgd
2 Col:0 Row:1 grids\58.xgd
3 Col:0 Row:2 grids\59.xgd
4 Col:0 Row:3 grids\60.xgd
5 Col:1 Row:0 grids\53.xgd
6 Col:1 Row:1 grids\54.xgd
7 Col:1 Row:2 grids\55.xgd
8 Col:1 Row:3 grids\52+56.xgd
9 Col:1 Row:4 grids\02.xgd
10 Col:2 Row:0 grids\48.xgd
11 Col:2 Row:1 grids\49.xgd
12 Col:2 Row:2 grids\50.xgd
13 Col:2 Row:3 grids\51.xgd
14 Col:2 Row:4 grids\04.xgd
15 Col:3 Row:0 grids\44.xgd
16 Col:3 Row:1 grids\45.xgd
17 Col:3 Row:2 grids\46.xgd
18 Col:3 Row:3 grids\47.xgd
19 Col:3 Row:4 grids\05.xgd
20 Col:4 Row:0 grids\40.xgd
21 Col:4 Row:1 grids\41.xgd
22 Col:4 Row:2 grids\42.xgd
23 Col:4 Row:3 grids\43.xgd
24 Col:4 Row:4 grids\06.xgd
25 Col:5 Row:0 grids\36.xgd
26 Col:5 Row:1 grids\37.xgd
27 Col:5 Row:2 grids\38.xgd
28 Col:5 Row:3 grids\39.xgd
29 Col:5 Row:4 grids\07.xgd
30 Col:6 Row:0 grids\32.xgd
31 Col:6 Row:1 grids\33.xgd
32 Col:6 Row:2 grids\34.xgd
33 Col:6 Row:3 grids\35.xgd
34 Col:6 Row:4 grids\08.xgd
35 Col:7 Row:0 grids\28.xgd
36 Col:7 Row:1 grids\29.xgd
37 Col:7 Row:2 grids\30.xgd
38 Col:7 Row:3 grids\31.xgd
39 Col:7 Row:4 grids\09.xgd
40 Col:8 Row:0 grids\24.xgd
41 Col:8 Row:1 grids\25.xgd
42 Col:8 Row:2 grids\26.xgd
43 Col:8 Row:3 grids\27.xgd
44 Col:8 Row:4 grids\10.xgd
45 Col:9 Row:0 grids\20.xgd
46 Col:9 Row:1 grids\21.xgd
47 Col:9 Row:2 grids\22.xgd
48 Col:9 Row:3 grids\23.xgd
49 Col:9 Row:4 grids\11.xgd
50 Col:10 Row:0 grids\16.xgd
51 Col:10 Row:1 grids\17.xgd
52 Col:10 Row:2 grids\18.xgd
53 Col:10 Row:3 grids\19.xgd
54 Col:11 Row:0 grids\12.xgd
55 Col:11 Row:1 grids\13.xgd
56 Col:11 Row:2 grids\14.xgd
57 Col:11 Row:3 grids\15.xgd

Area 7 processed magnetometer data

COMPOSITE
Filename: J481-mag-Area7-proc.xcp

Stats
Max: 3.00
Min: -3.00
Std Dev: 1.26
Mean: 0.02
Median: -0.02
Composite Area: 5.4 ha
Surveyed Area: 4.1296 ha

Processes: 12
1 Base Layer
2 DeStripe Mean Traverse: Grids: 57.xgd 58.xgd 59.xgd 53.xgd 54.xgd 55.xgd 48.xgd 49.xgd 50.xgd 44.xgd 45.xgd 46.xgd 40.xgd 41.xgd 42.xgd 36.xgd 37.xgd 38.xgd 32.xgd 33.xgd 34.xgd 28.xgd 29.xgd 30.xgd 24.xgd 25.xgd 26.xgd 20.xgd 21.xgd 22.xgd 16.xgd 17.xgd 18.xgd 12.xgd 13.xgd 14.xgd Threshold: 0.5 SDs
3 DeStripe Mean Traverse: Grids: 60.xgd 52+56.xgd 02.xgd 51.xgd 04.xgd Threshold: 0.5 SDs
4 DeStripe Mean Traverse: Grids: 43.xgd 06.xgd 39.xgd 07.xgd 35.xgd 08.xgd 31.xgd 09.xgd 27.xgd 10.xgd 23.xgd 11.xgd 19.xgd 15.xgd Threshold: 0.5 SDs
5 DeStripe Mean Traverse: Grids: 05.xgd Threshold: 0.25 SDs
6 DeStripe Mean Traverse: Grids: 05.xgd Threshold: 0.25 SDs
7 DeStripe Mean Traverse: Grids: 05.xgd Threshold: 0.5 SDs
8 Edge Match (Area: Top 120, Left 360, Bottom 149, Right 479) to Left edge
9 Clip from -3.00 to 3.00 nT
10 De Stagger: Grids: 17.xgd Mode: Both By: -1 intervals
11 De Stagger: Grids: 18.xgd Mode: Both By: -1 intervals
12 Clip from -3.00 to 3.00 nT

Area 8 raw magnetometer data

COMPOSITE
Filename: J481-mag-Area8-raw.xcp
Instrument Type: Grad 601 (Gradiometer)
Units: nT
Surveyed by: on 13/06/2013
Assembled by: on 13/06/2013
Direction of 1st Traverse: 45 deg
Collection Method: ZigZag
Sensors: 2 @ 1.00 m spacing.
Dummy Value: 32702

Dimensions
Composite Size (readings): 480 x 30
Survey Size (meters): 120 m x 30 m
Grid Size: 30 m x 30 m
X Interval: 0.25 m
Y Interval: 1 m

Stats
Max: 30.00
Min: -30.00
Std Dev: 2.73
Mean: -0.74
Median: 0.11
Composite Area: 0.36 ha
Surveyed Area: 0.26545 ha

Processes: 2
1 Base Layer
2 Clip from -30.00 to 30.00 nT
Source Grids: 4
1 Col:0 Row:0 grids\01.xgd
2 Col:1 Row:0 grids\02.xgd
3 Col:2 Row:0 grids\03.xgd
4 Col:3 Row:0 grids\04.xgd

Area 8 processed magnetometer data

COMPOSITE
Filename: J481-mag-Area8-proc.xcp

Stats
Max: 3.00
Min: -3.00
Std Dev: 0.83
Mean: -0.04
Median: 0.00
Composite Area: 0.36 ha
Surveyed Area: 0.26545 ha

Processes: 3
1 Base Layer
2 DeStripe Median Traverse: Grids: All
3 Clip from -3.00 to 3.00 nT

Area 9 raw magnetometer data

COMPOSITE
Filename: J481-mag-Area9-raw.xcp
Instrument Type: Bartington (Gradiometer)
Units: nT
Surveyed by: on 17/06/2013
Assembled by: on 17/06/2013
Direction of 1st Traverse: 45 deg
Collection Method: ZigZag
Sensors: 2 @ 1.00 m spacing.
Dummy Value: 32702

Dimensions
Composite Size (readings): 840 x 150
Survey Size (meters): 210 m x 150 m
Grid Size: 30 m x 30 m
X Interval: 0.25 m
Y Interval: 1 m

Stats
Max: 30.00
Min: -30.00
Std Dev: 4.39
Mean: -0.83
Median: -0.44
Composite Area: 3.15 ha
Surveyed Area: 1.8056 ha

Processes: 2
1 Base Layer
2 Clip from -30.00 to 30.00 nT

Source Grids: 33
1 Col:0 Row:1 grids\01.xgd
2 Col:0 Row:2 grids\02.xgd
3 Col:0 Row:3 grids\03.xgd
4 Col:1 Row:0 grids\33.xgd
5 Col:1 Row:1 grids\04.xgd
6 Col:1 Row:2 grids\05.xgd
7 Col:1 Row:3 grids\06.xgd
8 Col:1 Row:4 grids\07.xgd
9 Col:2 Row:0 grids\32.xgd
10 Col:2 Row:1 grids\08.xgd
11 Col:2 Row:2 grids\09.xgd
12 Col:2 Row:3 grids\10.xgd
13 Col:2 Row:4 grids\11.xgd
14 Col:3 Row:0 grids\31.xgd
15 Col:3 Row:1 grids\12.xgd
16 Col:3 Row:2 grids\13.xgd
17 Col:3 Row:3 grids\14.xgd
18 Col:3 Row:4 grids\15.xgd
19 Col:4 Row:0 grids\30.xgd
20 Col:4 Row:1 grids\16.xgd
21 Col:4 Row:2 grids\17.xgd
22 Col:4 Row:3 grids\18.xgd
23 Col:4 Row:4 grids\19.xgd
24 Col:5 Row:0 grids\29.xgd
25 Col:5 Row:1 grids\20.xgd
26 Col:5 Row:2 grids\21.xgd
27 Col:5 Row:3 grids\22.xgd
28 Col:5 Row:4 grids\23.xgd
29 Col:6 Row:0 grids\28.xgd
30 Col:6 Row:1 grids\24.xgd
31 Col:6 Row:2 grids\25.xgd
32 Col:6 Row:3 grids\26.xgd
33 Col:6 Row:4 grids\27.xgd

Area 9 processed magnetometer data

COMPOSITE
Filename: J481-mag-Area9-proc.xcp

Stats
Max: 3.00
Min: -3.00
Std Dev: 1.08
Mean: -0.12
Median: -0.06
Composite Area: 3.15 ha
Surveyed Area: 1.8056 ha

Processes: 7
1 Base Layer
2 DeStripe Mean Traverse: Grids: All Threshold: 0.5 SDs
3 Clip from -3.00 to 3.00 nT
4 Edge Match (Area: Top 30, Left 720, Bottom 59, Right 839) to Left edge
5 Edge Match (Area: Top 60, Left 720, Bottom 89, Right 839) to Left edge
6 Edge Match (Area: Top 90, Left 720, Bottom 119, Right 839) to Left edge
7 Clip from -3.00 to 3.00 nT

Area 6 raw earth resistance data

COMPOSITE
Filename: J481-res-Area6.xcp
Instrument Type: GeoScan (Resistance)
Units: Ohm
Surveyed by: on 13/06/2013
Assembled by: on 13/06/2013
Direction of 1st Traverse: 0 deg
Collection Method: ZigZag
Sensors: 1
Dummy Value: 32702

Dimensions
Composite Size (readings): 120 x 90
Survey Size (meters): 120 m x 90 m
Grid Size: 30 m x 30 m
X Interval: 1 m
Y Interval: 1 m

Stats
Max: 14.17
Min: 0.52
Std Dev: 3.44
Mean: 6.84
Median: 6.65
Composite Area: 1.08 ha
Surveyed Area: 0.7306 ha

Processes: 2
1 Base Layer
2 Clip at 1.00 SD

Source Grids: 11
1 Col:0 Row:1 grids\10.xgd
2 Col:0 Row:2 grids\11.xgd
3 Col:1 Row:0 grids\01.xgd
4 Col:1 Row:1 grids\12+02.xgd
5 Col:1 Row:2 grids\03+13.xgd
6 Col:2 Row:0 grids\04.xgd
7 Col:2 Row:1 grids\05.xgd
8 Col:2 Row:2 grids\06.xgd
9 Col:3 Row:0 grids\07.xgd
10 Col:3 Row:1 grids\08.xgd
11 Col:3 Row:2 grids\09.xgd

Area 6 processed earth resistance data

COMPOSITE
Path: D:\Business\Jobs\J481 Wanborough\Data\Res\Area 6\comps\
Filename: J481-res-Area6-proc.xcp
Instrument Type: GeoScan (Resistance)

Stats
Max: 10.28
Min: 3.40
Std Dev: 2.60
Mean: 6.61
Median: 6.65
Composite Area: 1.08 ha
Surveyed Area: 0.7306 ha

Processes: 3
1 Base Layer
2 Clip at 1.00 SD
3 Clip at 1.00 SD

Appendix D – digital archive

Archaeological Surveys Ltd hold the primary digital archive at their Wiltshire offices. 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. Surveys are reported on in hardcopy (recycled paper) using A4 for text and A3 for plots (all plots are scaled for A3).

As a requirement of gaining the *Ancient Monuments and Archaeological Areas Act 1979 (as amended) section 42 - licence to carry out a geophysical survey*, copies of the report will be sent to the English Heritage offices in Bristol and Portsmouth. A copy will also be sent to the Wiltshire Historic Environment Record and also uploaded to OASIS within three months of completing the survey.

This report has been prepared using the following software on a Windows XP platform:

- TerraSurveyor/ArcheoSurveyor version 2.5.19.3 (geophysical data analysis),
- ProgeCAD Professional 2009 (report graphics),
- AutoCAD LT 2007 (report figures),
- OpenOffice.org 3.0.1 Writer (document text),
- PDF Creator version 0.9 (PDF archive).

Digital data produced by the survey and report include the following files:

- TerraSurveyor/ArcheoSurveyor grid and composite files for geophysical data,
- CSV files for raw and processed composites,
- geophysical composite file graphics as Bitmap images,
- AutoCAD DWG files in 2000 and 2007 versions,
- report text as OpenOffice.org ODT file,
- report text as Word 2000 doc file,
- report text as rich text format (RTF),
- report text as PDF,
- PDFs of all figures.

ENGLISH HERITAGE

English Heritage Geophysical Survey Database Questionnaire

Survey Details

Name of Site: Site of Roman Town, West of Wanborough House (Report title: Swindon Eastern Villages, Wanborough, Swindon)

County: Wiltshire (Swindon Borough)

NGR Grid Reference (Centre of survey to nearest 100m):
SU 197 855

Start Date: 11th June 2013 **End Date: 14th June 2013**

Geology at site (Drift and Solid):

Ampthill and Kimmeridge Clay with some alluvial deposits possible

Known archaeological Sites/Monuments covered by the survey
(Scheduled Monument No. or National Archaeological Record No. if known)

SM SW 888

Archaeological Sites/Monument types detected by survey
(Type and Period if known. "?" where any doubt).

Roman town, ditches, enclosures, pits, roads, buildings

Surveyor (Organisation, if applicable, otherwise individual responsible for the survey):

Archaeological Surveys Ltd (David Sabin and Kerry Donaldson)

Name of Client, if any:

Ainscough Strategic Land

ENGLISH HERITAGE

Purpose of Survey:

To assess the nature and extent of the archaeological resource within and immediately adjacent to the scheduled area. This is part of the wider Swindon Eastern Villages proposal which does not aim to impact on the scheduled area.

Location of:

a) Primary archive, i.e. raw data, electronic archive etc:

Archaeological Surveys Ltd, 1 West Nolands, Nolands Road, Yatesbury, Calne, SN11 8YD

b) Full Report:

As above and also sent to Wiltshire HER.

ENGLISH HERITAGE

Technical Details

(Please fill out a separate sheet for each survey technique used)

Type of Survey (Use term from attached list or specify other):

Magnetometer

Area Surveyed, if applicable (In hectares to one decimal place):

6.2ha within the scheduled area (additional 9.8ha outside of scheduled area)

Traverse Separation, if regular: **Reading/Sample Interval:**

1m 0.25m

Type, Make and model of Instrumentation:

Bartington Grad601-2

For Resistivity Survey:

Probe configuration:

Probe Spacing:

Land use at the time of the survey (Use term/terms from the attached list or specify other):

Arable (fruit farm) and grassland

ENGLISH HERITAGE

Technical Details

(Please fill out a separate sheet for each survey technique used)

Type of Survey (Use term from attached list or specify other):

Resistivity

Area Surveyed, if applicable (In hectares to one decimal place):

0.75ha

Traverse Separation, if regular: **Reading/Sample Interval:**

1m 1m

Type, Make and model of Instrumentation:

Geoscan Research Ltd RM85

For Resistivity Survey:

Probe configuration: Twin probe

Probe Spacing: 0.5m

Land use at the time of the survey (Use term/terms from the attached list or specify other):

Arable (cultivated to east, raspberry plants in centre and to west)

Additional Remarks (Please mention any other technical aspects of the survey that have not been covered by the above questions such as sampling strategy, non standard technique, problems with equipment etc.):

List of terms for Survey Type

Magnetometer (includes gradiometer)

Resistivity

Resistivity Profile

Magnetic Susceptibility

Electro-Magnetic Survey

Ground Penetrating Radar

Other (please specify)

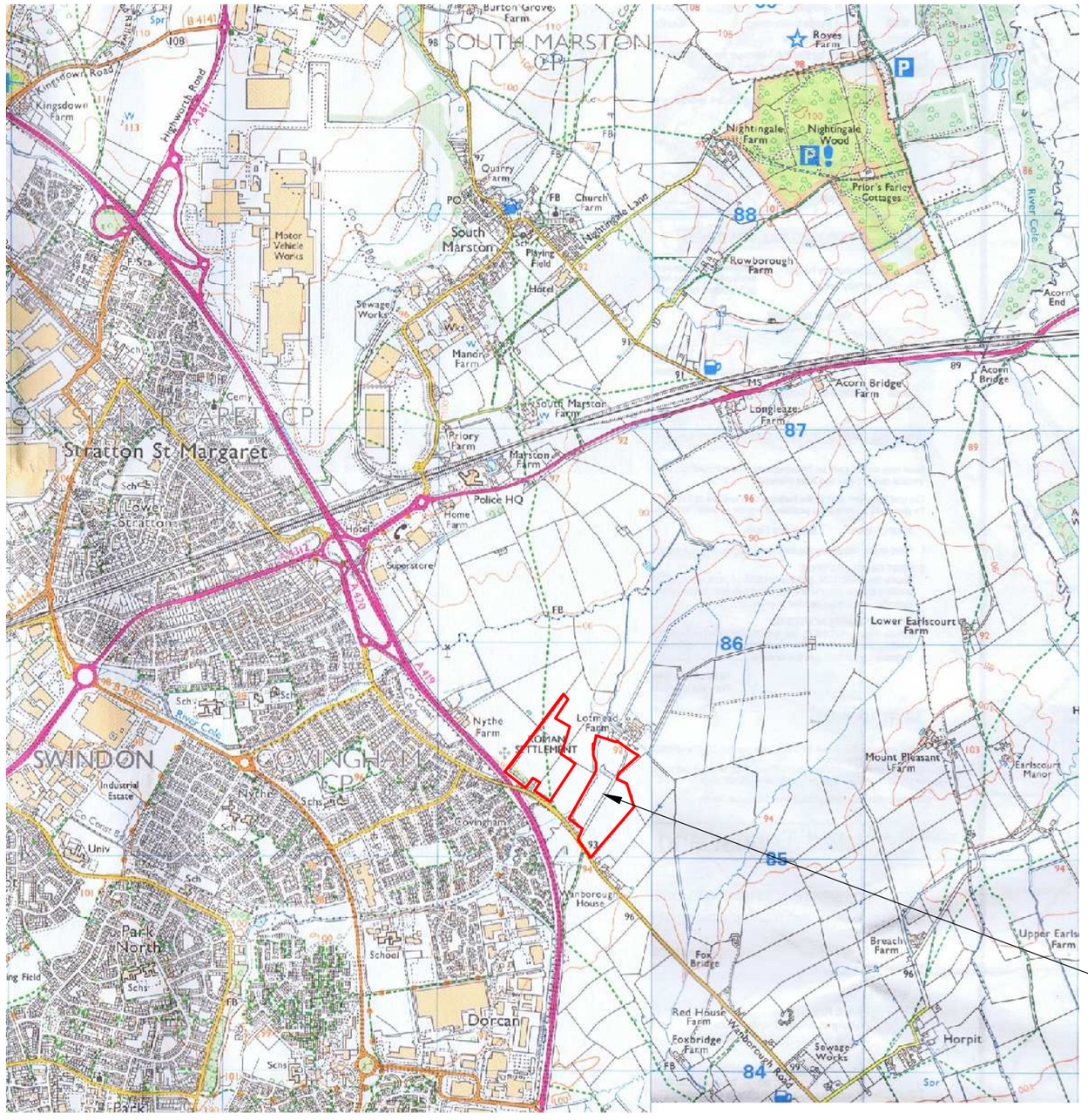
ENGLISH HERITAGE

List of terms for Land Use:

Arable
Grassland - Pasture
Grassland - Undifferentiated
Heathland
Moorland
Coastland - Inter-Tidal
Coastland - Above High Water
Allotment
Archaeological Excavation
Garden
Lawn
Orchard
Park
Playing Field
Built-Over
Churchyard
Waste Ground
Woodland
Other (please specify)

Archaeological Surveys Ltd

Geophysical Survey
Swindon Eastern Villages
Wanborough
Swindon



Map of survey area

● Survey location

Site centred on OS NGR
SU 197 855

SCALE 1:25 000

0m 500m 1000m

SCALE TRUE AT A3

FIG 01

Archaeological Surveys Ltd

Geophysical Survey
Swindon Eastern Villages
Wanborough
Swindon

Referencing information

Grid coordinates based on Ordnance Survey OSGB36 datum

Grids set out using RTK GPS with Leica SmartNet correction data RTCMv2 format OSTN02 transformation

Survey grid size = 30m

Survey start and traverse direction

01 Magnetometry grid reference number

02 Resistivity grid reference number

Scheduled area

SCALE 1:3000

0m 30 60 90 120 150m

SCALE TRUE AT A3

FIG 02

Area 8

Area 7

Area 6

Area 4

Area 3

Area 5

Area 2

Area 1

Area 9

N

Archaeological Surveys Ltd

Geophysical Survey
Swindon Eastern Villages
Wanborough
Swindon

Greyscale plot of raw magnetometer data

-30nT

-30nT

-30nT Area 1 -30nT

-30nT Area 2 -30nT

-30nT Area 6 -30nT

-30nT Area 3 -30nT

-30nT Area 7 -30nT

-30nT Area 4 -30nT

-30nT Area 8 -30nT

-30nT Area 5 -30nT

-30nT Area 9 -30nT

SCALE 1:2500

0m 50 100m

SCALE TRUE AT A1

FIG 03

Archaeological Surveys Ltd

Geophysical Survey
Swindon Eastern Villages
Wanborough
Swindon

Area 8
Area 7
Area 6
Area 4
Area 3
Area 5
Area 2
Area 1
Area 9
N

Greyscale plot of processed magnetometer data

-3nT
-3nT

-3nT Area 1 -3nT
-3nT Area 2 -3nT
-3nT Area 6 -3nT
-3nT Area 3 -3nT
-3nT Area 7 -3nT
-3nT Area 4 -3nT
-3nT Area 8 -3nT
-3nT Area 5 -3nT
-3nT Area 9 -3nT

SCALE 1:2500

0m 50 100m

SCALE TRUE AT A1

FIG 04

Archaeological Surveys Ltd

Geophysical Survey
Swindon Eastern Villages
Wanborough
Swindon

Abstraction and interpretation of magnetometer and resistance anomalies

- Positive linear anomaly - cut feature of archaeological potential
- Positive linear anomaly - possible ditch-like feature
- Positive linear anomaly - possible land drain
- Negative linear anomaly - material of low magnetic susceptibility
- Discrete positive response - cut feature of archaeological potential
- Discrete positive response - possible pit-like feature
- Positive anomaly - magnetically enhanced material
- Magnetically variable response - material of archaeological potential
- Variable magnetic response - former stream channel
- Magnetic debris - spread of magnetically thermoremnant/ferrous material
- Magnetic disturbance from ferrous material
- Strong dipolar anomaly - ferrous object
- High resistance linear anomaly - structural remains
- High resistance linear anomaly - of archaeological potential
- High resistance linear anomaly - edge of modern cultivation
- Area of high resistance - of archaeological potential
- Area of low resistance - of archaeological potential

SCALE 1:2500

0m 50 100m

SCALE TRUE AT A3

FIG 05

Area 2

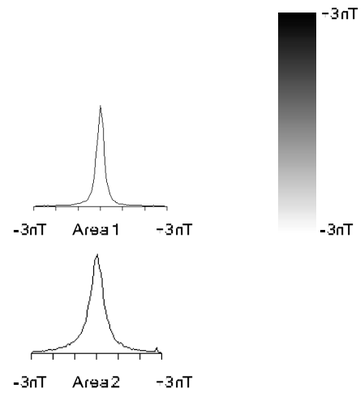
Area 1

N

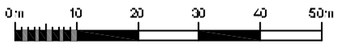
Archaeological Surveys Ltd

Geophysical Survey
Swindon Eastern Villages
Wanborough
Swindon

Greyscale plot of processed magnetometer data - Areas 1 & 2



SCALE 1:1000



SCALE TRUE AT A1

FIG 06

Archaeological Surveys Ltd

Geophysical Survey
Swindon Eastern Villages
Wanborough
Swindon

Abstraction and interpretation of magnetometer anomalies - Areas 1 & 2

- Positive linear anomaly - cut feature of archaeological potential
- Positive linear anomaly - possible ditch-like feature
- Discrete positive response - possible pit-like feature
- Magnetic debris - spread of magnetically thermoremnant/ferrous material
- Strong dipolar anomaly - ferrous object
- Magnetic disturbance from ferrous material

N

Area 1

Area 2

1

2

3

4

5

6

7

8

34

SCALE 1:1000

0m 10 20 30 40 50m

SCALE TRUE AT A3

FIG 07

Area 4

Area 3

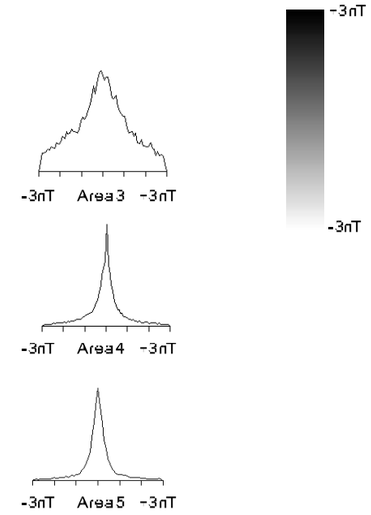
Area 5

N

Archaeological Surveys Ltd

Geophysical Survey
Swindon Eastern Villages
Wanborough
Swindon

Greyscale plot of processed magnetometer data - Areas 3, 4 & 5



SCALE 1:1000

0m 10 20 30 40 50m

SCALE TRUE AT A1

FIG 08

Area 4

Area 3

Area 5

N

12

14

13

9

15

10

11

8

Archaeological Surveys Ltd

Geophysical Survey
Swindon Eastern Villages
Wanborough
Swindon

Abstraction and interpretation of magnetometer anomalies - Areas 3, 4 & 5

- Positive linear anomaly - possible ditch-like feature
- Discrete positive response - possible pit-like feature
- 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 1:1000

0m 10 20 30 40 50m

SCALE TRUE AT A3

FIG 09

Area 7

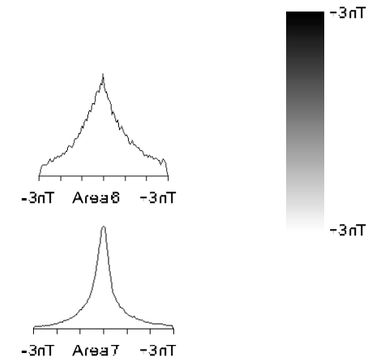
Area 6

N

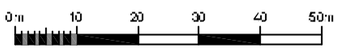
Archaeological Surveys Ltd

Geophysical Survey
Swindon Eastern Villages
Wanborough
Swindon

Greyscale plot of processed magnetometer data - Area 6 & Area 7 south



SCALE 1:1000



SCALE TRUE AT A1

FIG 10

Archaeological Surveys Ltd

Geophysical Survey
Swindon Eastern Villages
Wanborough
Swindon

Abstraction and interpretation of magnetometer anomalies - Area 6 & Area 7 south

- Positive linear anomaly - cut feature of archaeological potential
- Positive linear anomaly - possible ditch-like feature
- Positive linear anomaly - possible land drain
- Negative linear anomaly - material of low magnetic susceptibility
- Discrete positive response - cut feature of archaeological potential
- Discrete positive response - possible pit-like feature
- Positive anomaly - magnetically enhanced material
- Magnetically variable response - material of archaeological potential
- Magnetic debris - spread of magnetically thermoremnant/ferrous material
- Magnetic disturbance from ferrous material
- Strong dipolar anomaly - ferrous object

Area 7

Area 6

22 28 24 25 21 26 23 18 16 29 19 17 20

N

SCALE 1:1000

0m 10 20 30 40 50m

SCALE TRUE AT A3

FIG 11

Area 8

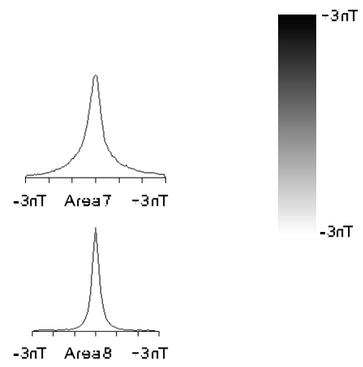
Area 7

N

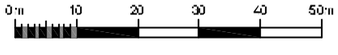
Archaeological Surveys Ltd

Geophysical Survey
Swindon Eastern Villages
Wanborough
Swindon

Greyscale plot of processed magnetometer data - Area 7 north & Area 8



SCALE 1:1000



SCALE TRUE AT A1

FIG 12

Archaeological Surveys Ltd

Geophysical Survey
Swindon Eastern Villages
Wanborough
Swindon

Abstraction and interpretation of magnetometer anomalies - Area 7 north & Area 8

- Positive linear anomaly - cut feature of archaeological potential
- Positive linear anomaly - possible ditch-like feature
- Positive linear anomaly - possible land drain
- Negative linear anomaly - material of low magnetic susceptibility
- Discrete positive response - possible pit-like feature
- Magnetic debris - spread of magnetically thermoremnant/ferrous material
- Magnetic disturbance from ferrous material
- Strong dipolar anomaly - ferrous object

Area 8

Area 7

N

30
32
31
27
22
28
24
25
21

SCALE 1:1000

0m 10 20 30 40 50m

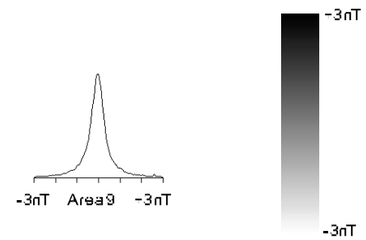
SCALE TRUE AT A3

FIG 13

Archaeological Surveys Ltd

Geophysical Survey
Swindon Eastern Villages
Wanborough
Swindon

Greyscale plot of processed magnetometer data - Area 9



Area 9

SCALE 1:1000

0m 10 20 30 40 50m

FIG 14

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Abstraction and interpretation of magnetometer anomalies - Area 9

- Positive linear anomaly - cut feature of archaeological potential
- Positive linear anomaly - possible ditch-like feature
- Discrete positive response - possible pit-like feature
- Magnetic debris - spread of magnetically thermoremnant/ferrous material
- Magnetic disturbance from ferrous material
- Strong dipolar anomaly - ferrous object

N

4
7
6
5
2
3
34
35
33

Area 9

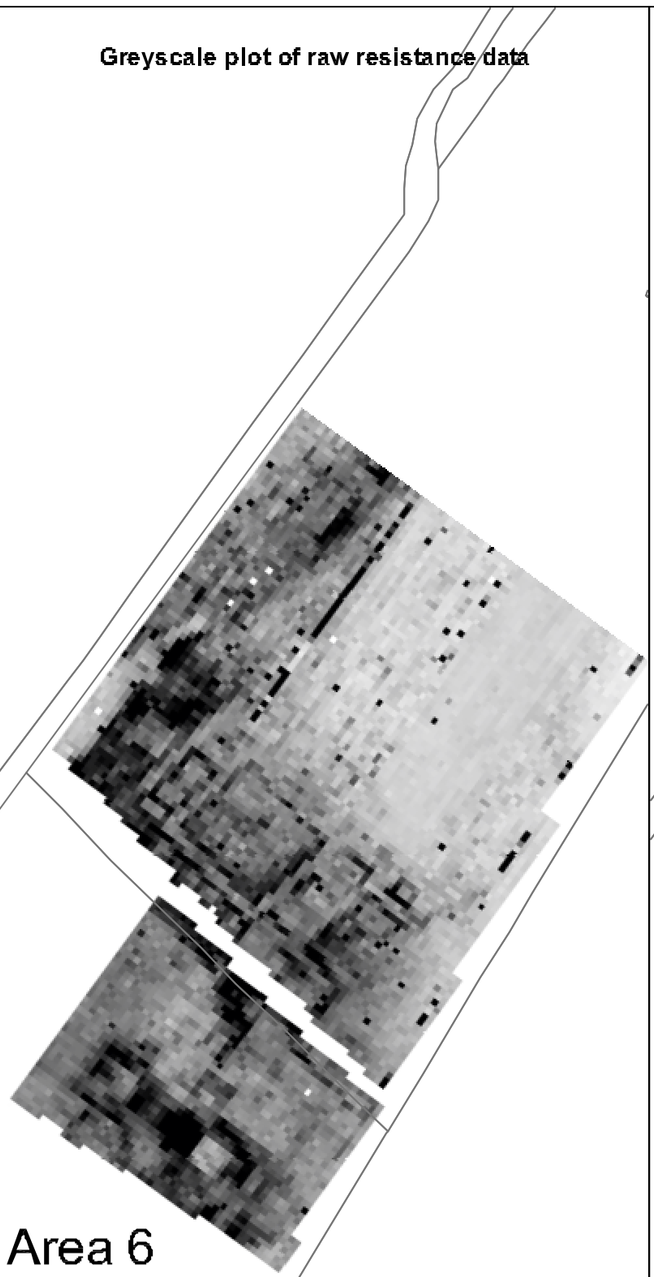
SCALE 1:1000

0m 10 20 30 40 50m

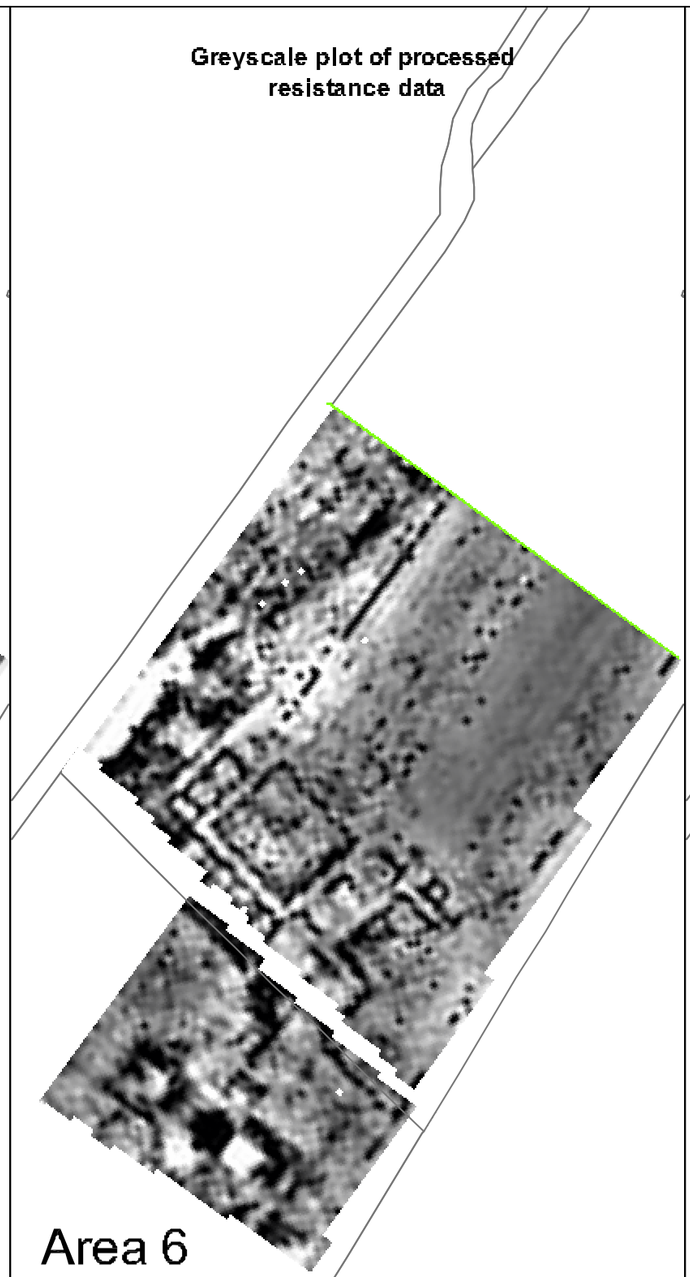
SCALE TRUE AT A3

FIG 15

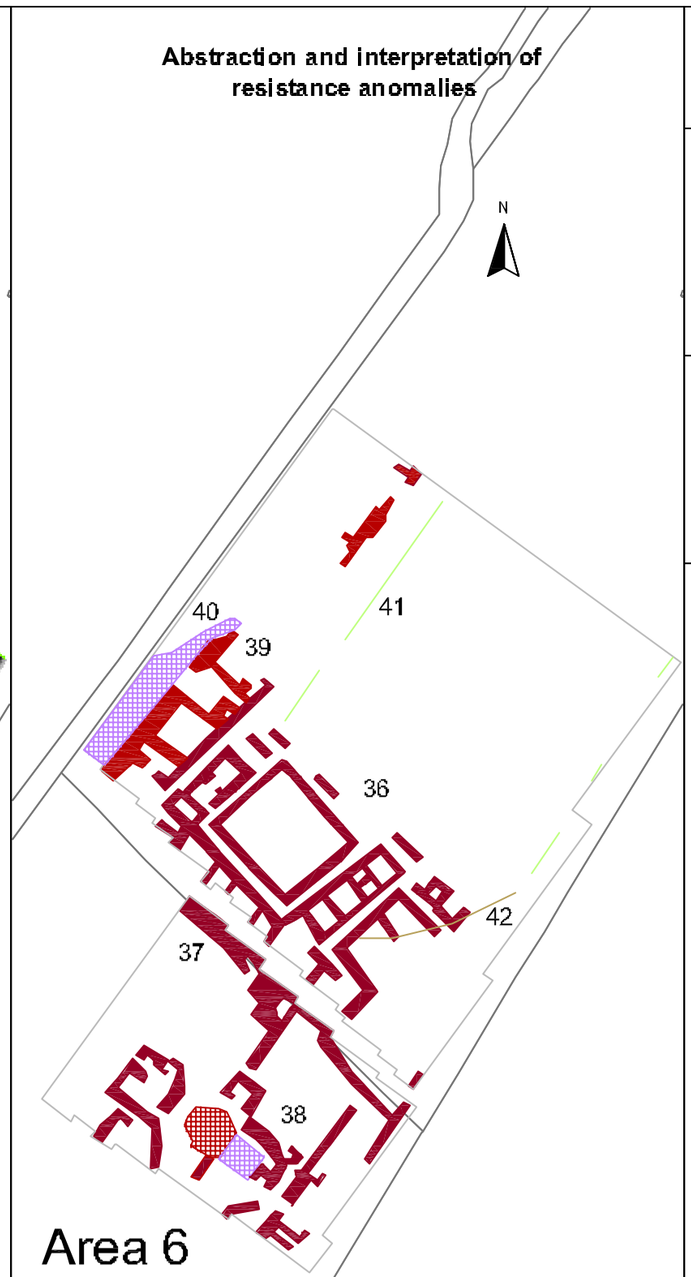
Greyscale plot of raw resistance data



Greyscale plot of processed resistance data



Abstraction and interpretation of resistance anomalies



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Greyscale plot of raw and processed resistance data

Abstraction and interpretation of resistance anomalies

- High resistance linear anomaly - structural remains
- High resistance linear anomaly - of archaeological potential
- High resistance linear anomaly - of uncertain origin
- High resistance linear anomaly - edge of modern cultivation
- Area of high resistance - of archaeological potential
- Area of low resistance - of archaeological potential

SCALE 1:1000

0m 10 20 30 40 50m

SCALE TRUE AT A1

FIG 16