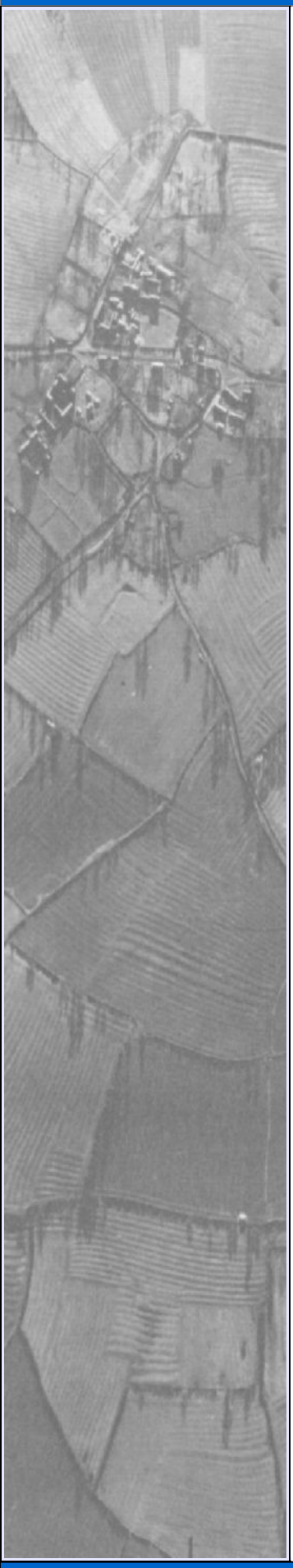

Land off Stourport Road
Great Witley
Worcestershire

MAGNETOMETER SURVEY REPORT

for

Galliford Try

Kerry Donaldson & David Sabin

March 2016

Ref. no. 651

Worcestershire HER Event No: WSM67789

OASIS ID: archaeol20-245445

ARCHAEOLOGICAL SURVEYS LTD

Land off Stourport Road
Great Witley
Worcestershire

Magnetometer Survey Report

for

Galliford Try

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

Survey dates – 23rd to 25th February 2016
Ordnance Survey Grid Reference – **SO 75800 65950**

Worcestershire HER Event No: WSM67789

OASIS ID: archaeol20-245445

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SUMMARY

A detailed magnetometer survey was undertaken by Archaeological Surveys Ltd within two fields at Great Witley, Worcestershire. The results of the survey demonstrate the presence of a number of positive linear anomalies with a north east to south west orientation that may relate to ditch-like features. Several negative anomalies have also been located in the western part of the site, but it is not possible to determine if these are of natural or anthropogenic origin. In the eastern part of the site, weakly positive responses may relate to natural features. Modern anomalies can also be seen within the data, including magnetic debris, services, agricultural anomalies and vehicle ruts.

1 INTRODUCTION

1.1 Survey background

1.1.1 Archaeological Surveys Ltd was commissioned by Galliford Try to carry out a magnetometer survey on land off Stourport Road, Great Witley, Worcestershire. A planning application has been submitted to Malvern Hills District Council (16/00013/FUL) by Elgar Properties (Worcs.) Ltd and Marsten Developments (Worcester) Ltd for the erection of 44 affordable and 131 market dwellings, formation of new accesses onto Stourport Road (the A451 road) and B4197 road, public open space, dedication of land for Great Witley Primary School and new doctors surgery and associated new access, surface and foul water management system and landscaping. The survey forms part of an archaeological assessment of the site.

1.1.2 The geophysical survey was carried out in accordance with a Written Scheme of Investigation (WSI) produced by Archaeological Surveys (2016) and approved by Adrian Scruby, Historic Environment Advisor for Worcestershire Archive & Archaeology Service, prior to commencing the fieldwork. The survey has been issued with a Worcestershire Historic Environment Record (HER) Event Number WSM67789.

1.2 Survey objectives and techniques

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

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

Geophysical Survey and with regard to the *Standards and Guidelines for Archaeological Projects in Worcestershire* (Worcestershire Archive & Archaeology Service, 2012).

1.3 Site location, description and survey conditions

1.3.1 The site is located at Great Witley in Worcestershire. It is centred on Ordnance Survey National Grid Reference (OS NGR) SO 75800 65950, see Figures 01 and 02.

1.3.2 The geophysical survey covers approximately 8.5ha within two fields. Area 1 is an "L" shaped land parcel to the south of the A451 Stourport Road that contained grass cover, Area 2 lies to the east and is bounded to the east by the B4197 and south by the A443 Worcester Road. It contained an emerging arable crop.

1.3.3 Area 1 slopes down from the southern boundary towards the north and into a shallow dry valley that continues beyond the survey area towards the east. Area 2 tends to slope down towards the north and east. Within the lower part of Area 1 was evidence of a village bonfire with a spread of ash containing a very large number of nails. An inspection chamber was noted within the central part of Area 2 and parts of the field were heavily rutted due to recent geotechnical investigations.

1.3.4 The ground conditions across the site were generally considered to be favourable for the collection of magnetometry data. Weather conditions during the survey were fine.

1.4 Site history and archaeological potential

1.4.1 Heritage Statement Archaeological Desk-Based Assessments have been carried out for the two fields within the application area by The Historic Environment Consultancy (Wardle & Lacey, 2015a & 2015b). The site does not contain any designated or undesignated heritage assets and no previous archaeological investigations have been undertaken within it. Just to the south of the site, an excavation was carried out in 2014 by Cotswold Archaeology (Holt, 2014) and a number of undated archaeological features were recorded. These include two ditches, a gully and three pits sealed beneath a post-medieval colluvial deposit with a sherd of highly abraded Roman Severn Valley Ware which was interpreted as residual. A number of silver and copper alloy Roman coins have been made within the parish of Great Witley.

1.4.2 The south eastern corner of the site is part of the Grade II* Witley Court Park which contained trees until at least 1954, but had been incorporated into farmland by 1962. The landscape park was laid out in the late 18th century, with amendments in the 19th century. The rest of the site has been utilised for agriculture since at least the early 19th century.

1.4.3 Although the site does not contain any known archaeological sites or findspots, there is always potential for the geophysical survey to locate anomalies that may relate to previously unrecorded archaeological features should they exist within the site.

1.4.4 The surface conditions within Area 2 were suitable for the observation of cultural material during the course of the survey due to the presence of an emerging crop. No significant scatters were noted.

1.5 Geology and soils

1.5.1 The underlying solid geology across the site comprises Triassic Sandstones, with Wildmoor Sandstone Formation in the north and Bromsgrove Sandstone Formation in the south (BGS, 2016).

1.5.2 The overlying soil across the survey area is from the Bromsgrove association and is a typical brown earth. It consists of a well drained, reddish, coarse, loamy soil over sandstone (Soil Survey of England and Wales, 1983).

1.5.3 Magnetometry survey carried out across similar soils has produced variable results; however, there can be sufficient magnetic contrast for the fill of cut features to be seen within the data. The underlying geology and soils are therefore considered acceptable for magnetic survey.

2 METHODOLOGY

2.1 Technical synopsis

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

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

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

2.1.4 The localised variations in magnetism are measured as sub-units of the Tesla, which is a SI unit of magnetic flux density. These sub-units are nano Teslas (nT),

which are equivalent to 10^{-9} Tesla (T).

2.2 Equipment configuration, data collection and survey detail

2.2.1 The detailed magnetic survey was carried out using a SENSYS MAGNETO®MXPDA 5 channel cart-based system. The instrument has 5 fluxgate gradiometers spaced 0.5m apart with readings recorded at 20Hz. The gradiometers have a range of recording data between 0.1nT and 10,000nT. The sensors are not zeroed in the field, as the vertical axis alignment is fixed using a tension band system. In order to produce visible, useful greyscale images a zero median traverse process is undertaken in TerraSurveyor. The system is linked to a Leica GS10 RTK GPS with data recorded by SENSYS MAGNETO®MXPDA software on a rugged computer.

2.2.2 Data are collected along a series of parallel survey tracks wherever possible. The length of each track is variable and relates to the size of the survey area and other factors including ground conditions. A visual display aids accurate placing of tracks and their separation.

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

2.3 Data processing and presentation

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

2.3.2 The data are collected between limits of ±10000nT and clipped for display at ±5nT. Data are interpolated to a resolution of effectively 0.5m between tracks and 0.15m along each survey track. A zero median traverse function is required in order to remove fixed offset values present within the sensors which do not undergo a zeroing procedure in the field. The approach ensures that the gradiometer sensors are very accurately aligned and fixed to the vertical magnetic field and are not influenced by localised magnetic fields or disturbed by vibration. Although a zero median traverse algorithm can remove anomalies aligned with the survey tracks, in practice this rarely occurs due to the use of long traverses, high resolution measurement and variability within the magnetic susceptibility of long linear features.

2.3.3 Appendix C contains metadata concerning the survey and data attributes and is derived directly from TerraSurveyor. Reference should be made to Appendix B for further information on any processes, such as clipping, carried out on the data.

2.3.4 A TIF file is produced by TerraSurveyor software along with an associated

world file (.TFW) that allows automatic georeferencing (OSGB36 datum) when using GIS or CAD software. The main form of data display used in the report is the minimally processed greyscale plot.

2.3.5 The raster images are combined with base mapping using ProgeCAD Professional 2014, creating DWG (2010) file formats. All images are externally referenced to the CAD drawing in order to maintain good graphical quality. The CAD plots are effectively georeferenced facilitating relocation of features using GPS, resection method, etc.

2.3.6 An abstraction and interpretation is also 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.

2.3.7 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.

2.3.8 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

3.1.1 The detailed magnetic survey was carried out over two survey areas covering approximately 8.5ha.

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

3.2 Statement of data quality

3.2.1 Data are considered representative of the magnetic anomalies present within the site. There are no significant defects within the dataset.

3.3 Data interpretation

3.3.1 The list of sub-headings below attempts to define a number of separate categories that reflect the range and type of features located during the

survey. A basic explanation of the characteristics of the magnetic anomalies is set out for each category in order to justify interpretation, a basic key is indicated to allow cross referencing to the abstraction and interpretation plot. CAD layer names are included to aid reference to associated digital files (.dwg/.dxf). Sub-headings are then used to group anomalies with similar characteristics for each survey area.

Report sub-heading CAD layer names and plot colour	Description and origin of anomalies
Anomalies with an uncertain origin AS-ABST MAG POS LINEAR UNCERTAIN AS-ABST MAG NEG LINEAR UNCERTAIN AS-ABST MAG POS DISCRETE UNCERTAIN AS-ABST MAG POS UNCERTAIN AS-ABST MAG NEG 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 with an agricultural origin AS-ABST MAG AGRICULTURAL	The anomalies are often linear and form a series of parallel responses or are parallel to extant land boundaries and relate to the existing or former cultivation trend.
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 AS-ABST MAG VEHICLE RUT	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. Closely spaced, parallel, negative linear anomalies are associated with vehicle ruts.
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.

Table 1: List and description of interpretation categories

3.4 List of anomalies - Area 1

Area centred on OS NGR 375680 266025, see Figs 04 - 07.

Anomalies with an uncertain origin

(1) – A positive linear anomaly (5nT) extends north eastwards from the southern edge of the survey area. It may have been truncated by a service (10), but it cannot be clearly seen close to the north eastern corner. A second, weaker, slightly curving, positive linear anomaly (1-3nT) can be seen to the east, and this has an associated negative response. It is possible that these anomalies relate to cut, ditch-like features, or former field boundaries. They are parallel with anomaly (11), located 140m to the east within Area 2, and an association is possible.

(2) – A number of broad, negative responses are located in the southern part of the survey area. It is not clear if they are relate to features with an anthropogenic or natural origin and an association with anomalies (17) is possible.

(3) – Very weakly positive anomalies (<0.5nT) are located to the north of anomalies (2) and may be associated. They are also generally parallel to anomaly (1).

(4) – The survey area contains a number of weakly positive linear and possible curvilinear responses. It is not possible to determine their origin as they are very weak and poorly defined.

(5) – A small number of negative linear anomalies can be seen in the survey area. This type of response can relate to a rut or agricultural mark; however, there is no coherent pattern and their origin is uncertain.

Anomalies with an agricultural origin

(6) – A series of parallel linear anomalies, oriented north to south, relate to agricultural activity and not all of the anomalies have been abstracted.

Anomalies associated with magnetic debris

(7) – The survey area contains zones of strongly magnetic debris. This relates to spreads of dumped ferrous and other magnetically thermoremnant material and possible areas of burning which are likely to be modern in origin.

(8) – Strong, discrete, dipolar anomalies are a response to ferrous and other magnetically thermoremnant objects within the topsoil. These are numerous and widespread indicating that the material may have been incorporated during the process of manuring.

Anomalies with a modern origin

(9 & 10) - Strong, multiple dipolar anomalies relate to buried services.

3.5 List of anomalies - Area 2

Area centred on OS NGR 375900 265865, see Figs 07 & 08.

Anomalies with an uncertain origin

(11) - A weakly positive (2-3nT), and partially fragmented, positive linear anomaly extends across the north western part of the survey area. It may relate to a former ditch or boundary feature and a second anomaly appears to extend towards it from the south east. However, the southern end of the anomaly is strongly magnetic (20-70nT), possibly indicating a ferrous content or possible intense burning. The northern end is not clear as it appears to extend towards a very strongly magnetic dipolar response possibly associated with a buried sewer (16).

(12) - Weakly positive linear anomalies can be seen in the south western corner of the survey area. The origin of these anomalies is not certain.

(13) - The north western part of the survey area contains two discrete positive responses. These appear to relate to pit-like features and an anthropogenic origin is possible, although a natural origin cannot be ruled out.

Anomalies with an agricultural origin

(14) - A series of parallel linear anomalies relate to a north to south cultivation trend and not all anomalies have been abstracted.

Anomalies with a modern origin

(15) - A number of double negative linear anomalies can be seen with a random pattern in the results. These are a response to ruts caused by vehicles associated with geotechnical investigations.

(16) - A positive linear anomaly extends across the survey area from the southern edge to the north east corner. It relates to a buried sewer pipe.

Anomalies with a natural origin

(17) - A number of weakly positive anomalies can be seen in the northern part of the survey area. It is possible that they relate to natural features within the underlying geology.

4 CONCLUSION

4.1.1 The detailed magnetometer survey located a number of geophysical anomalies across the two survey areas. There are several positive linear anomalies with a north east to south west orientation that may relate to cut, ditch-like features, although their origin is uncertain. Within Area 1, in the western part of the site, are several negative anomalies, although it is not possible to determine if these are of natural or anthropogenic origin. Within Area 2, there are weakly positive responses that may indicate naturally formed features.

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Appendix A – basic principles of magnetic survey

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

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

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

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

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

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

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

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

Appendix B – data processing notes

Clipping

Minimum and maximum values are set and replace data outside of the range with those values. Extreme values are removed improving colour or greyscale contrast associated with data values that may be archaeologically significant. It has been found that clipping data to ranges between ±5nT and ±3nT often improves the appearance of features associated with archaeology. Different ranges are applied to data in order to determine the most suitable for anomaly abstraction and display.

Zero (destripe) Median/Mean Traverse

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

High Pass Filtering

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

Appendix C – survey and data information

Area 1

COMPOSITE
Filename: J651-mag-Area1.proc.xcp
Description: Imported as Composite from: J651-mag-Area1.asc
Instrument Type: Sensys DLMGPS
Units: nT
UTM Zone: 30U
Survey corner coordinates (X/Y OSGB36
Northwest corner: 375574.156671796, 266166.864285047 m
Southeast corner: 375802.956671796, 265895.024285047 m
Collection Method: Randomised
Sensors: 5
Dummy Value: 32702

Source GPS Points: 1054400

Dimensions
Composite Size (readings): 1430 x 1699
Survey Size (meters): 229 m x 272 m
Grid Size: 229 m x 272 m
X Interval: 0.16 m
Y Interval: 0.16 m

Stats
Max: 3.00
Min: -3.00
Std Dev: 1.32
Mean: 0.00
Median: 0.00
Composite Area: 6.2197 ha
Surveyed Area: 3.7982 ha

PROGRAM
Name: TerraSurveyor
Version: 3.0.23.0

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

GPS based Proce4
1 Base Layer.
2 Unit Conversion Layer (Lat/Long to OSGB36).
3 DeStripe Median Traverse:

Area 2

COMPOSITE
Filename: J651-mag-Area2-proc.xcp
Description: Imported as Composite from: J651-mag-Area2.asc
Instrument Type: Sensys DLMGPS
Units: nT
UTM Zone: 30U
Survey corner coordinates (X/Y):OSGB36
Northwest corner: 375809.104239264, 265995.449527909 m
Southeast corner: 376006.384239264, 265733.049527909 m
Collection Method: Randomised
Sensors: 5
Dummy Value: 32702

Source GPS Points: 1295000

Dimensions
Composite Size (readings): 1315 x 1749
Survey Size (meters): 197 m x 262 m
Grid Size: 197 m x 262 m
X Interval: 0.15 m (surveyed @ 0.16 m)
Y Interval: 0.15 m (surveyed @ 0.16 m)

Stats
Max: 3.00
Min: -3.00
Std Dev: 1.21
Mean: 0.03
Median: 0.01
Composite Area: 5.1749 ha
Surveyed Area: 4.4339 ha

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

GPS based Proce4
1 Base Layer.
2 Unit Conversion Layer (Lat/Long to OSGB36).
3 DeStripe Median Traverse:
4 Clip from -5.00 to 5.00 nT

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.

The survey has been issued with Worcestershire HER Event No: WSM67789 and a printed copy of the report and a PDF copy will be supplied to the Worcestershire Historic Environment Record. The report will also be uploaded to the Online AccesS to the Index of archaeological investigationS (OASIS) (archaeol20-245445).

As a requirement of Worcestershire County Council raw data will be deposited with the ADS with a CAD file and raster greyscale images of the data in the formats stated below for archiving:

Archive contents:

Geophysical data - path: WSM67789 _J651_Great_Witley_geophysical_survey\WSM67789 _J651_Great_Witley_Geophysics				
Path and Filename	**Software**	**Description**	**Date**	**Creator**
WSM67789 _J651_mag_Area1.csv WSM67789 _J651_mag_Area2.csv	Sensys DLMGPS	Zipped ASCII CSV (tab) files representing survey area in eastings, northings (UTM Z30N), magnetic measurement, traverse file and sensor number.	05/03/16	K.T.Donaldson
Graphic data - path: WSM67789 _J651_Great_Witley_geophysical_survey\WSM67789 _J651_Great_Witley_GIS				
WSM67789 _J651_mag_Area1_proc_3nT.tif	TerraSurveyor 3.0.23.0	TIF file showing a minimally processed greyscale plot clipped to ±3nT.	05/03/16	K.T.Donaldson
WSM67789 _J651_mag_Area1_proc_3nT.tfw	TerraSurveyor 3.0.23.0	World file for georeferencing TIF to OSGB36.	05/03/16	K.T.Donaldson
WSM67789 _J651_mag_Area2_proc_3nT.tif	TerraSurveyor 3.0.23.0	TIF file showing a minimally processed greyscale plot clipped to ±3nT.	05/03/16	K.T.Donaldson
WSM67789 _J651_mag_Area2_proc_3nT.tfw	TerraSurveyor 3.0.23.0	World file for georeferencing TIF to OSGB36.05/03/16	05/03/16	K.T.Donaldson
CAD – path: WSM67789 _J651_Great_Witley_geophysical_survey\WSM67789 _J651_Great_Witley_CAD				
WSM67789 _J651_CAD.dwg	ProgeCAD 2016	CAD file for creating plots of greyscales, abstraction, interpretation and mapping. Grid coordinates as OSGB. AutoCAD 2010 format.	05/03/16	K.T.Donaldson

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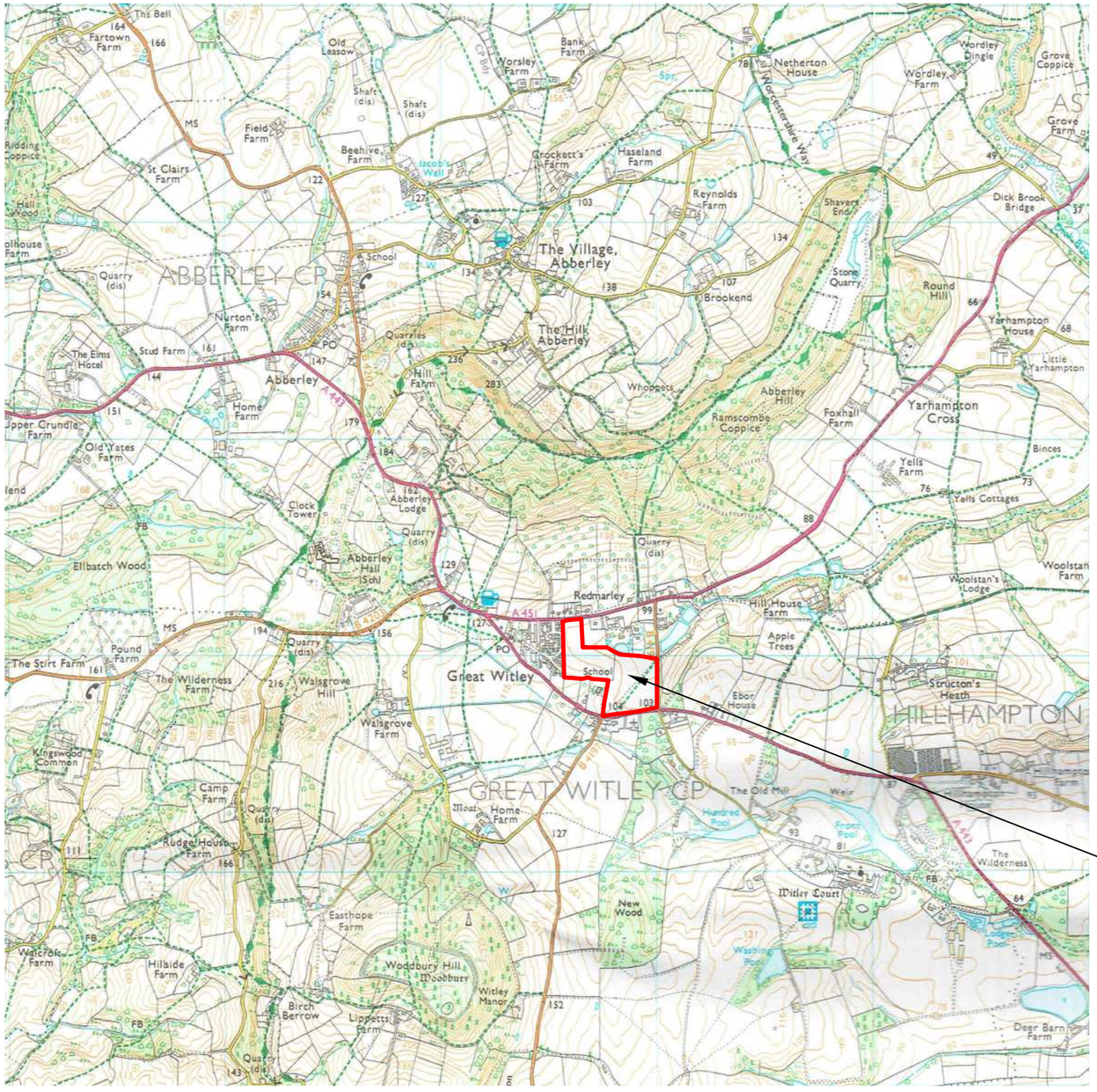

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Great Witley
Worcestershire

Map of survey area

Survey location

Site centred on OS NGR
SO 75800 65950

SCALE 1:25 000

0m 500m 1000m

SCALE TRUE AT A3

FIG 01

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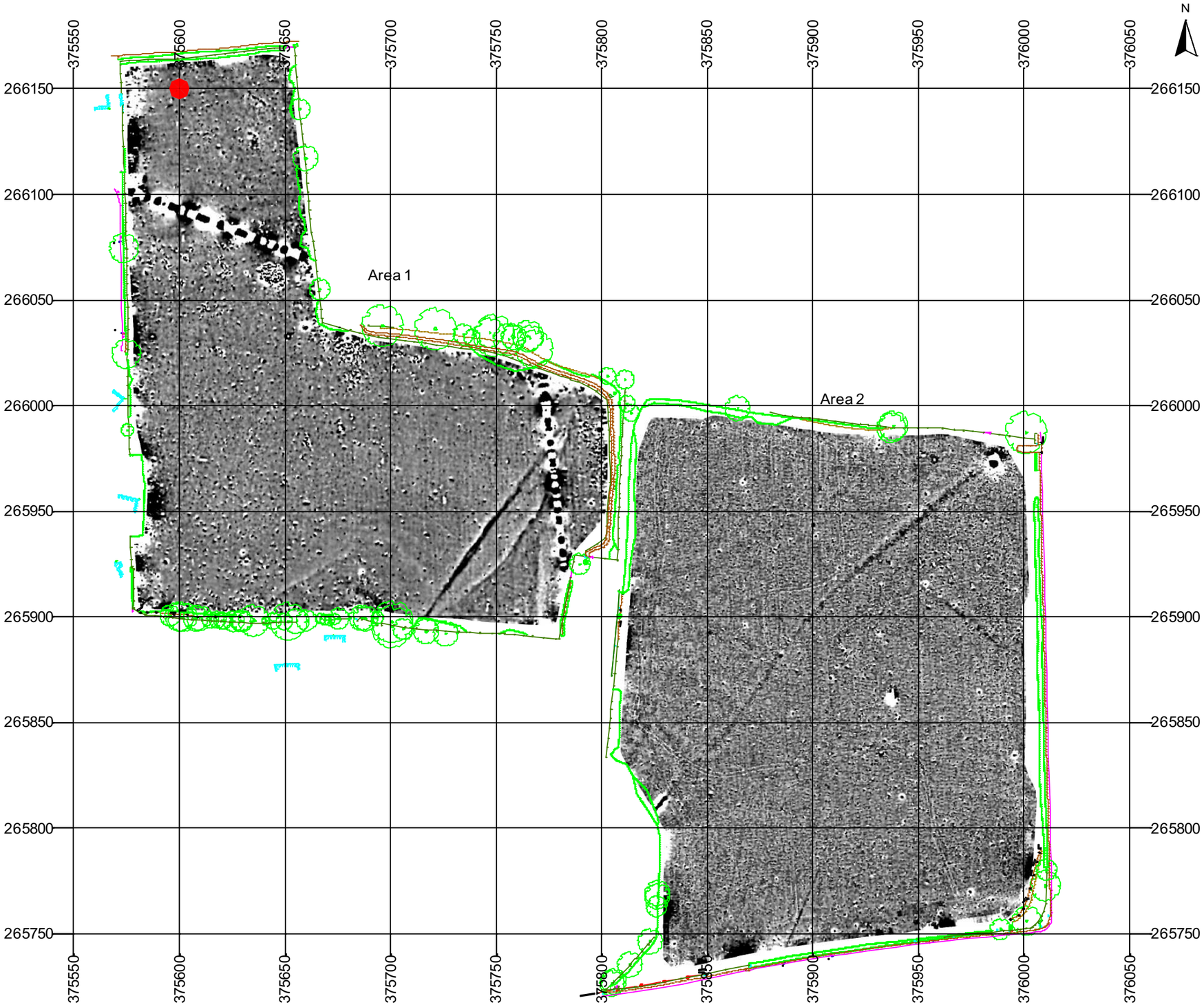
Referencing information



Referencing grid to OSGB36 datum at 50m intervals

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

● 375600 266150

SCALE 1:2000

0m 20 40 60 80 100m

SCALE TRUE AT A3

FIG 02

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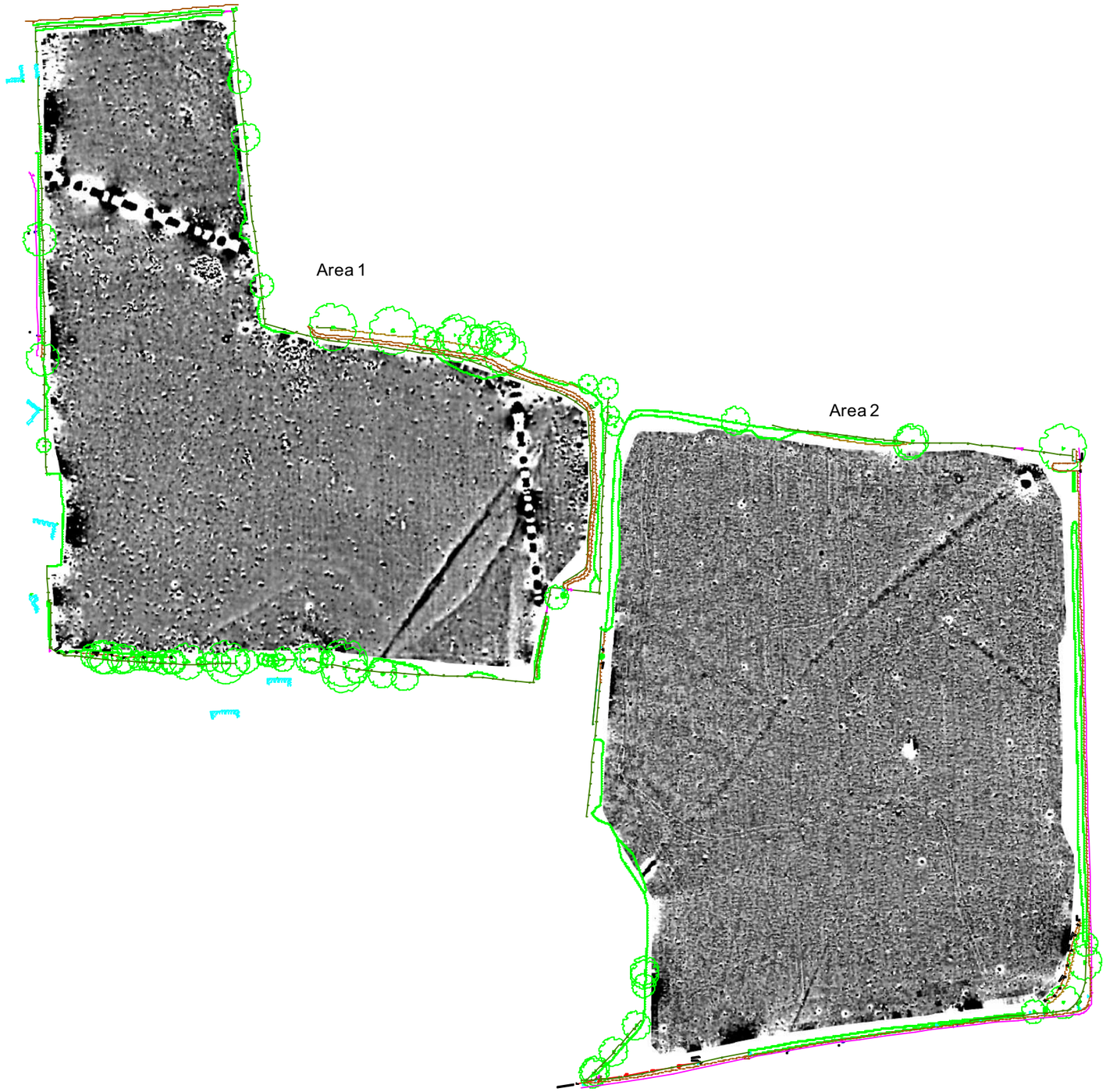
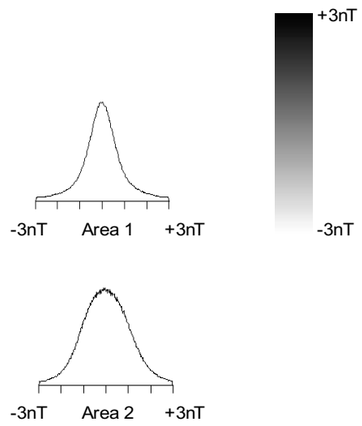


Greyscale plot of minimally processed magnetometer data



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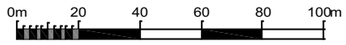

SCALE TRUE AT A3

FIG 03

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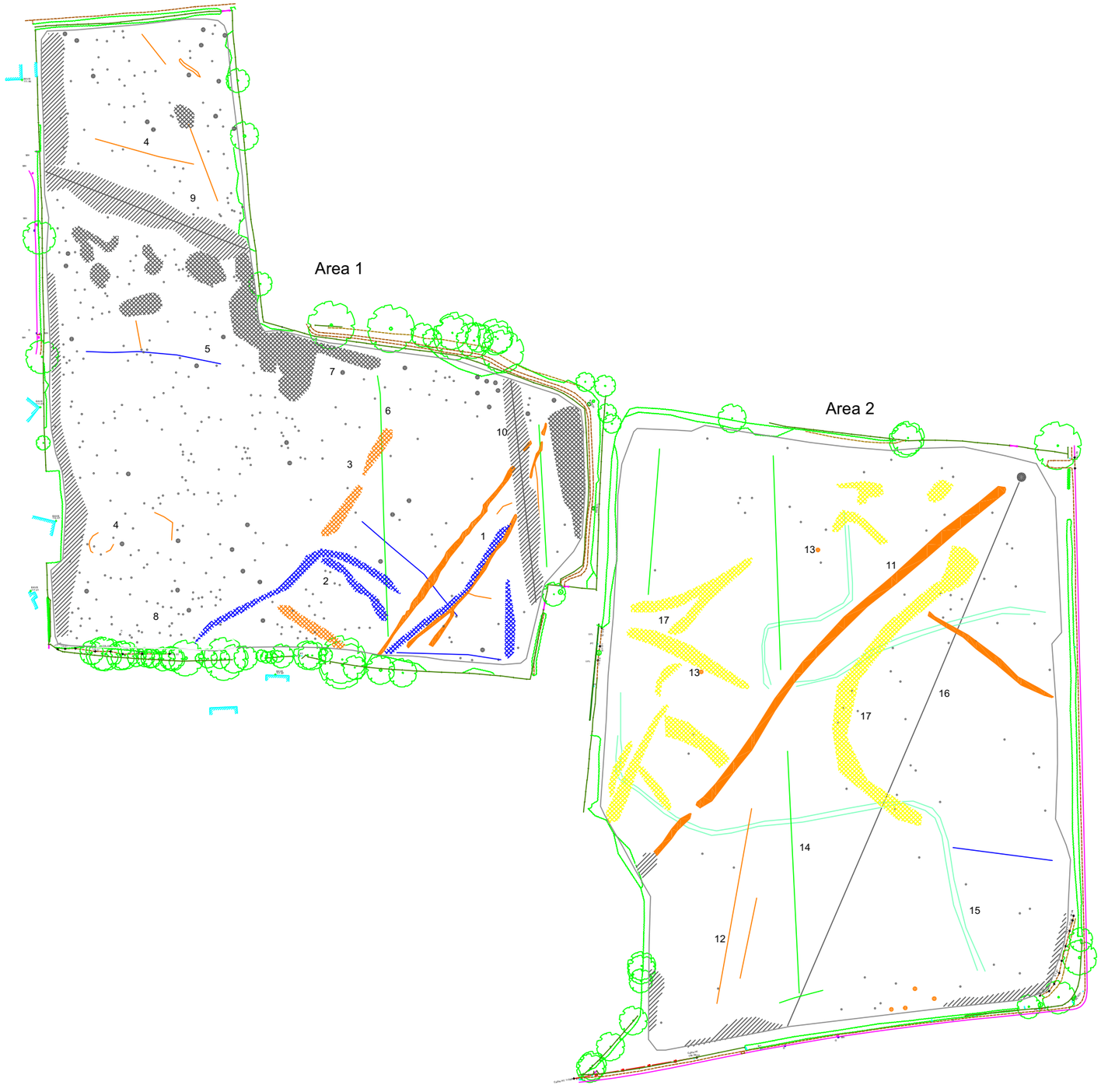

Abstraction and interpretation of magnetometer anomalies

- Positive linear anomaly - possible ditch-like feature
- Negative linear anomaly - material of low magnetic susceptibility
- Linear anomaly - agricultural origin
- Negative linear anomaly - vehicle rut
- Discrete positive response - possible pit-like feature
- Positive anomaly - magnetically enhanced material
- Negative anomaly - material with low magnetic susceptibility
- Weakly positive anomaly - possible 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 1:2000

0m 20 40 60 80 100m

SCALE TRUE AT A3

FIG 04

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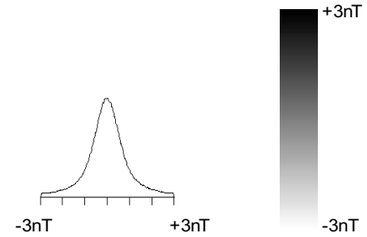
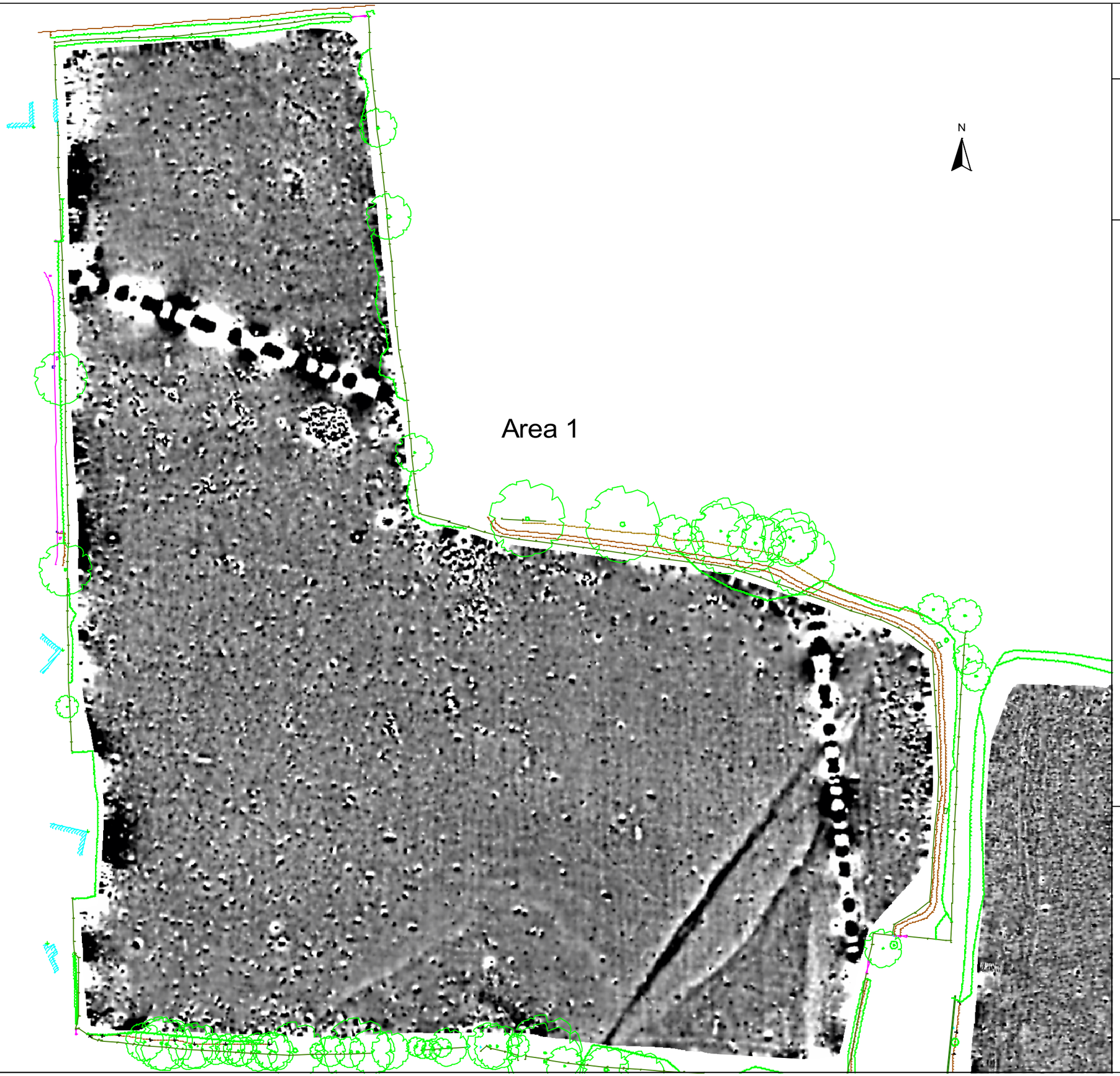
Greyscale plot of minimally processed magnetometer data





SCALE 1:1000

0m 10 20 30 40 50m

SCALE TRUE AT A3

FIG 05

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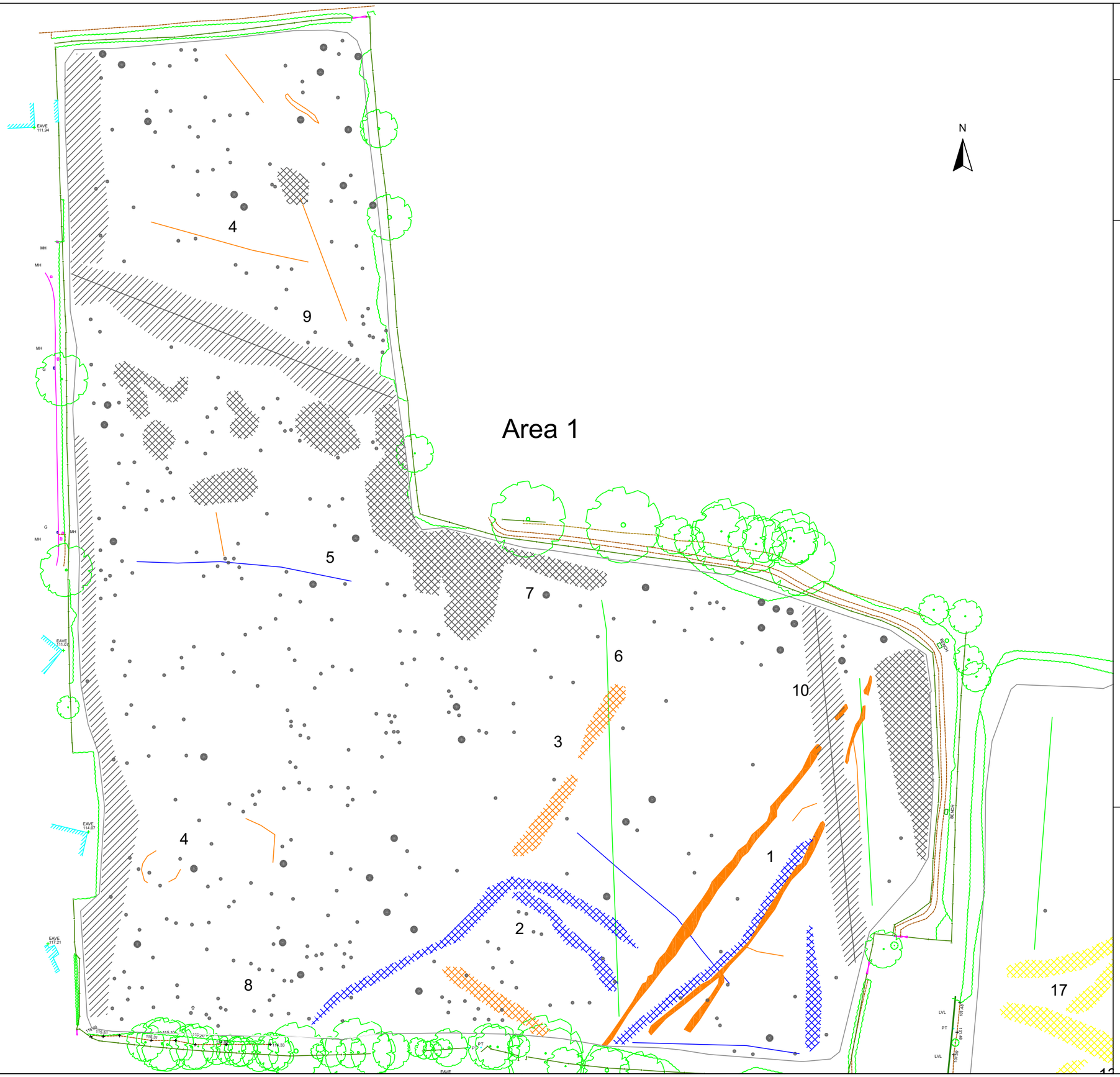


Abstraction and interpretation of magnetometer anomalies - Area 1

- Positive linear anomaly - possible ditch-like feature
- Negative linear anomaly - material of low magnetic susceptibility
- Linear anomaly - agricultural origin
- Negative linear anomaly - vehicle rut
- Discrete positive response - possible pit-like feature
- Positive anomaly - magnetically enhanced material
- Negative anomaly - material with low magnetic susceptibility
- Weakly positive anomaly - possible 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

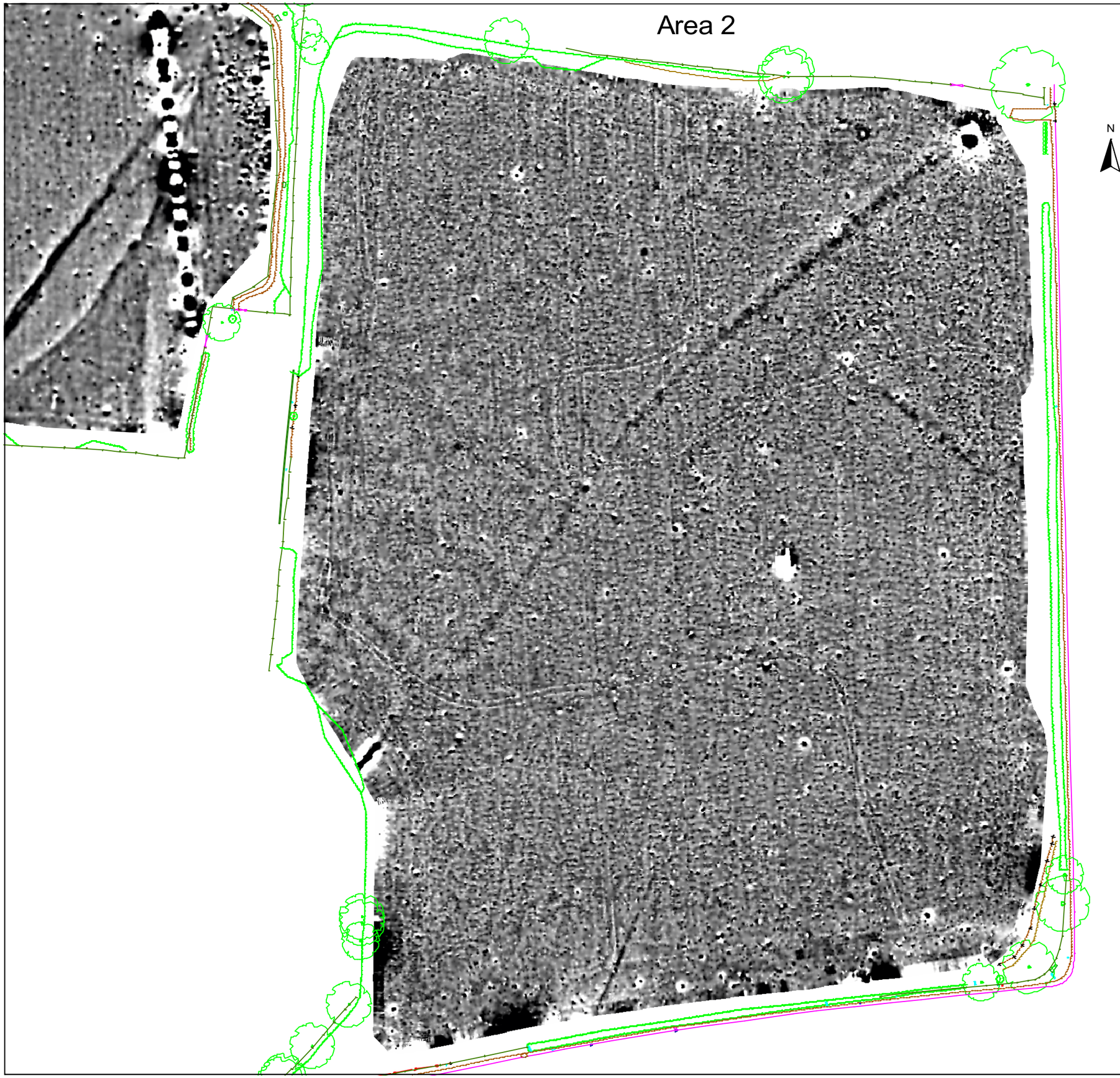
SCALE 1:1000

0m 10 20 30 40 50m

SCALE TRUE AT A3

FIG 06

Area 2



N

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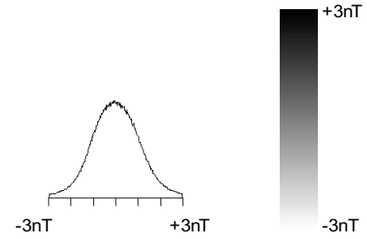
Greyscale plot of minimally processed magnetometer data



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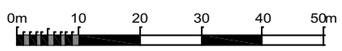

SCALE TRUE AT A3

FIG 07

Area 2

N

1
10
11
12
13
13
14
15
16
17
17

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Abstraction and interpretation of magnetometer anomalies - Area 2

- Positive linear anomaly - possible ditch-like feature
- Negative linear anomaly - material of low magnetic susceptibility
- Linear anomaly - agricultural origin
- Negative linear anomaly - vehicle rut
- Discrete positive response - possible pit-like feature
- Positive anomaly - magnetically enhanced material
- Negative anomaly - material with low magnetic susceptibility
- Weakly positive anomaly - possible 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 08