

**Land at Elm Grove
North Bradley, Trowbridge
Wiltshire**

MAGNETOMETER SURVEY REPORT

for

Coulston Estates Ltd

Kerry Donaldson & David Sabin

August 2016

Ref. no. J667

ARCHAEOLOGICAL SURVEYS LTD

**Land at Elm Grove
North Bradley, Trowbridge
Wiltshire**

Magnetometer Survey Report

for

Coulston Estates Ltd

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Primary archive location - Archaeological Surveys Ltd, Yatesbury, Wiltshire

Survey dates – 14th & 15th June, 6th July & 18th August 2016

Ordnance Survey Grid Reference – **ST 86020 56350**



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SUMMARY

Detailed magnetometry was carried out by Archaeological Surveys Ltd on land surrounding Elm Grove Farm within the parishes of North Bradley and Trowbridge in Wiltshire. The survey was conducted within five fields, the majority showing evidence for agricultural activity and land drainage. A number of positive linear and discrete responses were located within most survey areas, but the general lack of a coherent morphology prevents confident interpretation. A group of discrete positive responses arranged in a grid formation, with a second group in an irregular ring in the eastern part of the site, may relate to former tree planting, although none is indicated on any previous mapping. In the northern part of the site there is evidence for former structural remains associated with a farmstead indicated on early 19th century mapping, but demolished by 1887. There is potential for this to at least date to the earliest years of the 19th century and an earlier date should be considered.

1 INTRODUCTION

1.1 *Survey background*

1.1.1 Archaeological Surveys Ltd was commissioned by Coulston Estates Ltd to undertake a magnetometer survey of an area of land at Elm Grove, Trowbridge, Wiltshire. The site has been outlined for a proposed residential development and the survey forms part of an archaeological assessment of the site.

1.2 *Survey objectives and techniques*

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

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

1.3 *Site location, description and survey conditions*

1.3.1 The site is located on land surrounding Elm Grove Farm and adjacent to Drynham Lane, with three fields situated in the parish of North Bradley (Areas

1, 2 & 3) and two within the parish of Trowbridge (Areas 4 & 5). It is centred on Ordnance Survey National Grid Reference (OS NGR) ST 86020 56350, see Figures 01 and 02.

- 1.3.2 The geophysical survey covers approximately 12ha within five land parcels. Areas 1 and 4 were used as pony paddocks, Areas 2, 3 and 5 for cultivated pasture. Area 1 contained tall grass and had a very uneven surface. The cultivated pasture had been mown prior to the surveying, although Area 5 contained numerous bales which impeded survey and the southern end was fenced off and contained tall vegetation. Area 4 contained grazed grass, uneven ground and was subdivided into several separate paddocks.
- 1.3.3 The ground conditions across the site were generally considered to be favourable for the collection of magnetometry data. Weather conditions during the survey were variable but mainly fine.

1.4 *Site history and archaeological potential*

- 1.4.1 A Heritage Statement has been prepared by Michael Heaton Heritage Consultants (2016). It outlines that the site does not contain any designated or undesignated heritage assets except for the 19th century farmstead and associated buildings at Elm Grove Farm with another recorded at Southview Farm (Drynam Farm) at the very northern edge of the site. Also within the most northern field (Area 5) the Trowbridge enclosure map (1816) and tithe map (1840) show a small farmstead within the centre of the survey area which was no longer mapped on the 1887 1st Edition Ordnance Survey map. Although not recorded as a farmstead or outfarm on the Wiltshire Historic Environment Record, there is evidence for at least a dwelling and land boundaries that would date to at least the early 19th century or earlier.
- 1.4.2 In the wider area, evidence for Roman or possible Iron Age settlement has been located through geophysical survey of land to the east of the railway line and West Ashton Road, approximately 600-900m north east.

1.5 *Geology and soils*

- 1.5.1 The underlying geology is mudstone from the Oxford Clay Formation (BGS, 2015).
- 1.5.2 The overlying soil across the site is from the Wickham 2 association and is a typical stagnogley. It consists of a slowly permeable, seasonally waerlogged, fine, loamy over clayey soil (Soil Survey of England and Wales, 1983).
- 1.5.3 The underlying geology and soils are frequently associated with low magnetic contrast and low levels of magnetic susceptibility. However, cut features of archaeological potential may be located where human activity has altered the magnetic characteristics of the soil sufficiently. The underlying geology and soils are therefore considered acceptable for magnetic survey.

2 METHODOLOGY

2.1 *Technical synopsis*

- 2.1.1 Magnetometry survey records localised magnetic fields that can be associated with features formed by human activity. Magnetic susceptibility and magnetic thermoremnance 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 $\pm 10000\text{nT}$ and clipped for display at $\pm 5\text{nT}$. 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 a total of five survey areas covering approximately 12ha.
- 3.1.2 Magnetic anomalies located can be generally classified as positive linear and discrete positive responses of archaeological potential, positive and negative anomalies of an uncertain origin, anomalies associated with land management, linear anomalies of an agricultural origin, areas of magnetic debris and disturbance, strong discrete dipolar anomalies relating to ferrous objects and strong multiple dipolar linear anomalies relating to buried services or pipelines. Anomalies located within each survey area have been numbered and are described in 3.4 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
<p>Anomalies with archaeological potential</p> <p>AS-ABST MAG POS LINEAR ARCHAEOLOGY </p> <p>AS-ABST MAG POS DISCRETE ARCHAEOLOGY </p> <p>AS-ABST MAG POS STRUCTURAL ARCHAEOLOGY </p>	<p>Anomalies have the characteristics (mainly morphological) of a range of archaeological features such as pits, ring ditches, enclosures, etc..</p>
<p>Anomalies with an uncertain origin</p> <p>AS-ABST MAG POS LINEAR UNCERTAIN </p> <p>AS-ABST MAG NEG LINEAR UNCERTAIN </p> <p>AS-ABST MAG POS DISCRETE UNCERTAIN </p>	<p>The category applies to a range of anomalies where <u>there is not enough evidence to confidently suggest an origin</u>. Anomalies in this category <u>may well be related to archaeologically significant features, but equally relatively modern features, geological/pedological features and agricultural features should be considered</u>. 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.</p>

<p>Anomalies relating to land management</p> <p>AS-ABST MAG BOUNDARY </p> <p>AS-ABST MAG LAND DRAIN </p>	<p>Anomalies are mainly linear and may be indicative of the magnetically enhanced fill of cut features (i.e. ditches). The anomalies may be long and/or form rectilinear elements and they may relate to topographic features or be visible on early mapping. Associated agricultural anomalies (e.g. headlands, plough marks and former ridge and furrow) may support the interpretation. Land drains can appear in a classic herringbone pattern of interconnected multiple dipolar linear anomalies, or as parallel linear anomalies. The multiple dipolar response indicates a ceramic land drain.</p>
<p>Anomalies with an agricultural origin</p> <p>AS-ABST MAG AGRICULTURAL </p>	<p>The anomalies are often linear and form a series of parallel responses or are parallel to extant land boundaries. Where the response is broad, former ridge and furrow is likely; narrow response is often related to modern ploughing.</p>
<p>Anomalies associated with magnetic debris</p> <p>AS-ABST MAG DEBRIS </p> <p>AS-ABST MAG STRONG DIPOLAR </p>	<p>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 thermoremanent materials such as brick or tile or other small fragments of ferrous material. This type of response is occasionally associated with kilns, furnace structures, or hearths and <u>may therefore be archaeologically significant</u>. 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.</p>
<p>Anomalies with a modern origin</p> <p>AS-ABST MAG DISTURBANCE </p> <p>AS-ABST MAG SERVICE </p>	<p>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.</p>
<p>Anomalies with a natural origin</p> <p>AS-ABST MAG NATURAL FEATURES </p>	<p>Naturally formed magnetic anomalies 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.</p>

Table 1: List and description of interpretation categories

3.4 List of anomalies - Area 1

Area centred on OS NGR 385843 155998, see Figs 05 & 06.

Anomalies with an uncertain origin

(1) - A large, discrete positive response is located in the western part of the survey area. It is not possible to determine if this relates to a pit-like response, area of burning or possibly a deeply buried ferrous object

(2) - The survey area has a small number of weakly positive linear responses. It is

possible that they are related to agricultural activity, although they are on a different orientation to other cultivation marks and land drains.

Anomalies associated with land management

(3) - A number of land drains are evident within the field.

Anomalies with an agricultural origin

(4) - Parallel linear anomalies relate to agricultural activity.

Anomalies associated with magnetic debris

(5) - Strong, discrete, dipolar anomalies are a response to buried ferrous and other magnetically thermoremanent objects within the topsoil. All the survey areas contain such responses.

Anomalies with a modern origin

(6) - A patch of magnetic disturbance located in the centre of the field was caused by a steel gate buried below long grass.

(7) - A strongly magnetic linear anomaly in the north western part of the site relates to a buried service. This extends along the line of a former field boundary.

3.5 List of anomalies - Area 2

Area centred on OS NGR 385994 156175, see Figs 07 & 08.

Anomalies associated with land management

(8) - A number of land drains are evident mainly within the north eastern part of the survey area.

Anomalies with an agricultural origin

(9) - The survey area contains two series of parallel linear anomalies which relate to two different regimes of agricultural activity.

3.6 List of anomalies - Area 3

Area centred on OS NGR 386135 156336, see Figs 09 & 10.

Anomalies with an uncertain origin

(10) - In the western part of the survey area are a group of discrete positive anomalies. They appear to relate to pits 1.5m in diameter laid out in five rows approximately 4.5m apart, with between five and seven pits in each row approximately 3.2m apart. It is possible that these anomalies are associated with a former orchard, although none has been recorded within the field.

(11) - To the south of anomalies (1) are a roughly circular cluster of pit-like responses with some strong dipolar responses in the vicinity. It is also possible that this is related to former tree planting, but this is uncertain.

(12) - A positive linear anomaly is located in the eastern part of the site. It may relate to a buried service but this is not certain.

(13) - A number of weakly positive responses are mainly oriented parallel with the northern edge of the site and may relate to agricultural activity.

Anomalies with an agricultural origin

(14) - Positive linear anomalies oriented parallel to the western field boundary relate to agricultural activity.

Anomalies with a modern origin

(15) - A strong, multiple dipolar, linear anomaly extends across the site from the south western corner towards the north east and relates to buried service that just clips the south eastern corner of Area 2.

(16) - Magnetic disturbance from inspection chamber covers indicates the line of a buried service.

Anomalies with a natural origin

(17) - Along the northern edge of the survey area is a small zone of magnetic enhancement relating to a former meander in the stream to the north. Adjacent magnetic debris indicates material used to infill a former pond.

3.7 List of anomalies - Area 4

Area centred on OS NGR 386027 156434, see Figs 11 & 12.

Anomalies with an uncertain origin

(18) - A positive linear anomaly extends across the centre of the survey area. It appears to correspond to a shallow gully and may relate to land drainage or a former unmapped field boundary.

(19) - The survey area contains a small number of discrete and possible curvilinear

anomalies. The site is disturbed by land drains and modern use and it is not possible to determine if these anomalies relate to cut features.

(20) - A negative linear anomaly extends along the southern part of the survey area. It corresponds to a shallow gully within the ground, and a drainage ditch or possible service is possible.

Anomalies associated with land management

(21) - A series of a land drains is evident within the survey area.

Anomalies associated with magnetic debris

(22) - Very strongly magnetic debris is located in the south western corner of the site. Generally this type of response would indicate dumped material used for ground consolidation; however, their are linear elements within and an association with demolished structural remains is possible. Other patches of magnetic debris lie within and at the edges of the site and are likely to be modern in origin.

3.8 *List of anomalies - Area 5*

Area centred on OS NGR 386054 156703, see Figs 13 & 14.

Anomalies of archaeological potential

(23) - A number of positive rectilinear, linear and discrete anomalies appear to relate to former structural remains, land divisions and pit-like responses. A dwelling is recorded in this part of the site in the early 19th century and these anomalies are associated with it.

(24) - An isolated pit-like response may be associated with anomalies (23).

Anomalies with an uncertain origin

(25) - A positive linear anomaly appears to be associated with a shallow gully. It is not possible to determine if it relates to a service or former land division. There is another linear anomaly on a similar north west to south east orientation to the south.

(26) - A number of positive linear, rectilinear and discrete responses can be seen to the north of (23) and south of (27). Although with a moderately strong response (10-15nT), it is not clear if they relate to cut features. An association with the farm to the north or (23) to the south is possible.

Anomalies associated with land management

(27) - A strongly magnetic response is associated with a former land boundary that

bounded Southview Farm in the northern part of the site.

Anomalies associated with magnetic debris

(28) - Widespread magnetic debris in the northern part of the site is associated with the close proximity to Southview Farm. Orchards and other land divisions are recorded during the early 20th century.

Anomalies with a modern origin

(29 & 30) - A service is evident in places as a negative and also a positive linear response (29). It appears to extend from close to Southview Farm in the north western corner towards the south east and then along the eastern edge of the site. A second service appears as a strong, multiple dipolar response, continuing as a positive anomaly for a short section, but it cannot be seen to continue southwards in the data.

4 CONCLUSION

- 4.1.1 The majority of the survey areas show evidence for agricultural activity and land drainage. Area 1 in the south western part of the site contains a large pit-like anomaly, but its origin is uncertain. Within Area 3, in the eastern part of the site, there are a group of discrete positive responses in a grid formation with another cluster in an irregular ring. The origin of these pit-like features is uncertain, although tree planting is possible. Within Area 4 there are several positive linear and discrete responses and widespread magnetic debris.
- 4.1.2 In the northern part of the site (Area 5), the detailed magnetometer survey has located the remains of a farmstead or dwelling marked on the 1816 and 1840 enclosure and tithe maps, but not on the 1st Edition 1887 Ordnance Survey map. Although its date is unknown, it is likely to pre-date the 19th century and may have archaeological potential. Further north there are further positive linear and discrete responses; however, it is not possible to determine their origin. At the very northern end is evidence for widespread magnetic debris associated with Southview Farm (former Drynham Farm) and 20th century Ordnance Survey mapping shows land divisions and an orchard within this part of the site.

5 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 thermoremanent material.

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

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

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

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

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

Magnetic survey or magnetometry can be carried out using a fluxgate gradiometer and may be referred to as gradiometry. The SENSYS gradiometer is a passive instrument consisting of two fluxgate sensors mounted vertically 65cm apart. The instrument is carried about 10-20cm above the ground surface and the upper sensor measures the Earth's magnetic field as does the lower sensor but this is influenced to a greater degree by any localised buried 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 $\pm 5\text{nT}$ and $\pm 3\text{nT}$ 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

Filename: J667-mag-Area1-proc.xcp
 Description: Imported as Composite from: J667-mag-Area1.asc
 Instrument Type: Sensys DLMGPS
 Units: nT
 UTM Zone: 30U
 Survey corner coordinates (X/Y): OSGB36
 Northwest corner: 385775.716646968, 156096.633624975 m
 Southeast corner: 385925.116646968, 155900.973624975 m
 Collection Method: Randomised
 Sensors: 5
 Dummy Value: 32702
 Source GPS Points: 836000
 Dimensions
 Composite Size (readings): 830 x 1087
 Survey Size (meters): 149 m x 196 m
 Grid Size: 149 m x 196 m
 X Interval: 0.18 m
 Y Interval: 0.18 m
 Stats
 Max: 3.32
 Min: -3.30
 Std Dev: 1.31
 Mean: 0.01
 Median: 0.00
 Composite Area: 2.9232 ha
 Surveyed Area: 1.7804 ha
 PROGRAM
 Name: TerraSurveyor Version: 3.0.23.0
 Processes: 1
 1 Base Layer
 GPS based Proce4
 1 Base Layer.
 2 Unit Conversion Layer (Lat/Long to OSGB36).
 3 DeStripe Median Traverse:
 4 Clip from -3.00 to 3.00 nT

Area 2

Filename: J667-mag-Area2-proc.xcp
 Description: Imported as Composite from: J667-mag-Area2.asc
 Instrument Type: Sensys DLMGPS
 Units: nT
 UTM Zone: 30U
 Survey corner coordinates (X/Y): OSGB36
 Northwest corner: 385868.20498106, 156316.148683442 m
 Southeast corner: 386088.70498106, 156049.898683442 m
 Collection Method: Randomised
 Sensors: 5
 Dummy Value: 32702
 Source GPS Points: 979600
 Dimensions
 Composite Size (readings): 1470 x 1775
 Survey Size (meters): 221 m x 266 m
 Grid Size: 221 m x 266 m
 X Interval: 0.15 m
 Y Interval: 0.15 m
 Stats
 Max: 5.53
 Min: -5.50
 Std Dev: 1.52
 Mean: 0.05
 Median: 0.03
 Composite Area: 5.8708 ha
 Surveyed Area: 3.0113 ha
 Processes: 1
 1 Base Layer
 GPS based Proce4
 1 Base Layer.
 2 Unit Conversion Layer (Lat/Long to OSGB36).
 3 DeStripe Median Traverse:
 4 Clip from -5.00 to 5.00 nT

Area 3

Filename: J667-mag-Area3-proc.xcp
 Description: Imported as Composite from: J667-mag-Area3.asc
 Instrument Type: Sensys DLMGPS
 Units: nT
 UTM Zone: 30U
 Survey corner coordinates (X/Y): OSGB36
 Northwest corner: 386020.556880586, 156470.23983917 m
 Southeast corner: 386239.106880586, 156213.88983917 m
 Collection Method: Randomised
 Sensors: 5
 Dummy Value: 32702
 Source GPS Points: 918600
 Dimensions
 Composite Size (readings): 1457 x 1709
 Survey Size (meters): 219 m x 256 m

Grid Size: 219 m x 256 m
 X Interval: 0.15 m
 Y Interval: 0.15 m
 Stats
 Max: 5.53
 Min: -5.50
 Std Dev: 1.99
 Mean: 0.03
 Median: 0.02
 Composite Area: 5.6025 ha
 Surveyed Area: 3.1793 ha
 Processes: 1
 1 Base Layer
 GPS based Proce4
 1 Base Layer.
 2 Unit Conversion Layer (Lat/Long to OSGB36).
 3 DeStripe Median Traverse:
 4 Clip from -5.00 to 5.00 nT

Area 4

Filename: J667-mag-Area4-proc.xcp
 Description: Imported as Composite from: J667-mag-Area4.asc
 Instrument Type: Sensys DLMGPS
 Units: nT
 UTM Zone: 30U
 Survey corner coordinates (X/Y): OSGB36
 Northwest corner: 385985.828596769, 156545.223775785 m
 Southeast corner: 386090.828596769, 156363.423775785 m
 Collection Method: Randomised
 Sensors: 5
 Dummy Value: 32702
 Source GPS Points: 382700
 Dimensions
 Composite Size (readings): 700 x 1212
 Survey Size (meters): 105 m x 182 m
 Grid Size: 105 m x 182 m
 X Interval: 0.15 m
 Y Interval: 0.15 m
 Stats
 Max: 3.32
 Min: -3.30
 Std Dev: 1.27
 Mean: -0.02
 Median: 0.01
 Composite Area: 1.9089 ha
 Surveyed Area: 0.88984 ha
 Processes: 1
 1 Base Layer
 GPS based Proce4
 1 Base Layer.
 2 Unit Conversion Layer (Lat/Long to OSGB36).
 3 DeStripe Median Traverse:
 4 Clip from -3.00 to 3.00 nT

Area 5

COMPOSITE
 Filename: J667-mag-Area5-proc.xcp
 Description: Imported as Composite from: J667-mag-Area5.asc
 Instrument Type: Sensys DLMGPS
 Units: nT
 UTM Zone: 30U
 Survey corner coordinates (X/Y): OSGB36
 Northwest corner: 385965.624854187, 156832.764781468 m
 Southeast corner: 386126.424854187, 156586.764781468 m
 Collection Method: Randomised
 Sensors: 5
 Dummy Value: 32702
 Source GPS Points: 441800
 Dimensions
 Composite Size (readings): 1072 x 1640
 Survey Size (meters): 161 m x 246 m
 Grid Size: 161 m x 246 m
 X Interval: 0.15 m
 Y Interval: 0.15 m
 Stats
 Max: 5.53
 Min: -5.50
 Std Dev: 2.19
 Mean: -0.02
 Median: 0.02
 Composite Area: 3.9557 ha
 Surveyed Area: 1.3543 ha
 Processes: 1
 1 Base Layer
 GPS based Proce4
 1 Base Layer.
 2 Unit Conversion Layer (Lat/Long to OSGB36).
 3 DeStripe Median Traverse:
 4 Clip from -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.

A printed copy of the report and a PDF copy will be supplied to the Wiltshire Historic Environment Record. The report will also be uploaded to the Online Access to the Index of archaeological investigationS (OASIS).

Archive contents:

Geophysical data Area 1 - path: J667 Elm Grove Farm\Data\				
Path and Filename	Software	Description	Date	Creator
trow1\MX\ trow2\MX\ trow3\MX\ trow4\MX\ trow5\MX\ .prm .dgb .disp	Sensys MXPDA	Proprietary data formats representing magnetometer survey traverses logged to a PDA.	14/06/16 15/06/16 16/06/16 06/07/16 18/08/16	D.J.Sabin
trow1\MX\J667-mag-Area2.asc trow2\MX\J667-mag-Area4.asc trow3\MX\J667-mag-Area1.asc trow4\MX\J667-mag-Area3.asc trow5\MX\J667-mag-Area5.asc	Sensys DLMGPS	ASCII CSV (tab) file representing survey Area 1 in eastings, northings (UTM Z30N), magnetic measurement, traverse file and sensor number.	16/06/16 16/06/16 16/06/16 07/07/16 23/08/16	K.T. Donaldson
Area1\comps\J667-mag-Area1.xcp Area2\comps\J667-mag-Area2.xcp Area3\comps\J667-mag-Area3.xcp Area4\comps\J667-mag-Area4.xcp Area5\comps\J667-mag-Area5.xcp	TerraSurveyor 3.0.23.0	Composite data file derived from ASCII CSV.	16/06/16 17/06/17 07/07/16 17/06/16 23/06/16	K.T. Donaldson
Area1\comps\J667-mag-Area1-proc.xcp Area2\comps\J667-mag-Area2-proc.xcp Area3\comps\J667-mag-Area3-proc.xcp Area4\comps\J667-mag-Area4-proc.xcp Area5\comps\J667-mag-Area5-proc.xcp	TerraSurveyor 3.0.23.0	Processed composite data file (zmt and clipping to $\pm 3nT \pm 5nT$ Area 2, 3 & 5).	16/06/16 07/07/16 07/07/16 17/06/16 23/06/16	K.T. Donaldson
Graphic data - path: J667 Elm Grove Farm\Data\				
Area1\graphics\J667-mag-Area1-proc.tif Area2\graphics\J667-mag-Area2-proc.tif Area3\graphics\J667-mag-Area3-proc.tif Area4\graphics\J667-mag-Area4-proc.tif Area5\graphics\J667-mag-Area5-proc.tif	TerraSurveyor 3.0.23.0	TIF file showing a minimally processed greyscale plot clipped to $\pm 3nT$. TIF file showing a minimally processed greyscale plot clipped to $\pm 5nT$. TIF file showing a minimally processed greyscale plot clipped to $\pm 5nT$. TIF file showing a minimally processed greyscale plot clipped to $\pm 3nT$. TIF file showing a minimally processed greyscale plot clipped to $\pm 5nT$.	16/06/16 07/07/16 07/07/16 17/06/16 23/06/16	K.T. Donaldson
Area1\graphics\J667-mag-Area1-proc.tfw Area2\graphics\J667-mag-Area2-proc.tfw Area3\graphics\J667-mag-Area3-proc.tfw Area4\graphics\J667-mag-Area4-proc.tfw Area5\graphics\J667-mag-Area5-proc.tfw	TerraSurveyor 3.0.23.0	World file for georeferencing TIF to OSGB36.	16/06/16 07/07/16 07/07/16 17/06/16 23/06/16	K.T. Donaldson
CAD data - path: J667 Elm Grove Farm\CAD\				
J667\version 2.dwg	ProgeCAD 2016	CAD file for creating plots of greyscales, abstraction, interpretation and mapping. Grid coordinates as OSGB. AutoCAD 2010 format.	25/08/16	K.T. Donaldson
Text data - path: Jxxx xxxxxx\Documentation\				
Jxxx report.odt	OpenOffice.org 3.0.1 Writer	Report text as an Open Office document.	16/06/16	K.T. Donaldson

Appendix E – copyright and intellectual property

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**Geophysical Survey
Land at Elm Grove
North Bradley
Trowbridge
Wiltshire**

Map of survey area

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● Survey location

Site centred on OS NGR
ST 86020 56350

SCALE 1:25 000



SCALE TRUE AT A3



Survey location

**Geophysical Survey
Land at Elm Grove
North Bradley
Trowbridge
Wiltshire**

Referencing information

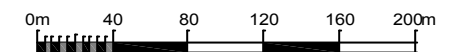
Referencing grid to OSGB36 datum at 50m intervals

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

● 385800 155950



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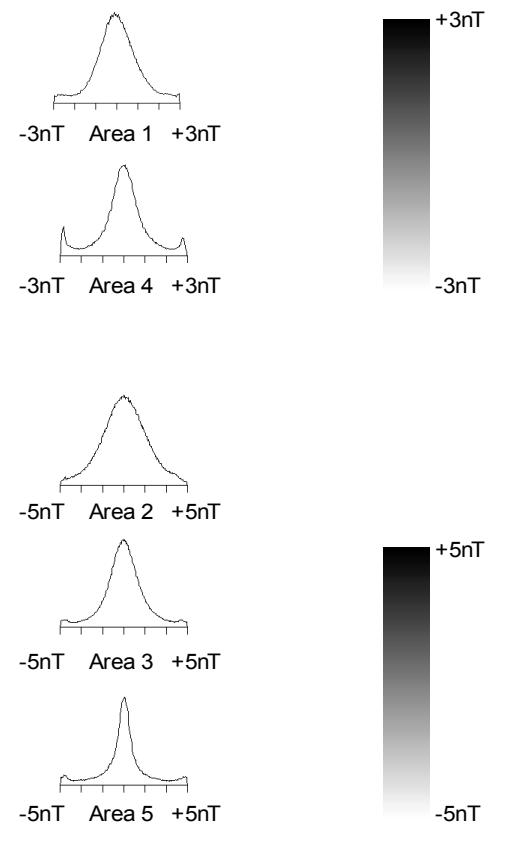


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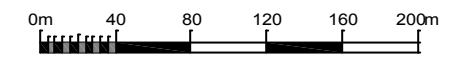
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**Geophysical Survey
Land at Elm Grove
North Bradley
Trowbridge
Wiltshire**

**Greyscale plot of minimally
processed magnetometer data**



SCALE 1:4000

















SCALE TRUE AT A3

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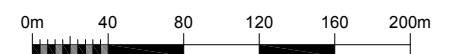
FIG 03

**Geophysical Survey
Land at Elm Grove
North Bradley
Trowbridge
Wiltshire**

**Abstraction and interpretation of
magnetometer anomalies**

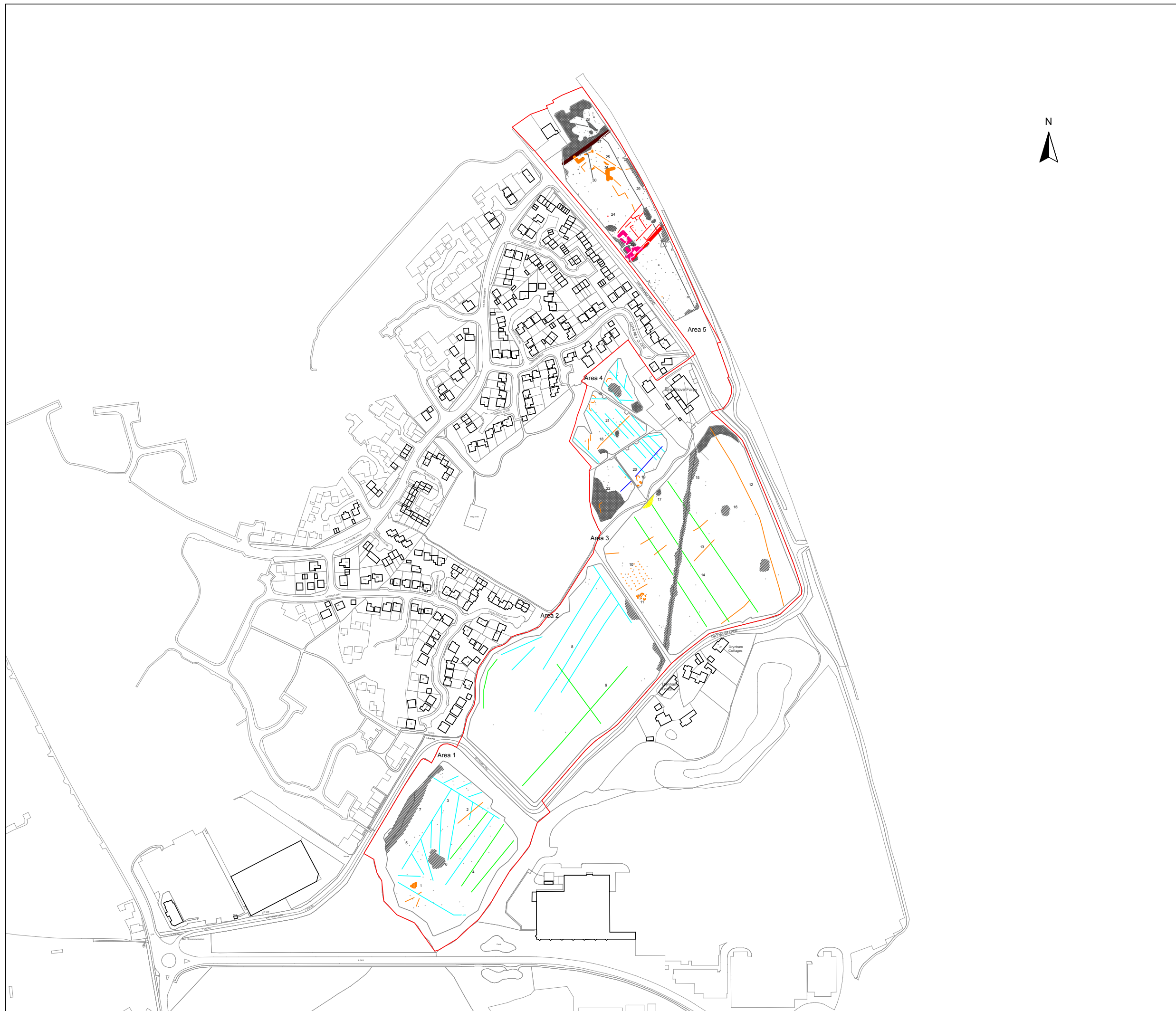
-  Positive linear anomaly - cut feature of archaeological potential
-  Positive linear anomaly - associated with structural remains
-  Positive linear anomaly - possible ditch-like feature
-  Linear anomaly - of agricultural origin
-  Positive linear anomaly - possible land drain
-  Positive linear anomaly - former field boundary
-  Negative linear anomaly - material of low magnetic susceptibility
-  Discrete positive response - cut feature of archaeological potential
-  Discrete positive response - possible pit-like feature
-  Variable magnetic response - of natural origin
-  Magnetic debris - spread of magnetically thermoremanent/ferrous material
-  Magnetic disturbance from ferrous material
-  Strong multiple dipolar linear anomaly - pipeline / cable / service
-  Strong dipolar anomaly - ferrous object

SCALE 1:4000



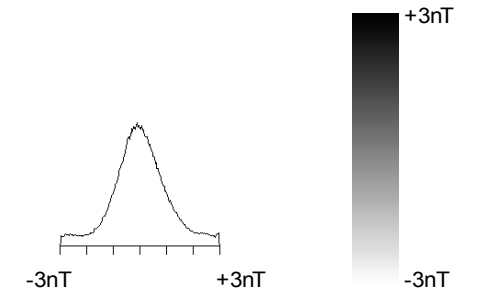
SCALE TRUE AT A3

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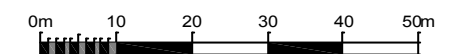


**Geophysical Survey
Land at Elm Grove
North Bradley
Trowbridge
Wiltshire**

**Greyscale plot of minimally
processed magnetometer data -
Area 1**



SCALE 1:1000










SCALE TRUE AT A3

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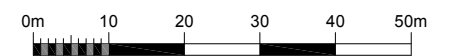
FIG 05

**Geophysical Survey
Land at Elm Grove
North Bradley
Trowbridge
Wiltshire**

**Abstraction and interpretation of
magnetometer anomalies -
Area 1**

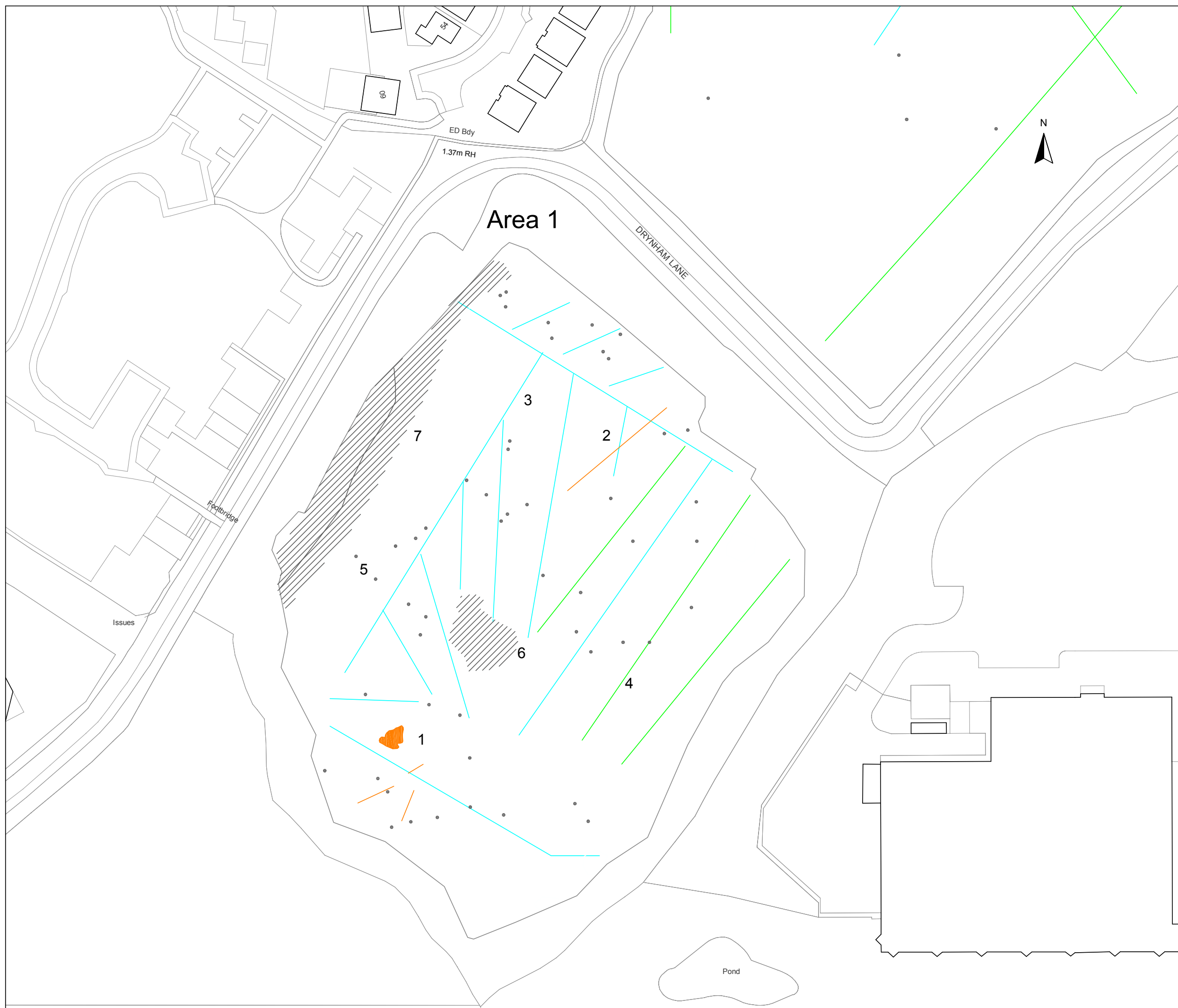
-  Positive linear anomaly - possible ditch-like feature
-  Linear anomaly - of agricultural origin
-  Positive linear anomaly - possible land drain
-  Discrete positive response - possible pit-like feature
-  Magnetic disturbance from ferrous material
-  Strong multiple dipolar linear anomaly - pipeline / cable / service
-  Strong dipolar anomaly - ferrous object

SCALE 1:1000



SCALE TRUE AT A3

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**Geophysical Survey
Land at Elm Grove
North Bradley
Trowbridge
Wiltshire**

**Greyscale plot of minimally
processed magnetometer data -
Area 2**

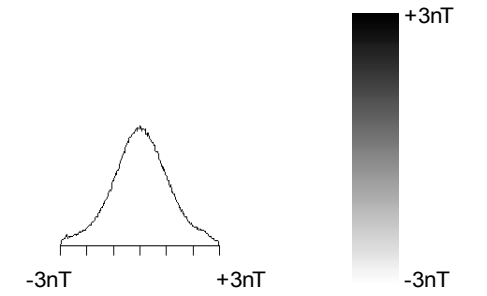


FIG 07

**Geophysical Survey
Land at Elm Grove
North Bradley
Trowbridge
Wiltshire**

**Abstraction and interpretation of
magnetometer anomalies -
Area 2**

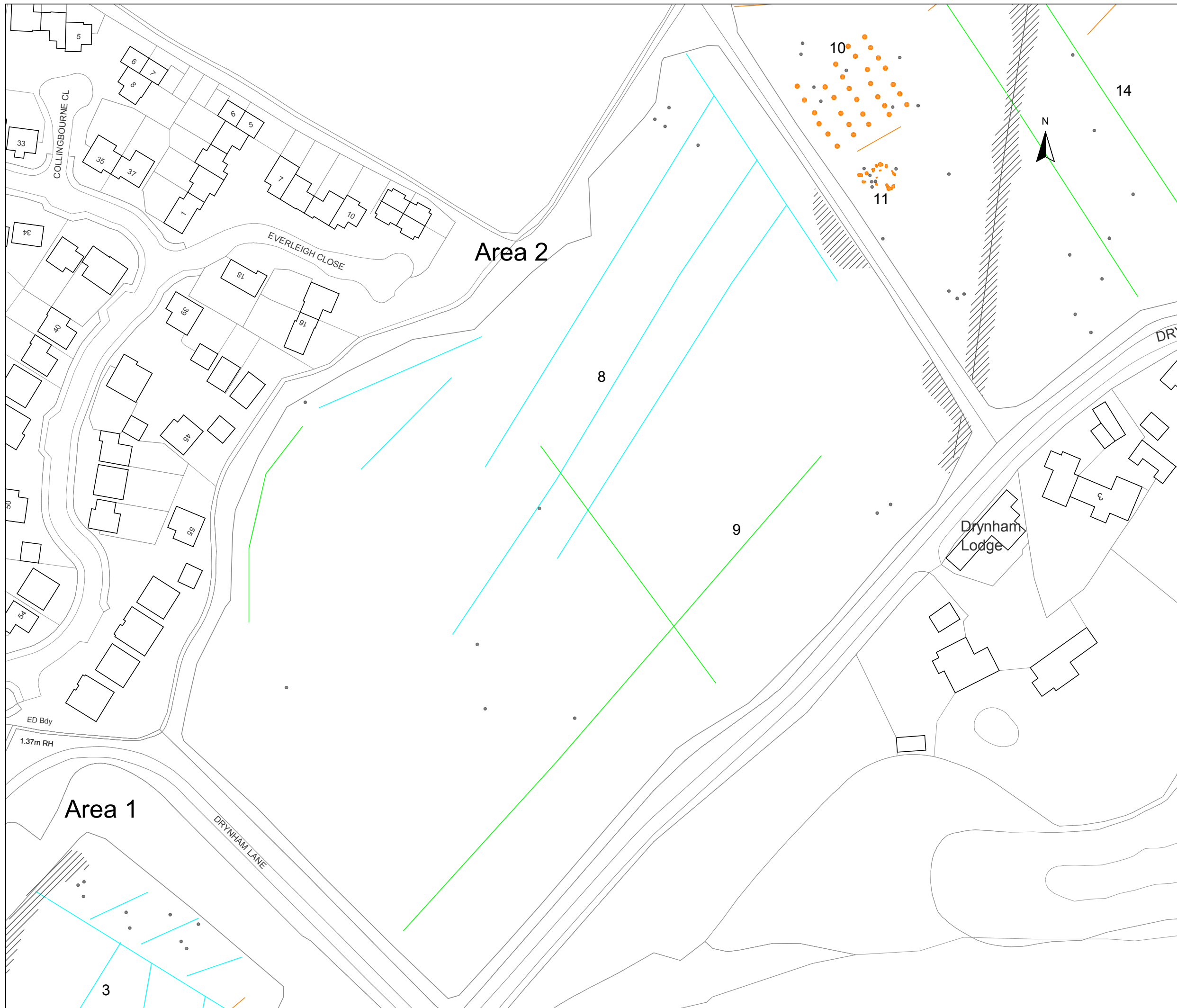
- Linear anomaly - of agricultural origin
- Positive linear anomaly - possible land drain
- Strong dipolar anomaly - ferrous object

SCALE 1:1000



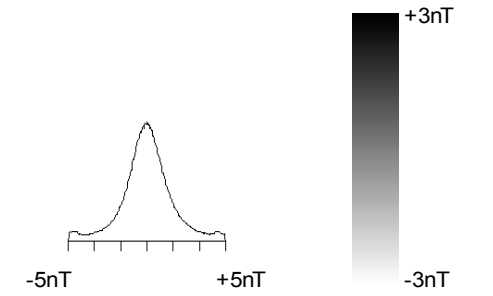
SCALE TRUE AT A3

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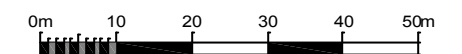


**Geophysical Survey
Land at Elm Grove
North Bradley
Trowbridge
Wiltshire**

**Greyscale plot of minimally
processed magnetometer data -
Area 3**



SCALE 1:1000











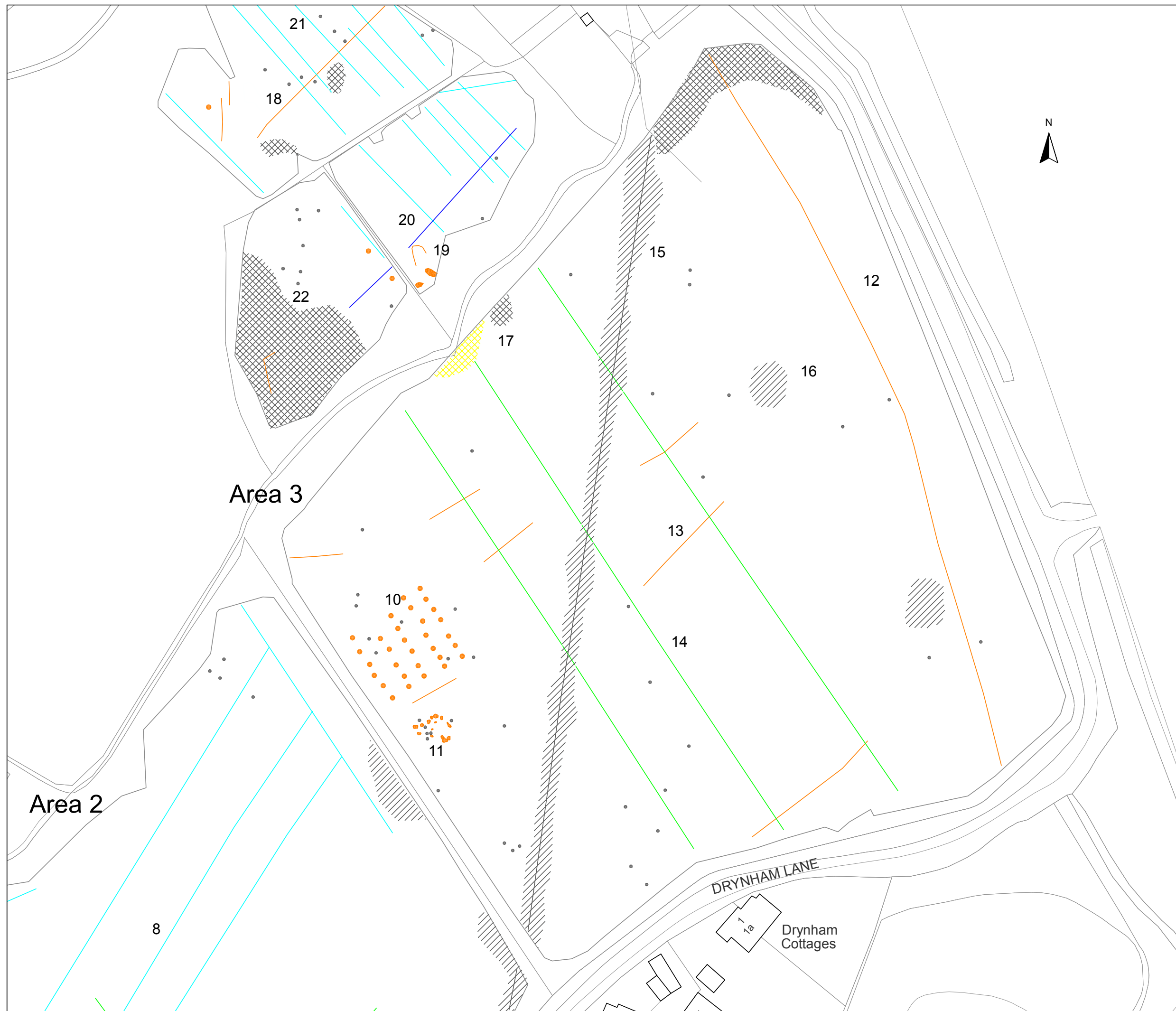
SCALE TRUE AT A3

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**Geophysical Survey
Land at Elm Grove
North Bradley
Trowbridge
Wiltshire**

**Abstraction and interpretation of
magnetometer anomalies -
Area 3**

-  Positive linear anomaly - possible ditch-like feature
-  Linear anomaly - of agricultural origin
-  Discrete positive response - possible pit-like feature
-  Variable magnetic response - paleochannel
-  Magnetic debris - spread of magnetically thermoremanent/ferrous material
-  Magnetic disturbance from ferrous material
-  Strong multiple dipolar linear anomaly - pipeline / cable / service
-  Strong dipolar anomaly - ferrous object



SCALE 1:1000

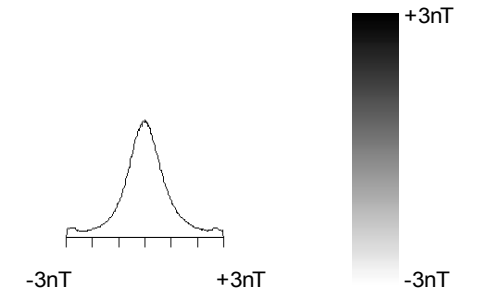


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**Geophysical Survey
Land at Elm Grove
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Trowbridge
Wiltshire**

**Greyscale plot of minimally
processed magnetometer data -
Area 4**



SCALE 1:1000










SCALE TRUE AT A3

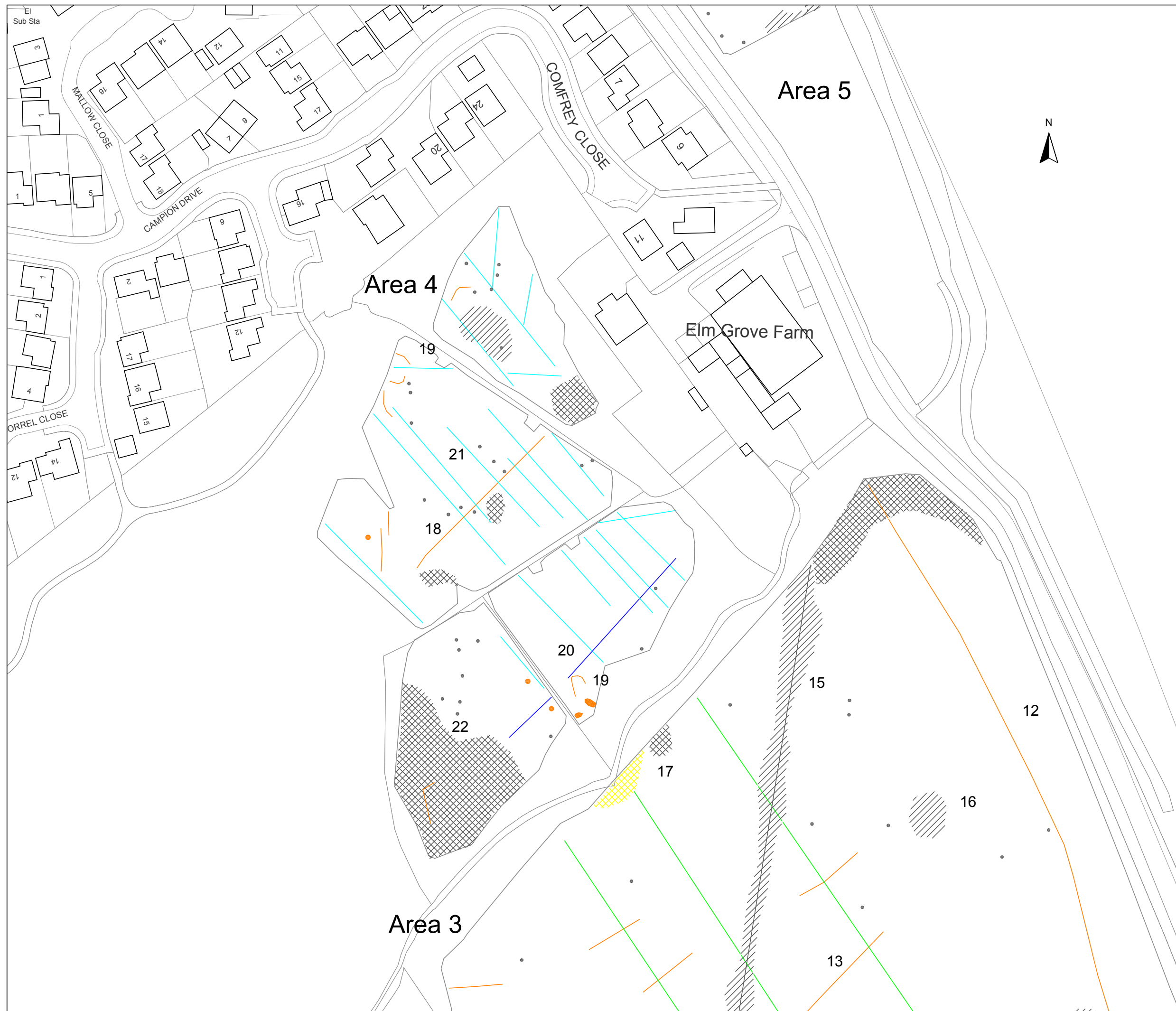
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FIG 11

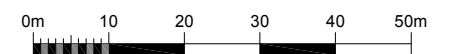
**Geophysical Survey
Land at Elm Grove
North Bradley
Trowbridge
Wiltshire**

**Abstraction and interpretation of
magnetometer anomalies -
Area 4**

-  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 thermoremanent/ferrous material
-  Magnetic disturbance from ferrous material
-  Strong dipolar anomaly - ferrous object



SCALE 1:1000

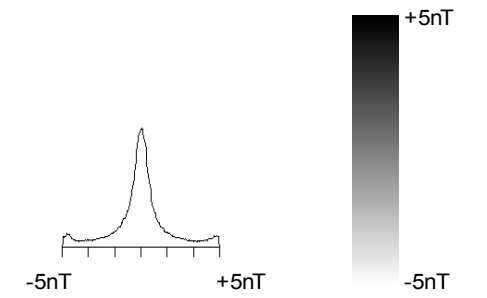


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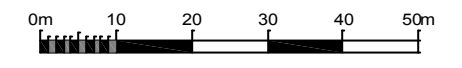
**Geophysical Survey
Land at Elm Grove
North Bradley
Trowbridge
Wiltshire**

**Greyscale plot of minimally
processed magnetometer data -
Area 5**



Area 5

SCALE 1:1000













SCALE TRUE AT A3

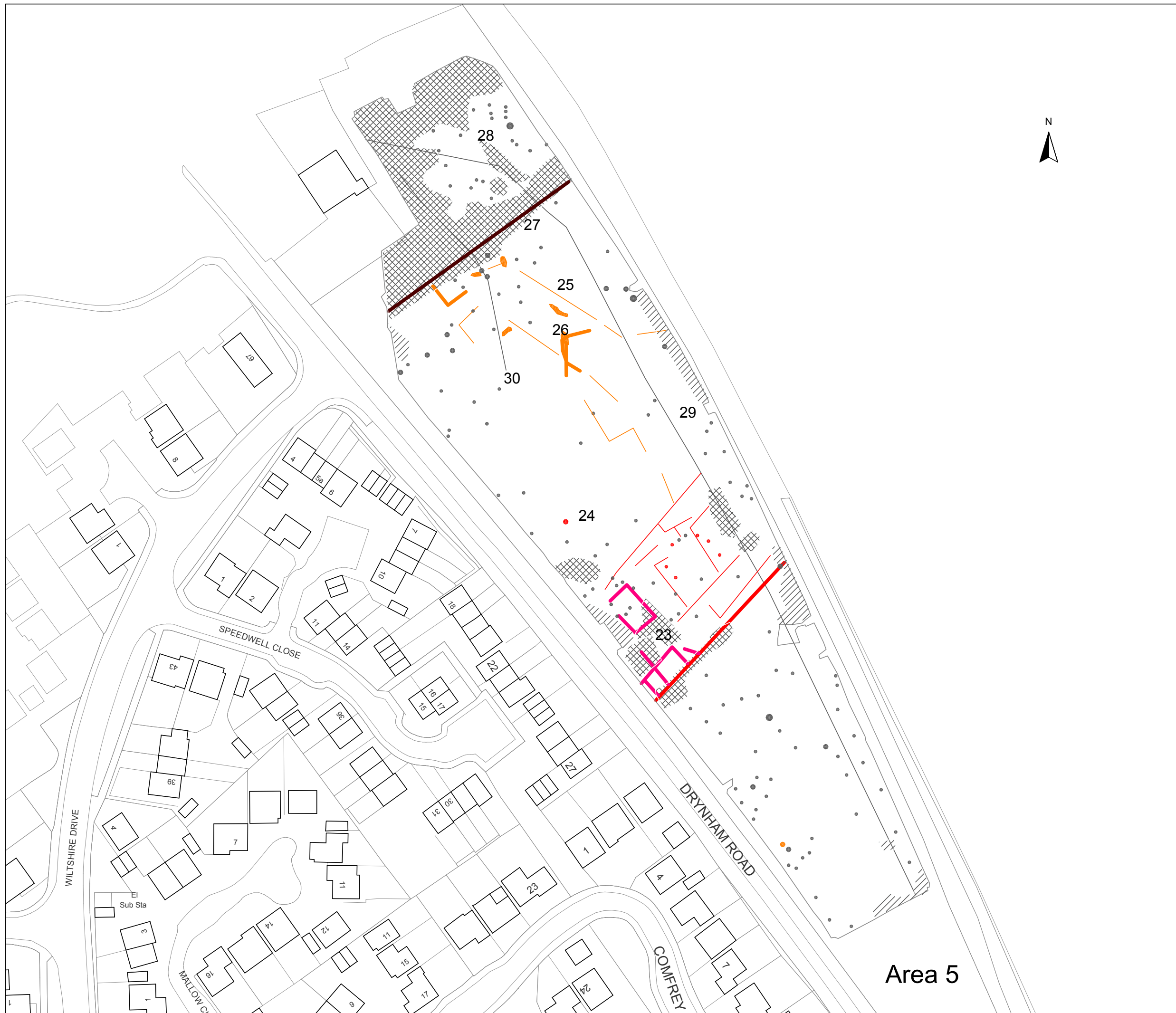
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FIG 13

**Geophysical Survey
Land at Elm Grove
North Bradley
Trowbridge
Wiltshire**

**Abstraction and interpretation of
magnetometer anomalies -
Area 5**

-  Positive linear anomaly - structural remains
-  Positive linear anomaly - cut feature of archaeological potential
-  Positive linear anomaly - possible ditch-like feature
-  Positive linear anomaly - former field boundary
-  Discrete positive response - pit-like feature of archaeological potential
-  Discrete positive response - possible pit-like feature
-  Magnetic debris - spread of magnetically thermoremanent/ferrous material
-  Magnetic disturbance from ferrous material
-  Strong multiple dipolar linear anomaly - pipeline / cable / service
-  Strong dipolar anomaly - ferrous object



SCALE 1:1000



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Area 5