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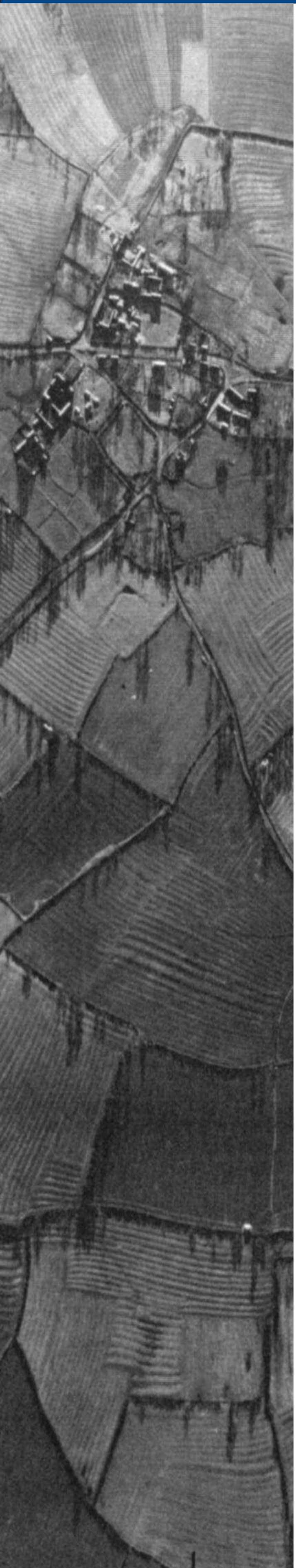

The Crown Estate
Nerrols, North Taunton

MAGNETOMETER SURVEY REPORT

for

Entec UK Ltd

David Sabin and Kerry Donaldson

November 2010

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ARCHAEOLOGICAL SURVEYS LTD

The Crown Estate
Nerrols, North Taunton

Magnetometer Survey

for

Entec UK Ltd

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Survey dates – **26th, 28th & 30th July and 7th, 8th 10th & 28th October 2010**
Ordnance Survey Grid Reference – **ST 242 266**

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SUMMARY

A magnetometer survey was commissioned by Entec UK Ltd, on behalf of The Crown Estate, on land to the north east of Taunton in Somerset. The survey covered 19ha of agricultural land within six fields. The results substantiated cropmark evidence for a rectilinear enclosure within the north western part of the site. Other positive linear, curvilinear and discrete anomalies close to the enclosure may appear to relate to ditch-like and pit-like features; however, the archaeological potential of these could not be determined.

The survey areas within the southern and eastern parts of the site, contained many positive linear, curvilinear, diffuse and discrete anomalies, and although some may relate to natural features, others may indicate cut features of anthropogenic origin. Due to the low magnetic enhancement and general lack of coherent morphology, the majority of these features are classified as uncertain in origin. As noted from other surveys within the region, the soils and underlying geology do not produce optimum conditions for magnetometry, although archaeological features do tend to produce anomalies of sufficient contrast for abstraction from the data.

1 INTRODUCTION

1.1 Survey background

1.1.1 Archaeological Surveys Ltd was commissioned by Entec UK Ltd (Entec), on behalf of The Crown Estate, to undertake a magnetometer survey of an area of land referred to as Nerrols to the north east of Taunton. The site has been outlined for a proposed residential development. 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.

1.2.2 The methodology is considered an efficient and effective approach to archaeological prospection. The survey and report generally follow the recommendations set out by: English Heritage, 2008, *Geophysical survey in archaeological field evaluation;* Institute for Archaeologists, 2002, *The use of Geophysical Techniques in Archaeological Evaluations*.

1.3 Site location, description and survey conditions

1.3.1 The site is located on the north eastern edge of Taunton, Somerset, at Nerrols Farm. The site is centred on Ordnance Survey National Grid Reference (OS NGR) ST 242 266, see Figures 01 and 02.

1.3.2 The geophysical survey covers an area of approximately 19ha of agricultural land, within six separate fields (Areas 1-6). The survey was conducted within two sessions; Areas 1 and 3 were surveyed after removal of a barley crop, Areas 4 to 6 surveyed after removal of a maize crop, whilst Area 2 was surveyed across pasture land.

Plate 1: Survey Area 5 looking to the north

1.3.3 Survey within Areas 4 and 5 was particularly difficult due to tall maize stubble (see Plate 1) though the dataset was considered unlikely to be significantly affected. Weather conditions were generally fine during the survey periods.

1.4 Site history and archaeological potential

1.4.1 A scoping report produced by Entec (2010) outlined the baseline cultural heritage within and surrounding the site. Former archaeological investigation prior to construction of the residential development immediately to the west of the site during the 1990s, revealed evidence for archaeological artefacts and features from the Mesolithic, Neolithic, Bronze Age, Iron Age and Roman periods. The main archaeological feature directly within the development area is a rectilinear cropmark enclosure in the north western part of the site, with other possible cropmarks to the south of this enclosure.

1.4.2 There is, therefore, high potential for the geophysical survey to locate the cropmark enclosure and possible other associated archaeological features.

1.5 Geology and soils

1.5.1 The underlying geology is Mercia Mudstone (BGS, 2010). The overlying soils across the site are from the Whimple 3 association which are stagnogleyic, argillic brown earths. These consist of reddish, fine loamy or fine silty over clayey soils with slowly permeable subsoils and slight seasonal waterlogging (Soil Survey of England and Wales, 1983).

1.5.2 Although Triassic mudstones and the overlying soils from which they are derived may result in low magnetic enhancement within cut features, previous geophysical surveys in the vicinity by Archaeological Surveys (2007, 2009), have located a number of cut features with archaeological potential.

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 Bartington Grad601-2 gradiometers. The instruments effectively measure 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 instruments are extremely sensitive and are 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 instruments are 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 gradiometers undergo 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, 242 and 396
Date of calibration/service	16th May 2009
Bandwidth	12Hz (100nT range) both sensors
Noise	<100pT peak to peak
Adjustable errors	<2nT

Table 1: Bartington fluxgate gradiometer sensor calibration results

The instruments were 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 survey grids were set out to the Ordnance Survey OSGB36 datum using a Penmap RTK GPS. The GPS is used in conjunction with Topcon's TopNet 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).

2.2.8 The fixed orientation of survey grids based on the OSGB36 datum was considered appropriate given that the orientation of land boundaries was variable and consequently partial survey grids were unavoidable. In addition, there is an optimum north – south traverse direction for magnetic survey (English Heritage, 2008). Survey in this direction can produce anomalies with a higher contrast when compared to other orientations; this is a function of their presence within the Earth's magnetic field. A fixed grid across the site also simplifies its relocation should that be required.

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.

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 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.

2.3.4 The main form of data display used in 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.

2.3.5 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 90° anticlockwise to restore north to the top of the image. Greyscale images are rotated by AutoCAD.

2.3.6 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.. A digital archive, including raster images, is produced with this report allowing separate analysis if necessary, see Appendix D below.

3 RESULTS

3.1 General overview

3.1.1 The detailed magnetic survey was carried out over six survey areas covering approximately 19ha. Geophysical anomalies located can be generally classified as positive linear responses of archaeological potential, positive and negative anomalies of an uncertain 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 below with subsequent discussion in Section 4.

3.1.2 Data are considered representative of the magnetic conditions encountered across the site. The underlying geology and soils tend to produce low contrast, weak anomalies, and it is possible that some features of archaeological potential do not contain sufficient enhancement to be visible. However, cropmark features were abstracted from the data, and magnetometry has proved effective over similar conditions in the locality.

3.1.3 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	Anomalies have the characteristics (mainly morphological) of a range of archaeological features such as pits, ring ditches, enclosures, etc..
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 AREA UNCERTAIN AS-ABST MAG NEG AREA 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 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.

Table 2: List and description of interpretation categories

3.2 List of anomalies - Area 1

Area centred on OS NGR 324085 126890, see Figures 03 – 08.

Anomalies of archaeological potential

(1) – Positive rectilinear anomaly represents an enclosure with dimensions of 45m by 40m. There is an entrance close to the south western corner, and it also contains an internal cut feature approximately 27m long.

Anomalies with an uncertain origin

(2) – The survey area contains many very weakly positive, curvilinear and linear

anomalies that may relate to cut features. However, due to their very weak response (>1nT), it is difficult to ascertain if they are anthropogenic or natural in origin.

(3) – Positive linear anomalies may indicate cut features.

(4) – The southern part of the survey area contains numerous discrete positive anomalies that indicate pit-like features. As with anomalies (2) and (3), it is uncertain if these anomalies relate to archaeological or natural features.

(5) – Situated on the north eastern edge of the survey area is a negative linear anomaly, flanked by two weakly positive anomalies. It is possible that the negative feature is a response to material with a lower magnetic susceptibility than the surrounding soil, such as sub-soil, and may, therefore, relate to a former earthwork or embankment, with possible ditch-like features either side. The feature may be natural in origin.

(6) – Weak positive responses may be a continuation of anomaly (5).

Anomalies associated with magnetic debris

(7) – Widespread magnetic debris, located in the south eastern part of the survey area, may relate to magnetically thermoremnant material that has been used in ground make-up or consolidation.

(8) – Strong, discrete dipolar anomalies are a response to ferrous or other magnetically thermoremnant objects within the topsoil.

Anomalies with a modern origin

(9) – Magnetic disturbance at the edges of survey area are a response to adjacent ferrous material.

3.3 List of anomalies - Area 2

Area centred on OS NGR 324280 126900, see Figures 06 – 08.

Anomalies associated with magnetic debris

(10) - Widespread magnetic debris throughout the survey area may relate to magnetically thermoremnant material within the topsoil.

Anomalies with a modern origin

(11) – Multiple dipolar linear anomaly located adjacent to the north eastern corner of the survey area is a response to a buried service.

3.4 List of anomalies - Area 3

Area centred on OS NGR 324295 126500, see Figures 09 – 11.

Anomalies with an uncertain origin

(12) – Two positive linear anomalies, located within anomaly (16), may relate to cut features; however, their archaeological potential cannot be determined.

(13) – A weak positive linear anomaly at the southern end of the survey area.

(14) – A broad, positive zone extending across the northern part of the survey area may be a response to magnetically enhanced material although its origin is uncertain.

(15) – Discrete positive anomalies may indicate pit like features although their origin is uncertain.

Anomalies associated with magnetic debris

(16) - A zone of magnetic debris extending diagonally across the survey area from the north eastern corner to the western edge. Although there are some very strongly magnetic responses, much of the material is of relatively low magnitude. It is possible that the response is to igneous/metamorphic material and may indicate a former track

(17) – Strong, discrete dipolar anomalies are a response to ferrous or other magnetically thermoremnant objects within the topsoil.

Anomalies with a modern origin

(18) – Magnetic disturbance towards the edges of survey area are a response to adjacent ferrous material.

3.5 List of anomalies - Area 4

Area centred on OS NGR 324460 126555, see Figures 09 – 11 and 15 – 17

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Anomalies with an uncertain origin

(19) – Weak positive curvilinear and linear anomalies, close to the western edge of the survey area, may relate to ditch-like features.

(20) – Weak positive linear and discrete anomalies, close to the north western

corner of the survey area, are of uncertain origin.

(21) – A curvilinear anomaly on the eastern side of the survey area.

(22) – The survey area contains several weak, positive linear anomalies of uncertain origin.

(23) – Amorphous and discrete positive anomalies located on the eastern side of the survey area. It is possible that they have a natural origin.

(24) – Negative linear anomalies are likely to be a response to material with a lower magnetic susceptibility than the surrounding soil (e.g. subsoil). It is possible that they are related to agricultural activity.

Anomalies associated with magnetic debris

(25) – Strong, discrete dipolar anomalies are a response to ferrous or other magnetically thermoremnant objects within the topsoil.

Anomalies with a modern origin

(26) – Magnetic disturbance on edges of survey area are a response to adjacent ferrous material.

3.6 List of anomalies - Area 5

Area centred on OS NGR 324475 126750, see Figures 12 – 14

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Anomalies with an uncertain origin

(27) – Amorphous and discrete positive anomalies located on the central eastern side of the survey area. It is possible that they are natural in origin.

(28) – A positive linear anomaly extending 14m northwards from the southern edge of the survey area. It is possible that it is associated with anomaly (30).

(29) – A positive linear anomaly close to the south western corner of the survey area.

(30) – A negative linear anomaly, extending for approximately 90m with a north north west to south south east orientation. It is parallel with the eastern field boundary and it is possible that it relates to an agricultural feature.

Anomalies associated with magnetic debris

(31) – Patches of magnetic debris close to the south western edge of the survey area.

(32) – A zone of magnetic debris along the north western edge of the survey area may have been caused by material used within an agricultural track.

(33) – Strong, discrete dipolar anomalies are a response to ferrous or other magnetically thermoremnant objects within the topsoil.

Anomalies with a modern origin

(34) – Magnetic disturbance from modern ferrous material.

(35) – Magnetic disturbance associated with buried service.

3.7 List of anomalies - Area 6

Area centred on OS NGR 324580 126720, see Figures 12 – 17

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Anomalies with an uncertain origin

(36) – A negative rectilinear anomaly in the north western part of the survey area. It is not possible to determine the origin of this anomaly, but it appears to be a response to material that is less magnetically enhanced than the surrounding soil. This type of response may include subsoil, bedrock or structural remains.

(37) – Weak positive linear anomalies to the south of anomaly (36).

(38) – Weak, diffuse anomalies in the northern part of the survey area.

(39) – Weak, positive linear anomalies, parallel to the eastern and western field boundaries, may indicate agricultural marks.

(40) – A weak, positive linear anomaly oriented north east to south west.

(41) – A positive linear anomaly in the southern part of the survey area, oriented east west, may indicate a former field boundary ditch.

(42) – A positive linear anomaly located in the southern part of the survey area and oriented north-north-west to south-south-east. It is not possible to determine the origin of this anomaly, although it appears ditch-like. The presence of magnetic disturbance (50) from ferrous material possibly associated with a buried service to the south, appears to have obscured part of the anomaly. There is a possibility that this anomaly is also associated with a service.

(43) – A group of positive linear, discrete and diffuse anomalies located close to anomaly (42). Although they appear to relate to cut ditch-like and pit-like features, it is not possible to ascertain if they are anthropogenic in origin.

(44) – Very weakly positive linear anomalies in the southern half of the survey area.

(45) – Discrete positive anomalies may indicate pit-like features.

(46) – A negative linear anomaly extending 225m along the eastern edge of the survey area. The anomaly is parallel with the eastern boundary, suggesting an agricultural mark; however, it does appear to extend towards a linear zone of magnetic disturbance, which may indicate that it relates to a buried service.

Anomalies associated with magnetic debris

(47) – A zone of magnetic debris and magnetic disturbance in the centre of the survey area, may indicate dumped material.

(48) – Several patches of magnetic debris are evident within and at the edges of the survey area.

(49) – Strong, discrete dipolar anomalies are a response to ferrous or other magnetically thermoremnant objects within the topsoil.

Anomalies with a modern origin

(50) – Magnetic disturbance from ferrous material likely to be associated with a buried service along the southern edge of the survey area.

(51) – Magnetic disturbance associated with a buried service along the northern edge of the survey area.

4 DISCUSSION

4.1.1 Targeting of cropmark features derived from aerial photographs of Area 1, the location of a rectilinear enclosure, with dimensions of 45m by 40m, was confirmed. The enclosure appears to have an entrance, approximately 2m wide, close to the south western corner. There is evidence for an internal cut feature and also several other pit-like features; however, it has not been possible to confidently determine the origin of these anomalies. Several other linear, curvilinear and discrete positive anomalies have also been located within Area 1 but due to their low magnitude, widespread nature and lack of coherent morphology, it has not been possible to determine their archaeological potential.

4.1.2 Area 2 data appears to indicate the widespread presence of magnetic material. It is possible that this is associated with magnetically thermoremnant material (e.g. burnt material, brick, tile, slag) introduced onto the field from elsewhere.

4.1.3 Area 3 contains two positive linear anomalies within a band of magnetic debris. Although the linear anomalies may relate to cut-features, it has not been possible to determine their origin. The strength of the magnetic debris is relatively low, suggesting that the material has low magnetic enhancement and it is possible that it relates to a former agricultural track.

4.1.4 Area 4 contains several positive linear, curvilinear, discrete and diffuse anomalies. It is possible that some of the anomalies on the eastern side of the survey area are natural in origin, possibly fluvial; however, the majority of the anomalies within Area 4 are very weak and lack definition which has hindered interpretation.

4.1.5 Area 5 contains a group of positive discrete and diffuse anomalies, which although may indicate pit-like features, it is not possible to determine if they are anthropogenic in origin. A negative linear anomaly, may possibly be associated with a short positive linear anomaly, and may indicate a buried service, but this is uncertain. Strong magnetic responses crossing the northern part of the survey area appear to be associated with a removed field boundary and agricultural track.

4.1.6 Area 6 extends along the eastern edge of the site and contains several geophysical anomalies of uncertain origin. Negative linear and rectilinear anomalies in the northern part of the survey area are likely to be a response to material with low magnetic susceptibility such as subsoil or stone. Positive linear, discrete and diffuse anomalies, primarily in the southern part of the survey area, may indicate ditch-like and pit-like features, but again origin cannot be confidently determined.

5 CONCLUSION

5.1.1 The geophysical survey was carried over 19ha within six separate survey areas. Only one feature, within Area 1 forming the north western part of the site, could be confidently interpreted as archaeological in origin. This rectilinear anomaly relates to a cropmark enclosure known from aerial photographs. Several other positive curvilinear, linear and discrete anomalies were located in the area, and although they may relate to ditch-like and pit-like features, it has not been possible to confidently interpret their origin.

5.1.2 Positive and negative linear, curvilinear and discrete anomalies of uncertain origin were located across the site. It is likely that agricultural and natural features are represented although it should be considered that some may hold archaeological potential.

5.1.3 Many of the anomalies were weak and of low contrast within datasets displaying widespread low magnitude magnetic 'noise'. As noted from other surveys within the region, the soils and underlying geology do not produce optimum conditions for magnetometry, although archaeological features do tend to produce anomalies of sufficient contrast for abstraction from the data.

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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

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

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

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.

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.

Appendix C – survey and data information

Area 1 raw data

COMPOSITE
Filename: J324-mag-Area1-raw.xcp
Instrument Type: Bartington (Gradiometer)
Units: nT
Surveyed by: on 29/07/2010
Assembled by: on 29/07/2010
Direction of 1st Traverse: 0 deg
Collection Method: ZigZag
Sensors: 2 @ 1.00 m spacing.
Dummy Value: 32702

Dimensions
Composite Size (readings): 1440 x 480
Survey Size (meters): 360 m x 480 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: 2.10
Mean: 0.33
Median: 0.28
Composite Area: 17.28 ha
Surveyed Area: 6.8134 ha

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

Source Grids: 102
1 Col:0 Row:8 grids\25.xgd
2 Col:0 Row:9 01.xgd
3 Col:0 Row:10 02.xgd
4 Col:0 Row:11 03.xgd
5 Col:0 Row:12 04.xgd
6 Col:0 Row:13 grids\102.xgd
7 Col:1 Row:8 grids\26.xgd
8 Col:1 Row:9 05.xgd
9 Col:1 Row:10 06.xgd
10 Col:1 Row:11 07.xgd
11 Col:1 Row:12 08.xgd
12 Col:1 Row:13 grids\99.xgd
13 Col:1 Row:14 grids\100.xgd
14 Col:1 Row:15 grids\101.xgd
15 Col:2 Row:8 grids\27.xgd
16 Col:2 Row:9 09.xgd
17 Col:2 Row:10 10.xgd
18 Col:2 Row:11 11.xgd
19 Col:2 Row:12 12.xgd
20 Col:2 Row:13 grids\96.xgd
21 Col:2 Row:14 grids\97.xgd
22 Col:2 Row:15 grids\98.xgd
23 Col:3 Row:7 grids\28.xgd
24 Col:3 Row:8 grids\29.xgd
25 Col:3 Row:9 13.xgd
26 Col:3 Row:10 14.xgd
27 Col:3 Row:11 15.xgd
28 Col:3 Row:12 16.xgd
29 Col:3 Row:13 grids\93.xgd
30 Col:3 Row:14 grids\94.xgd
31 Col:3 Row:15 grids\95.xgd
32 Col:4 Row:7 grids\30.xgd
33 Col:4 Row:8 grids\31.xgd
34 Col:4 Row:9 17.xgd
35 Col:4 Row:10 18.xgd
36 Col:4 Row:11 19.xgd
37 Col:4 Row:12 20.xgd
38 Col:4 Row:13 grids\90.xgd
39 Col:4 Row:14 grids\91.xgd
40 Col:4 Row:15 grids\92.xgd
41 Col:5 Row:7 grids\32.xgd
42 Col:5 Row:8 grids\33.xgd
43 Col:5 Row:9 21.xgd
44 Col:5 Row:10 22.xgd
45 Col:5 Row:11 23.xgd
46 Col:5 Row:12 24.xgd
47 Col:5 Row:13 grids\88.xgd
48 Col:5 Row:14 grids\89.xgd
49 Col:6 Row:5 grids\34.xgd
50 Col:6 Row:6 grids\35.xgd
51 Col:6 Row:7 grids\36.xgd
52 Col:6 Row:8 grids\37.xgd
53 Col:6 Row:9 grids\71.xgd
54 Col:6 Row:10 grids\72.xgd
55 Col:6 Row:11 grids\73.xgd
56 Col:6 Row:12 grids\74.xgd
57 Col:6 Row:13 grids\86.xgd
58 Col:6 Row:14 grids\87.xgd
59 Col:7 Row:2 grids\68.xgd
60 Col:7 Row:3 grids\69.xgd
61 Col:7 Row:4 grids\70.xgd
62 Col:7 Row:5 grids\38.xgd
63 Col:7 Row:6 grids\39.xgd
64 Col:7 Row:7 grids\40.xgd
65 Col:7 Row:8 grids\41.xgd
66 Col:7 Row:9 grids\75.xgd
67 Col:7 Row:10 grids\76.xgd
68 Col:7 Row:11 grids\77.xgd
69 Col:7 Row:12 grids\78.xgd
70 Col:7 Row:13 grids\84.xgd
71 Col:7 Row:14 grids\85.xgd
72 Col:8 Row:0 grids\63.xgd
73 Col:8 Row:1 grids\64.xgd
74 Col:8 Row:2 grids\65.xgd
75 Col:8 Row:3 grids\66.xgd
76 Col:8 Row:4 grids\67.xgd
77 Col:8 Row:5 grids\42.xgd
78 Col:8 Row:6 grids\43.xgd
79 Col:8 Row:7 grids\44.xgd
80 Col:8 Row:8 grids\45.xgd
81 Col:8 Row:9 grids\79.xgd
82 Col:8 Row:10 grids\80.xgd
83 Col:8 Row:11 grids\81.xgd
84 Col:8 Row:12 grids\82.xgd
85 Col:8 Row:13 grids\83.xgd
86 Col:9 Row:0 grids\58.xgd
87 Col:9 Row:1 grids\59.xgd
88 Col:9 Row:2 grids\60.xgd
89 Col:9 Row:3 grids\61.xgd
90 Col:9 Row:4 grids\62.xgd
91 Col:9 Row:5 grids\46.xgd
92 Col:9 Row:6 grids\47.xgd
93 Col:9 Row:7 grids\48.xgd
94 Col:10 Row:0 grids\53.xgd
95 Col:10 Row:1 grids\54.xgd
96 Col:10 Row:2 grids\55.xgd
97 Col:10 Row:3 grids\56.xgd
98 Col:10 Row:4 grids\57.xgd
99 Col:10 Row:5 grids\49.xgd
100 Col:11 Row:0 grids\50.xgd
101 Col:11 Row:1 grids\51.xgd
102 Col:11 Row:2 grids\52.xgd

Area 1 processed data

COMPOSITE
Filename: J324-mag-Area1-proc.xcp

Stats
Max: 3.00
Min: -3.00
Std Dev: 0.89
Mean: 0.05
Median: 0.00

Processes: 5
1 Base Layer
2 Clip from -30.00 to 30.00 nT
3 DeStripe Median Traverse: Grids: 68.xgd 63.xgd 64.xgd 65.xgd 58.xgd 59.xgd 60.xgd 53.xgd 54.xgd 55.xgd 50.xgd 51.xgd 52.xgd
4 DeStripe Mean Traverse: Grids: 25.xgd 01.xgd 02.xgd 03.xgd 04.xgd 102.xgd 26.xgd 05.xgd 06.xgd 07.xgd 08.xgd 99.xgd 100.xgd 101.xgd 27.xgd 09.xgd 10.xgd 11.xgd 12.xgd 96.xgd 97.xgd 98.xgd 28.xgd 29.xgd 13.xgd 14.xgd 15.xgd 16.xgd 93.xgd 94.xgd 95.xgd 30.xgd 31.xgd 17.xgd 18.xgd 19.xgd 20.xgd 90.xgd 91.xgd 92.xgd 32.xgd 33.xgd 21.xgd 22.xgd 23.xgd 24.xgd 88.xgd 89.xgd 34.xgd 35.xgd 36.xgd 37.xgd 71.xgd 72.xgd 73.xgd 74.xgd 86.xgd 87.xgd 69.xgd 70.xgd 38.xgd 39.xgd 40.xgd 41.xgd 75.xgd 76.xgd 77.xgd 78.xgd 84.xgd 85.xgd 66.xgd 67.xgd 42.xgd 43.xgd 44.xgd 45.xgd 79.xgd 80.xgd 81.xgd 82.xgd 83.xgd 61.xgd 62.xgd 46.xgd 47.xgd 48.xgd 56.xgd 57.xgd 49.xgd
Threshold: 1 SDs
5 Clip from -3.00 to 3.00 nT

Source Grids: 102 as above

Area 2 raw data

COMPOSITE
Filename: J324-mag-Area2-raw.xcp
Instrument Type: Bartington (Gradiometer)
Units: nT
Surveyed by: on 30/07/2010
Assembled by: on 02/08/2010
Direction of 1st Traverse: 0 deg
Collection Method: ZigZag
Sensors: 2 @ 1.00 m spacing.
Dummy Value: 32702

Dimensions
Composite Size (readings): 720 x 90
Survey Size (meters): 180 m x 90 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: 6.79
Mean: -0.70
Median: -0.76
Composite Area: 1.62 ha
Surveyed Area: 0.58695 ha

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

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

Area 2 processed data

COMPOSITE
Filename: J324-mag-Area2-proc.xcp

Stats
Max: 3.00
Min: -3.00
Std Dev: 1.98
Mean: -0.54
Median: -0.76

Processes: 3
1 Base Layer
2 Clip from -30.00 to 30.00 nT
3 Clip from -3.00 to 3.00 nT

Source Grids: 13 as above

Area 3 raw data

COMPOSITE
Filename: J324-mag-Area3-raw.xcp
Instrument Type: Bartington (Gradiometer)
Units: nT
Surveyed by: on 31/07/2010
Assembled by: on 02/08/2010
Direction of 1st Traverse: 0 deg
Collection Method: ZigZag
Sensors: 2 @ 1.00 m spacing.
Dummy Value: 32702

Dimensions
Composite Size (readings): 1320 x 210
Survey Size (meters): 330 m x 210 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: 2.35
Mean: -0.08
Median: -0.24
Composite Area: 6.93 ha
Surveyed Area: 3.881 ha

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

Source Grids: 60
1 Col:0 Row:2 grids\57.xgd
2 Col:0 Row:3 grids\58.xgd
3 Col:0 Row:4 grids\59.xgd
4 Col:0 Row:5 grids\60.xgd
5 Col:1 Row:2 grids\53.xgd
6 Col:1 Row:3 grids\54.xgd
7 Col:1 Row:4 grids\55.xgd
8 Col:1 Row:5 grids\56.xgd
9 Col:2 Row:1 grids\48.xgd
10 Col:2 Row:2 grids\49.xgd
11 Col:2 Row:3 grids\50.xgd
12 Col:2 Row:4 grids\51.xgd
13 Col:2 Row:5 grids\52.xgd
14 Col:3 Row:1 grids\43.xgd
15 Col:3 Row:2 grids\44.xgd
16 Col:3 Row:3 grids\45.xgd
17 Col:3 Row:4 grids\46.xgd
18 Col:3 Row:5 grids\47.xgd
19 Col:4 Row:1 grids\38.xgd
20 Col:4 Row:2 grids\39.xgd
21 Col:4 Row:3 grids\40.xgd
22 Col:4 Row:4 grids\41.xgd
23 Col:4 Row:5 grids\42.xgd
24 Col:5 Row:1 grids\32.xgd
25 Col:5 Row:2 grids\33.xgd
26 Col:5 Row:3 grids\34.xgd
27 Col:5 Row:4 grids\35.xgd
28 Col:5 Row:5 grids\36.xgd
29 Col:5 Row:6 grids\37.xgd
30 Col:6 Row:1 grids\26.xgd
31 Col:6 Row:2 grids\27.xgd
32 Col:6 Row:3 grids\28.xgd
33 Col:6 Row:4 grids\29.xgd
34 Col:6 Row:5 grids\30.xgd
35 Col:6 Row:6 grids\31.xgd
36 Col:7 Row:0 grids\19.xgd
37 Col:7 Row:1 grids\20.xgd
38 Col:7 Row:2 grids\21.xgd
39 Col:7 Row:3 grids\22.xgd
40 Col:7 Row:4 grids\23.xgd
41 Col:7 Row:5 grids\24.xgd
42 Col:7 Row:6 grids\25.xgd
43 Col:8 Row:0 grids\12.xgd
44 Col:8 Row:1 grids\13.xgd
45 Col:8 Row:2 grids\14.xgd
46 Col:8 Row:3 grids\15.xgd
47 Col:8 Row:4 grids\16.xgd
48 Col:8 Row:5 grids\17.xgd
49 Col:8 Row:6 grids\18.xgd
50 Col:9 Row:0 grids\06.xgd
51 Col:9 Row:1 grids\07.xgd
52 Col:9 Row:2 grids\08.xgd
53 Col:9 Row:3 grids\09.xgd
54 Col:9 Row:4 grids\10.xgd
55 Col:9 Row:5 grids\11.xgd
56 Col:10 Row:1 grids\01.xgd
57 Col:10 Row:2 grids\02.xgd
58 Col:10 Row:3 grids\03.xgd
59 Col:10 Row:4 grids\04.xgd
60 Col:10 Row:5 grids\05.xgd

Area 3 processed data

COMPOSITE
Filename: J324-mag-Area3-proc.xcp

Stats
Max: 3.00
Min: -3.00
Std Dev: 0.86
Mean: 0.03
Median: 0.00

Processes: 10
1 Base Layer
2 Clip from -30.00 to 30.00 nT
3 DeStripe Median Traverse: Grids: 03.xgd
4 DeStripe Mean Traverse: Grids: 04.xgd 05.xgd Threshold: 1 SDs
5 DeStripe Mean Traverse: Grids: 06.xgd 07.xgd 08.xgd 09.xgd 10.xgd 11.xgd Threshold: 1 SDs
6 DeSlope (Area: Top 29, Left 1200, Bottom 90, Right 1296) using Horz Polynomial
7 DeStripe Median Traverse: Grids: 38.xgd 39.xgd 40.xgd 41.xgd 42.xgd 32.xgd 33.xgd 34.xgd 35.xgd 36.xgd 37.xgd 26.xgd 27.xgd 28.xgd 29.xgd 30.xgd 31.xgd 19.xgd 20.xgd 21.xgd 22.xgd 23.xgd 24.xgd 25.xgd 12.xgd 13.xgd 14.xgd 15.xgd 16.xgd 17.xgd 18.xgd
8 DeStripe Mean Traverse: Grids: 58.xgd 59.xgd 60.xgd 54.xgd 55.xgd 56.xgd 50.xgd 51.xgd 52.xgd 45.xgd 46.xgd 47.xgd Threshold: 1 SDs
9 DeStripe Median Traverse: Grids: 57.xgd 53.xgd 48.xgd 49.xgd 43.xgd 44.xgd
10 Clip from -3.00 to 3.00 nT

Source Grids: 60 as above

Area 4 raw data

COMPOSITE
Filename: J324-mag-Area4-raw.xcp
Instrument Type: Bartington (Gradiometer)
Units: nT
Surveyed by: on 07/10/2010
Assembled by: on 07/10/2010
Direction of 1st Traverse: 0 deg
Collection Method: ZigZag
Sensors: 2 @ 1.00 m spacing.
Dummy Value: 32702

Dimensions
Composite Size (readings): 840 x 180
Survey Size (meters): 210 m x 180 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: -0.15
Median: 0.09
Composite Area: 3.78 ha
Surveyed Area: 2.9582 ha

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

Source Grids: 39
1 Col:0 Row:0 grids\23.xgd
2 Col:0 Row:1 grids\24.xgd
3 Col:0 Row:2 grids\25.xgd
4 Col:0 Row:3 grids\26.xgd
5 Col:0 Row:4 grids\27.xgd
6 Col:1 Row:0 grids\19.xgd
7 Col:1 Row:1 grids\20.xgd
8 Col:1 Row:2 grids\21.xgd
9 Col:1 Row:3 grids\22.xgd
10 Col:1 Row:4 grids\28.xgd
11 Col:1 Row:5 grids\29.xgd
12 Col:2 Row:0 grids\15.xgd
13 Col:2 Row:1 grids\16.xgd
14 Col:2 Row:2 grids\17.xgd
15 Col:2 Row:3 grids\18.xgd
16 Col:2 Row:4 grids\30.xgd
17 Col:2 Row:5 grids\31.xgd
18 Col:3 Row:0 grids\11.xgd
19 Col:3 Row:1 grids\12.xgd
20 Col:3 Row:2 grids\13.xgd
21 Col:3 Row:3 grids\14.xgd
22 Col:3 Row:4 grids\32.xgd
23 Col:3 Row:5 grids\33.xgd
24 Col:4 Row:0 grids\07.xgd
25 Col:4 Row:1 grids\08.xgd
26 Col:4 Row:2 grids\09.xgd
27 Col:4 Row:3 grids\10.xgd
28 Col:4 Row:4 grids\34.xgd
29 Col:4 Row:5 grids\35.xgd
30 Col:5 Row:0 grids\03.xgd
31 Col:5 Row:1 grids\04.xgd
32 Col:5 Row:2 grids\05.xgd
33 Col:5 Row:3 grids\06.xgd
34 Col:5 Row:4 grids\36.xgd
35 Col:5 Row:5 grids\37.xgd
36 Col:6 Row:2 grids\01.xgd
37 Col:6 Row:3 grids\02.xgd
38 Col:6 Row:4 grids\38.xgd
39 Col:6 Row:5 grids\39.xgd

Area 4 processed data

COMPOSITE
Filename: J324-mag-Area4-proc.xcp

Stats
Max: 3.00
Min: -3.00
Std Dev: 0.94
Mean: 0.03
Median: 0.01

Processes: 5
1 Base Layer
2 Clip from -30.00 to 30.00 nT
3 DeStripe Median Traverse: Grids: 19.xgd 20.xgd 21.xgd 22.xgd 28.xgd 29.xgd 15.xgd 16.xgd 17.xgd 18.xgd 30.xgd 31.xgd 11.xgd 12.xgd 13.xgd 14.xgd 32.xgd 33.xgd 07.xgd 08.xgd 09.xgd 10.xgd 34.xgd 35.xgd 03.xgd 04.xgd 05.xgd 06.xgd 36.xgd 37.xgd 01.xgd 02.xgd 38.xgd 39.xgd
4 DeStripe Mean Traverse: Grids: 23.xgd 24.xgd 25.xgd 26.xgd 27.xgd Threshold: 0.5 SDs
5 Clip from -3.00 to 3.00 nT

Source Grids: 39 as above

Area 5 raw data

COMPOSITE
Filename: J324-mag-Area5-raw.xcp
Instrument Type: Bartington (Gradiometer)
Units: nT
Surveyed by: on 09/10/2010
Assembled by: on 09/10/2010
Direction of 1st Traverse: 0 deg
Collection Method: ZigZag
Sensors: 2 @ 1.00 m spacing.
Dummy Value: 32702

Dimensions
Composite Size (readings): 960 x 180
Survey Size (meters): 240 m x 180 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: 5.65
Mean: -0.09
Median: 0.25
Composite Area: 4.32 ha
Surveyed Area: 2.3342 ha

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

Source Grids: 34
1 Col:0 Row:1 grids\34.xgd
2 Col:0 Row:2 grids\01.xgd
3 Col:0 Row:3 grids\02.xgd
4 Col:1 Row:1 grids\33.xgd
5 Col:1 Row:2 grids\03.xgd
6 Col:1 Row:3 grids\04.xgd
7 Col:1 Row:4 grids\05.xgd
8 Col:1 Row:5 grids\06.xgd
9 Col:2 Row:1 grids\32.xgd
10 Col:2 Row:2 grids\07.xgd
11 Col:2 Row:3 grids\08.xgd
12 Col:2 Row:4 grids\09.xgd
13 Col:2 Row:5 grids\10.xgd
14 Col:3 Row:1 grids\31.xgd
15 Col:3 Row:2 grids\11.xgd
16 Col:3 Row:3 grids\12.xgd
17 Col:3 Row:4 grids\13.xgd
18 Col:3 Row:5 grids\14.xgd
19 Col:4 Row:1 grids\30.xgd
20 Col:4 Row:2 grids\15.xgd
21 Col:4 Row:3 grids\16.xgd
22 Col:4 Row:4 grids\17.xgd
23 Col:5 Row:0 grids\28.xgd
24 Col:5 Row:1 grids\29.xgd
25 Col:5 Row:2 grids\18.xgd
26 Col:5 Row:3 grids\19.xgd
27 Col:5 Row:4 grids\20.xgd
28 Col:6 Row:0 grids\26.xgd
29 Col:6 Row:1 grids\27.xgd
30 Col:6 Row:2 grids\21.xgd
31 Col:6 Row:3 grids\22.xgd
32 Col:7 Row:0 grids\24.xgd
33 Col:7 Row:1 grids\25.xgd
34 Col:7 Row:2 grids\23.xgd

Area 5 processed data

COMPOSITE
Filename: J324-mag-Area5-proc.xcp

Stats
Max: 3.00
Min: -3.00
Std Dev: 1.29
Mean: 0.00
Median: 0.00

Processes: 6
1 Base Layer
2 Clip from -30.00 to 30.00 nT
3 DeStripe Median Traverse: Grids: 34.xgd 01.xgd 02.xgd 33.xgd 03.xgd 04.xgd 05.xgd 06.xgd 32.xgd 07.xgd 08.xgd 09.xgd 10.xgd 31.xgd 11.xgd 12.xgd 13.xgd 14.xgd 30.xgd 15.xgd 16.xgd 17.xgd
4 DeStripe Median Traverse: Grids: 26.xgd 27.xgd 21.xgd 22.xgd 24.xgd 25.xgd 23.xgd

5 DeStripe Mean Traverse: Grids: 28.xgd 29.xgd 18.xgd 19.xgd 20.xgd Threshold: 1 SDs
6 Clip from -3.00 to 3.00 nT

Source Grids: 34 as above

Area 6 raw data

COMPOSITE
Filename: J324-mag-Area6-raw.xcp
Instrument Type: Bartington (Gradiometer)
Units: nT
Surveyed by: on 31/10/2010
Assembled by: on 31/10/2010
Direction of 1st Traverse: 0 deg
Collection Method: ZigZag
Sensors: 2 @ 1.00 m spacing.
Dummy Value: 32702

Dimensions
Composite Size (readings): 1800 x 240
Survey Size (meters): 450 m x 240 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: 5.81
Mean: -0.24
Median: 0.25
Composite Area: 10.8 ha
Surveyed Area: 2.385 ha

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

Source Grids: 44
1 Col:0 Row:5 grids\42.xgd
2 Col:0 Row:6 grids\43.xgd
3 Col:0 Row:7 grids\44.xgd
4 Col:1 Row:5 grids\39.xgd
5 Col:1 Row:6 grids\40.xgd
6 Col:1 Row:7 grids\41.xgd
7 Col:2 Row:5 grids\36.xgd
8 Col:2 Row:6 grids\37.xgd
9 Col:2 Row:7 grids\38.xgd
10 Col:3 Row:5 grids\34.xgd
11 Col:3 Row:6 grids\35.xgd
12 Col:4 Row:4 grids\31.xgd
13 Col:4 Row:5 grids\32.xgd
14 Col:4 Row:6 grids\33.xgd
15 Col:5 Row:4 grids\28.xgd
16 Col:5 Row:5 grids\29.xgd
17 Col:5 Row:6 grids\30.xgd
18 Col:6 Row:4 grids\25.xgd
19 Col:6 Row:5 grids\26.xgd
20 Col:6 Row:6 grids\27.xgd
21 Col:7 Row:4 grids\22.xgd
22 Col:7 Row:5 grids\23.xgd
23 Col:7 Row:6 grids\24.xgd
24 Col:8 Row:3 grids\19.xgd
25 Col:8 Row:4 grids\20.xgd
26 Col:8 Row:5 grids\21.xgd
27 Col:9 Row:3 grids\16.xgd
28 Col:9 Row:4 grids\17.xgd
29 Col:9 Row:5 grids\18.xgd
30 Col:10 Row:2 grids\13.xgd
31 Col:10 Row:3 grids\14.xgd
32 Col:10 Row:4 grids\15.xgd
33 Col:11 Row:1 grids\10.xgd
34 Col:11 Row:2 grids\11.xgd
35 Col:11 Row:3 grids\12.xgd
36 Col:12 Row:0 grids\06.xgd
37 Col:12 Row:1 grids\07.xgd
38 Col:12 Row:2 grids\08.xgd
39 Col:12 Row:3 grids\09.xgd
40 Col:13 Row:0 grids\03.xgd
41 Col:13 Row:1 grids\04.xgd
42 Col:13 Row:2 grids\05.xgd
43 Col:14 Row:0 grids\01.xgd
44 Col:14 Row:1 grids\02.xgd

Area 6 processed data

COMPOSITE
Filename: J324-mag-Area6-proc.xcp

Stats
Max: 3.00
Min: -3.00
Std Dev: 1.24
Mean: -0.11
Median: -0.02

Processes: 10
1 Base Layer
2 Clip from -30.00 to 30.00 nT
3 DeStripe Median Traverse: Grids: 19.xgd 20.xgd 21.xgd 16.xgd 17.xgd 18.xgd 13.xgd 14.xgd 15.xgd 10.xgd 11.xgd 12.xgd 06.xgd 07.xgd 08.xgd 09.xgd 03.xgd 04.xgd 05.xgd
4 DeStripe Median Traverse: Grids: 34.xgd 35.xgd 31.xgd 32.xgd 33.xgd 28.xgd 29.xgd 30.xgd 25.xgd 26.xgd 27.xgd
5 DeStripe Median Traverse: Grids: 22.xgd 23.xgd 24.xgd
6 DeStripe Mean Traverse: Grids: 01.xgd 02.xgd Threshold: 0.5 SDs
7 DeStripe Median Traverse: Grids: 36.xgd
8 DeStripe Mean Traverse: Grids: 42.xgd 43.xgd 44.xgd 39.xgd 40.xgd 41.xgd Threshold: 0.5 SDs
9 DeStripe Mean Traverse: Grids: 37.xgd Threshold: 0.5 SDs
10 Clip from -3.00 to 3.00 nT

Source Grids: 44 as above

Appendix D – digital archive

Archaeological Surveys Ltd hold the primary digital archive at Castle Combe, Wiltshire (see inside cover for address). 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. Digital data are also supplied to the client on CD ROM, see below.

Surveys are reported on in hardcopy (recycled paper) using A4 for text and A3 for plots (all plots are scaled for A3). The distribution of both hardcopy report and digital data is considered the responsibility of the Client unless explicitly stated in the survey Brief, Written Scheme of Investigation or other contractual agreement.

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

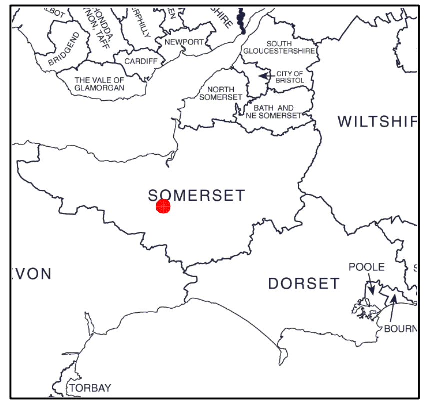
- ArcheoSurveyor version 2.5.2.1 (geophysical data analysis),
- ProgeCAD Professional 2009 (report graphics),
- AutoCAD LT 2007 (report figures),
- OpenOffice.org 3.0.1 Writer (document text),
- PDF Creator version 0.9 (PDF archive).

Digital data are supplied on CD ROM which includes the following files:

- ArcheoSurveyor grid and composite files for all 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.

The CD ROM structure is formed from a tree of directories under the title J324 Nerrols – CD. Directory titles include Data, Documentation, CAD, PDFs and Photos. Multiple directories exist under Data and hold Grid, Composite and Graphic files with CSV composite data held in Export.

The CAD file contains externally referenced graphics that are rotated with separate A3 size layouts for each figure. Layouts are fixed using frozen layers and named views allowing straightforward plotting or analysis on screen. (Note – CAD files are prepared using AutoCAD's e Transmit function to produce a directory containing the digital drawing along with any externally referenced graphics which may need reloading).



● Survey location

Archaeological Surveys Ltd

Geophysical Survey
The Crown Estate,
Nerrols, North Taunton

Map of survey area

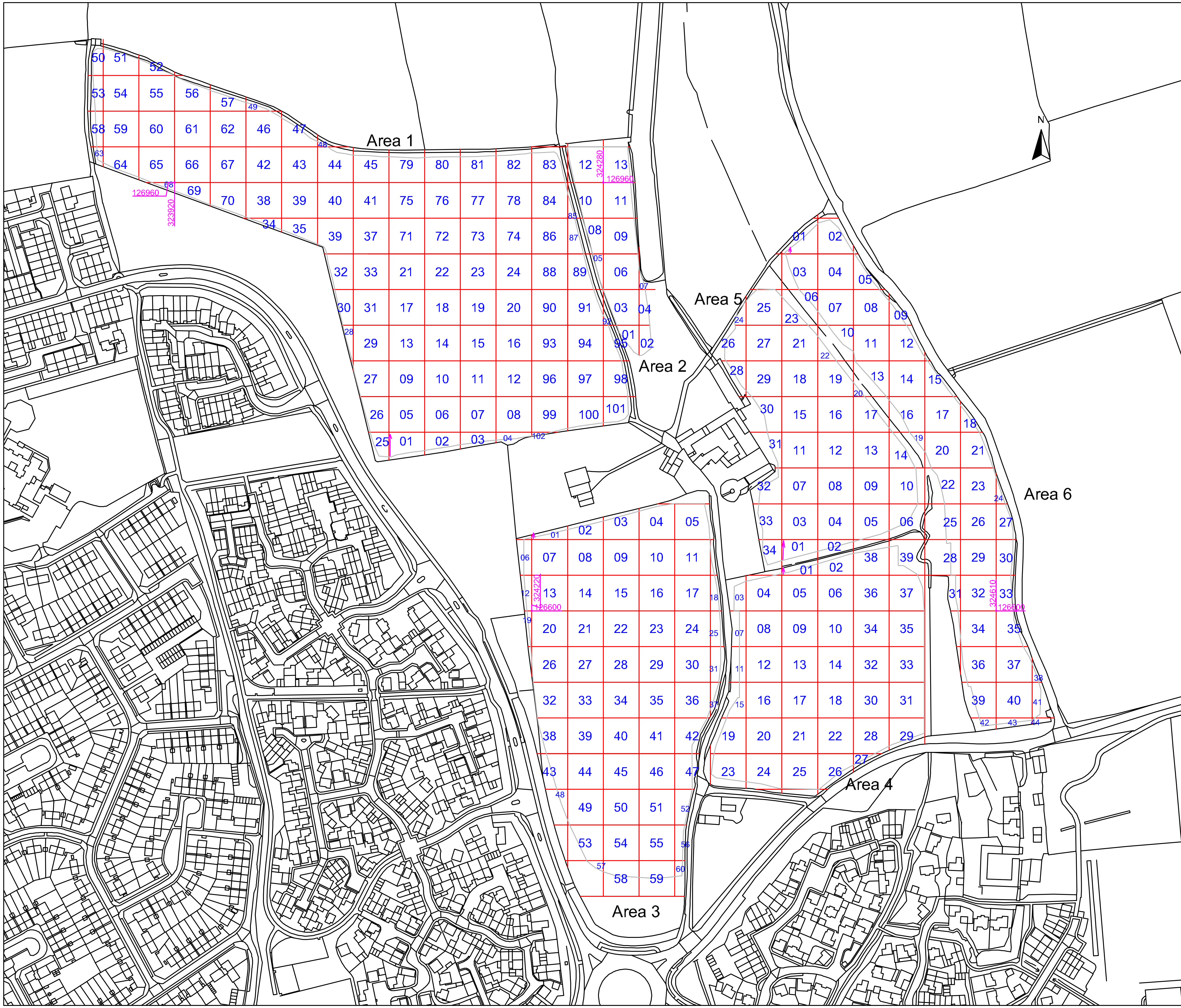
Site centred on OS NGR
ST 242 266

SCALE 1:50 000

0m 1000m 2000m

SCALE TRUE AT A3

FIG 01



Archaeological Surveys Ltd

Geophysical Survey
The Crown Estate, Nerrols, North Taunton

Referencing information

Grid coordinates based on Ordnance Survey OSGB36 datum

Grids set out using RTK GPS with Topcon TopNet correction data RTCMv2 format OSTN02 transformation

Survey grid size = 30m

Survey start and traverse direction

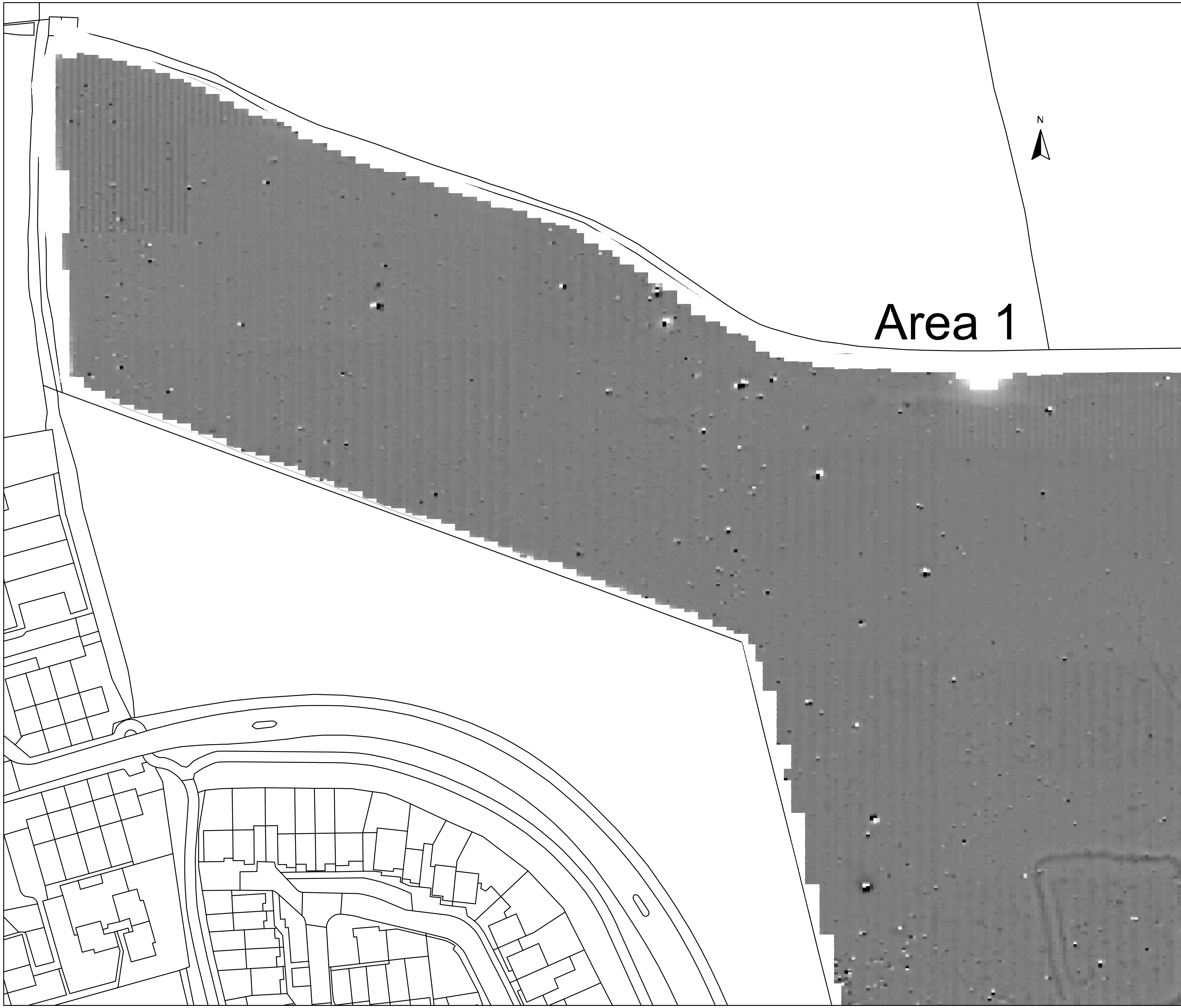
01 Grid reference number and filename

SCALE 1:3000

0m 30 60 90 120 150m

SCALE TRUE AT A3

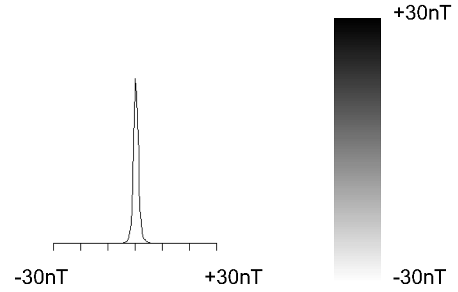
FIG 02



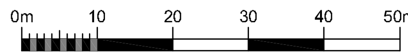
Archaeological Surveys Ltd

Geophysical Survey
The Crown Estate,
Nerrols, North Taunton

Greyscale plot of raw magnetometer data - Area 1 (north west part)



SCALE 1:1000



SCALE TRUE AT A3

FIG03

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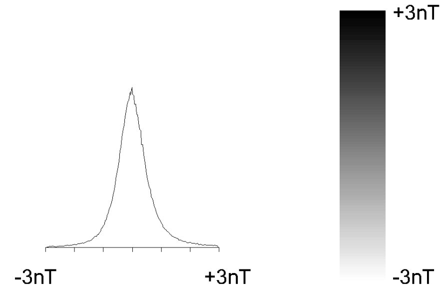
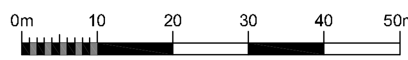
Geophysical Survey
The Crown Estate,
Nerrols, North Taunton

Greyscale plot of processed magnetometer data -
Area 1 (north west part)



SCALE 1:1000



SCALE TRUE AT A3

FIG 04

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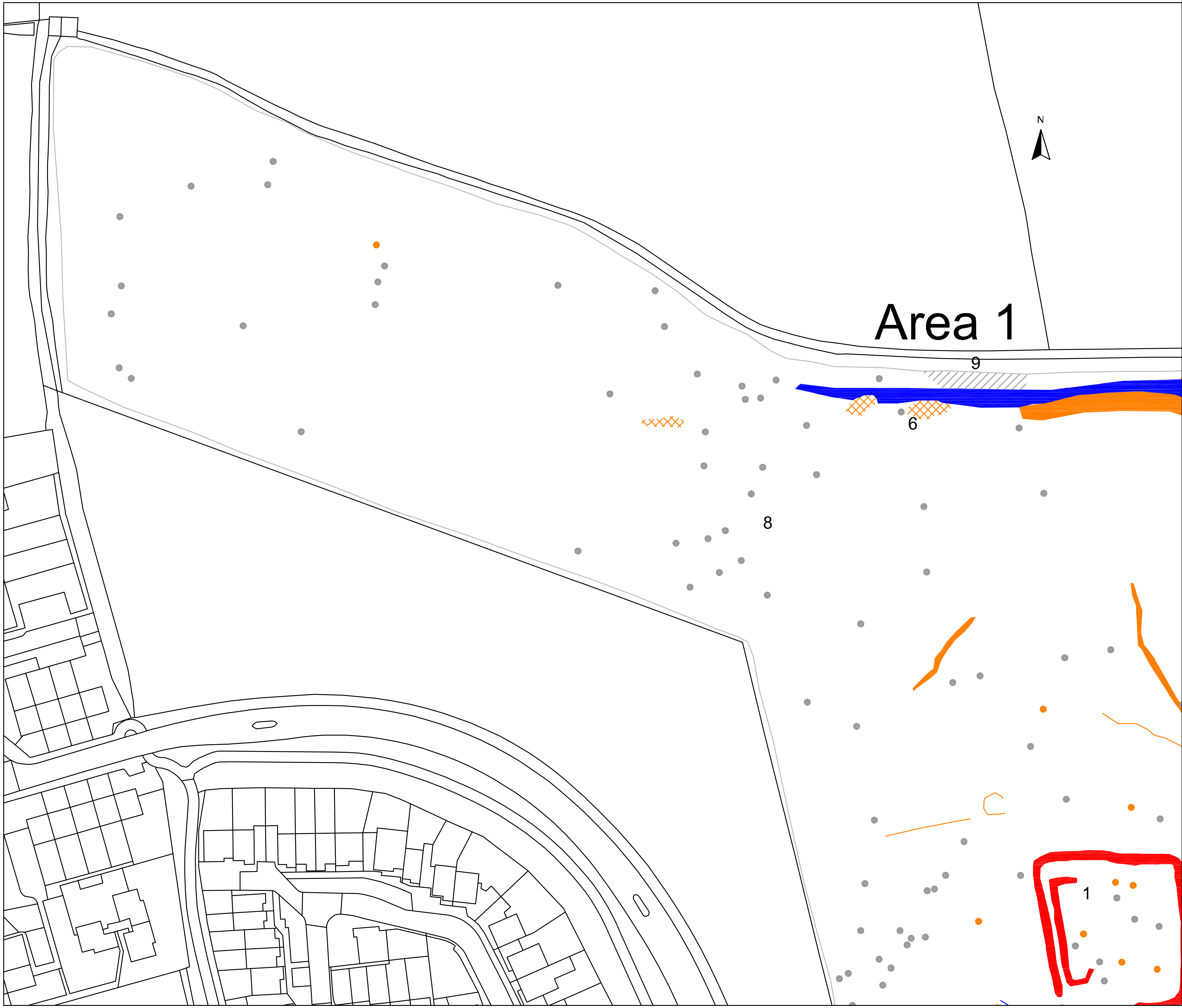
Geophysical Survey
The Crown Estate,
Nerrols, North Taunton



Abstraction and interpretation of magnetometer anomalies - Area 1 (north west part)

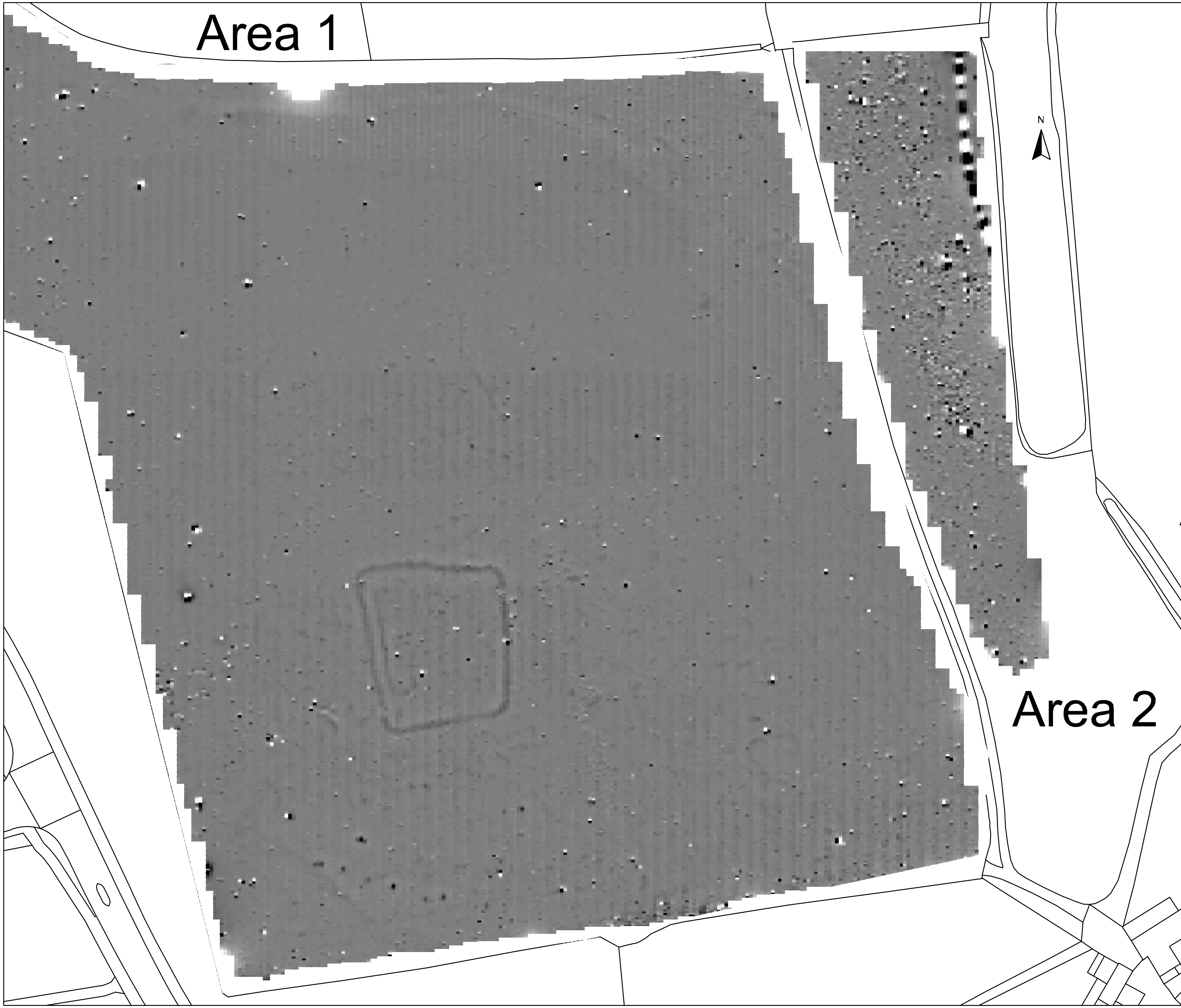
- Positive linear anomaly - cut feature of archaeological origin
- Positive linear anomaly - possible ditch-like feature
- Negative linear anomaly - material of low magnetic susceptibility
- Discrete positive response - possible pit-like feature
- Weak positive response - of uncertain origin
- Magnetic disturbance from ferrous material
- Strong dipolar anomaly - ferrous object

SCALE 1:1000

0m 10 20 30 40 50m

SCALE TRUE AT A3

FIG 05



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Geophysical Survey
The Crown Estate,
Nerrols, North Taunton

Greyscale plot of raw magnetometer data - Areas 1 and 2

+30nT
-30nT

-30nT Area 1 +30nT

-30nT Area 2 +30nT

SCALE 1:1000

0m 10 20 30 40 50m

SCALE TRUE AT A3

FIG06

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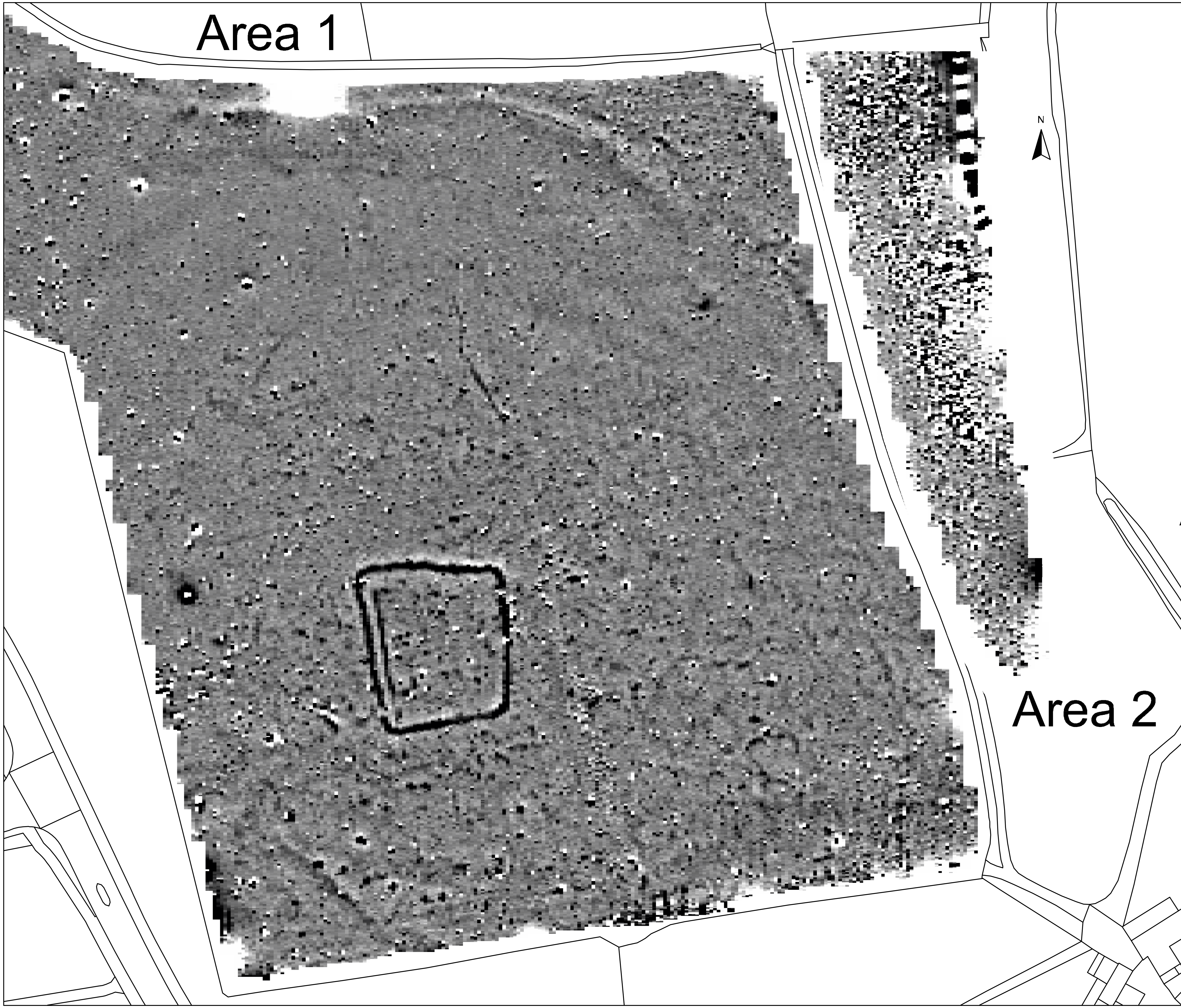
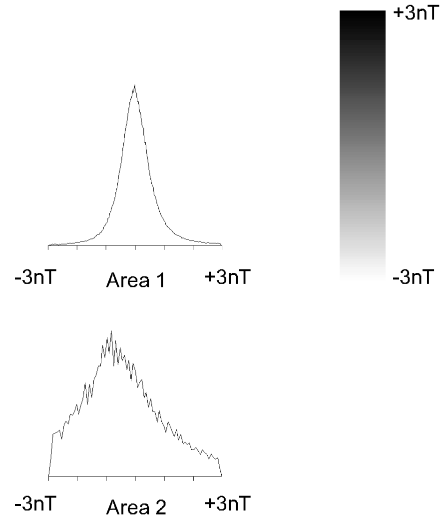
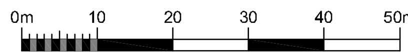
The Crown Estate,
Nerrols, North Taunton



Greyscale plot of processed magnetometer data - Areas 1 and 2

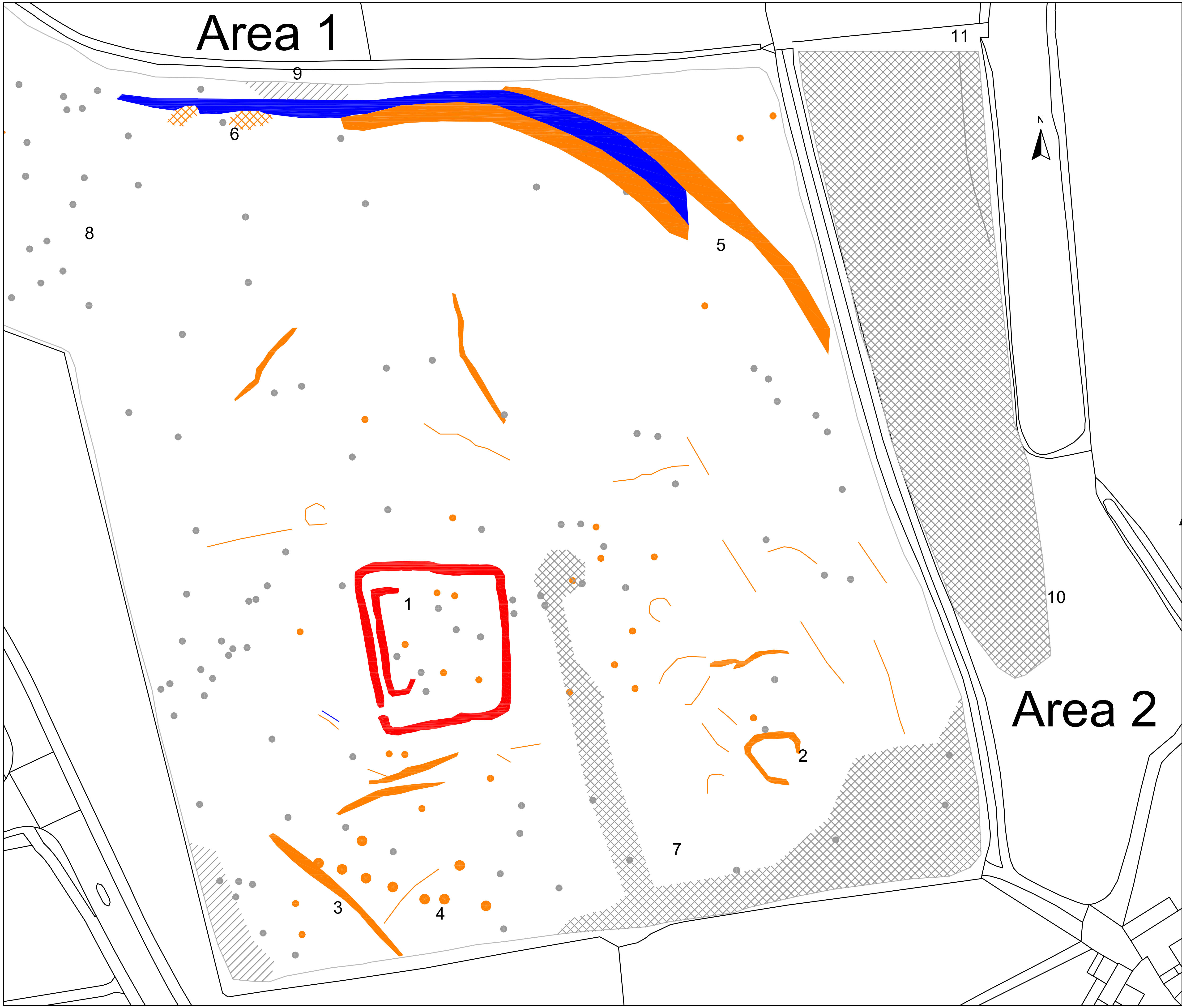


SCALE 1:1000



SCALE TRUE AT A3

FIG 07



Archaeological Surveys Ltd

Geophysical Survey
The Crown Estate,
Nerrols, North Taunton

Abstraction and interpretation of magnetometer anomalies - Areas 1 and 2

- Positive linear anomaly - cut feature of archaeological origin
- Positive linear anomaly - possible ditch-like feature
- Negative linear anomaly - material of low magnetic susceptibility
- Discrete positive response - possible pit-like feature
- Weak positive response - of uncertain origin
- Magnetic debris - spread of magnetically thermoremnant/ferrous material
- Magnetic disturbance from ferrous material
- Strong dipolar anomaly - ferrous object
- Strong multiple dipolar linear anomaly - buried service

SCALE 1:1000

0m 10 20 30 40 50m

SCALE TRUE AT A3

FIG 08

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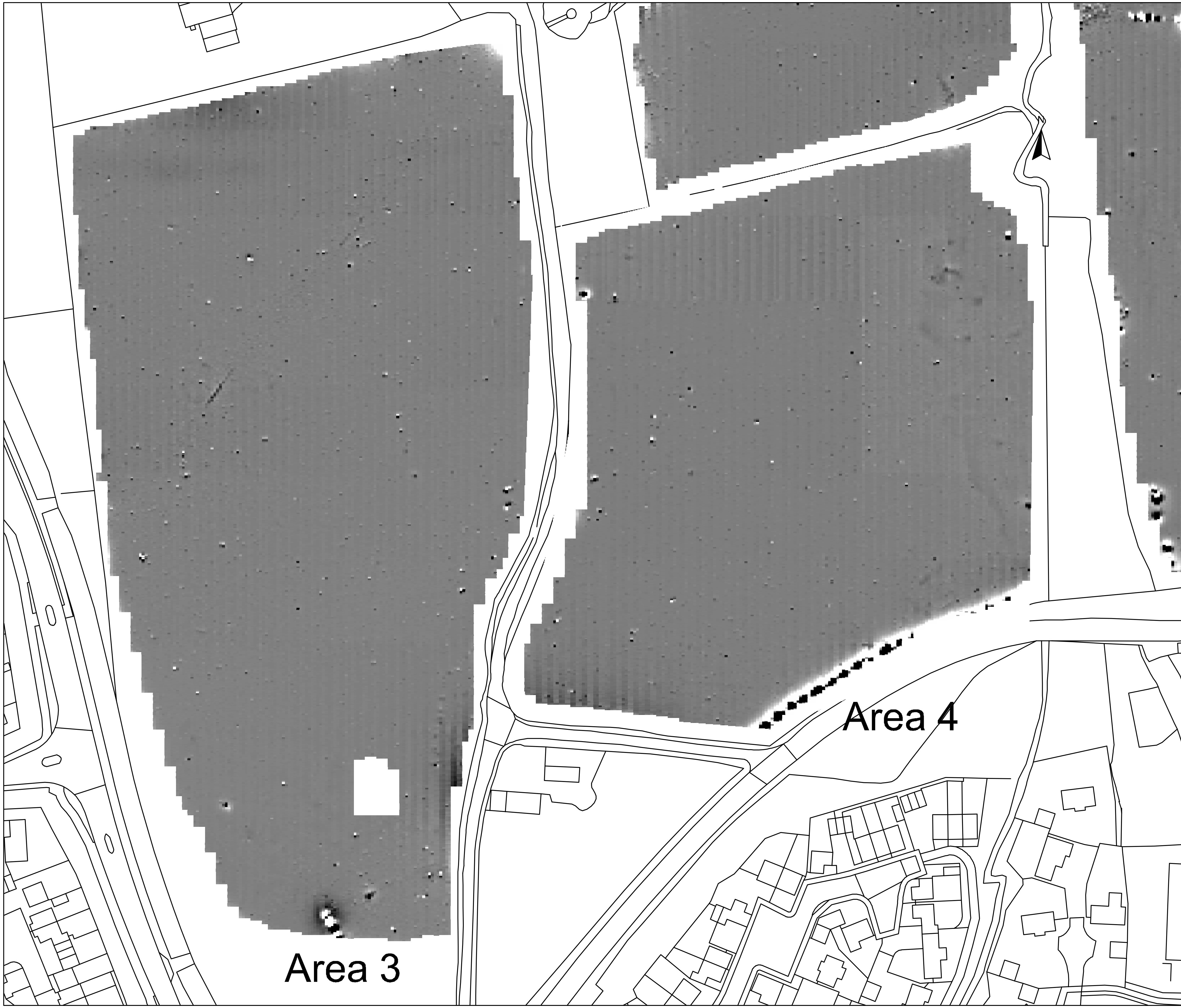
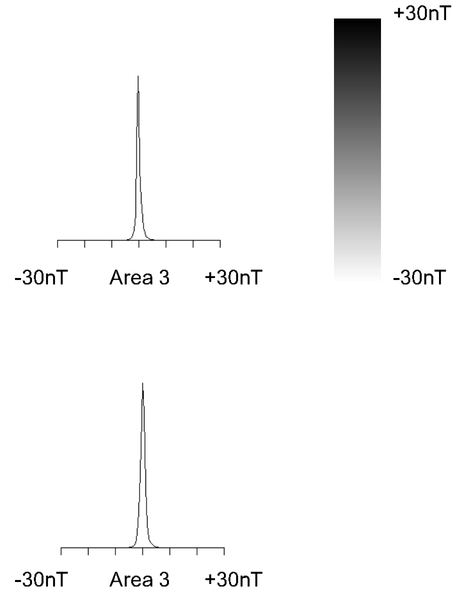
Geophysical Survey
The Crown Estate,
Nerrols, North Taunton

Greyscale plot of raw magnetometer data - Areas 3 and 4





SCALE 1:1250

0m 10 20 30 40 50m

SCALE TRUE AT A3

FIG 09

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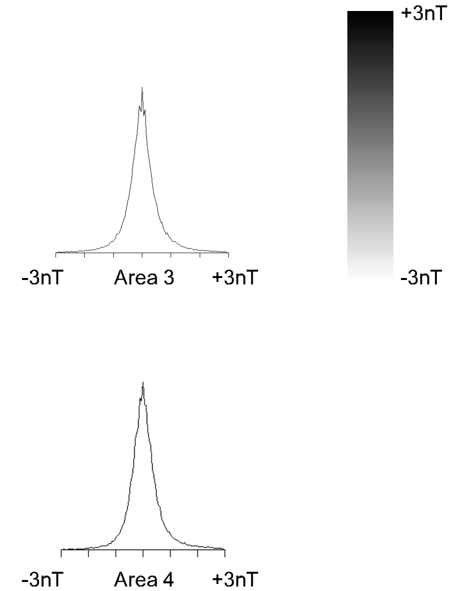
The Crown Estate,
Nerrols, North Taunton

Greyscale plot of processed magnetometer data - Areas 3 and 4

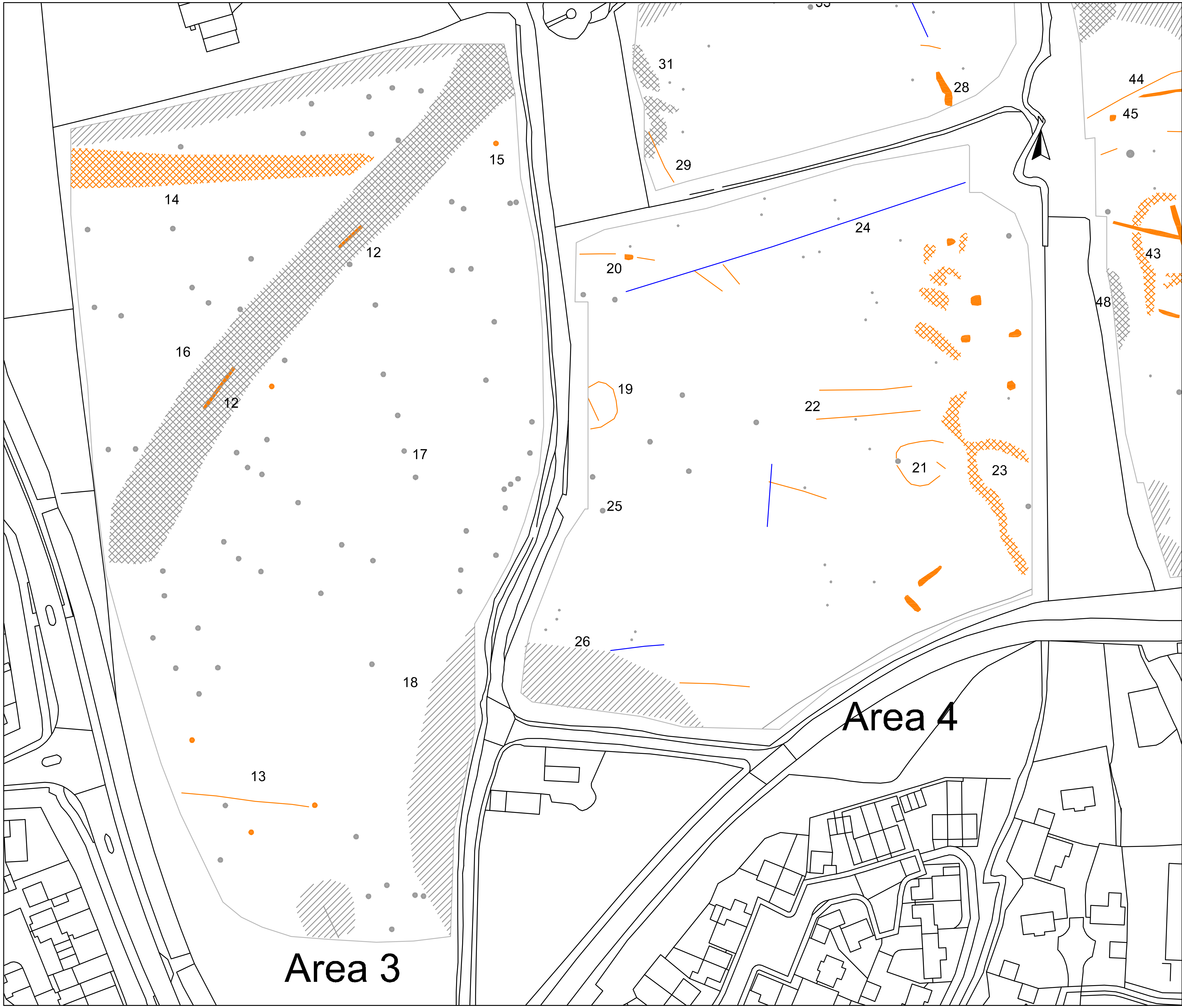


SCALE 1:1250

0m 10 20 30 40 50m

SCALE TRUE AT A3

FIG 10



Archaeological Surveys Ltd

Geophysical Survey
The Crown Estate,
Nerrols, North Taunton

Abstraction and interpretation of magnetometer anomalies - Areas 3 and 4

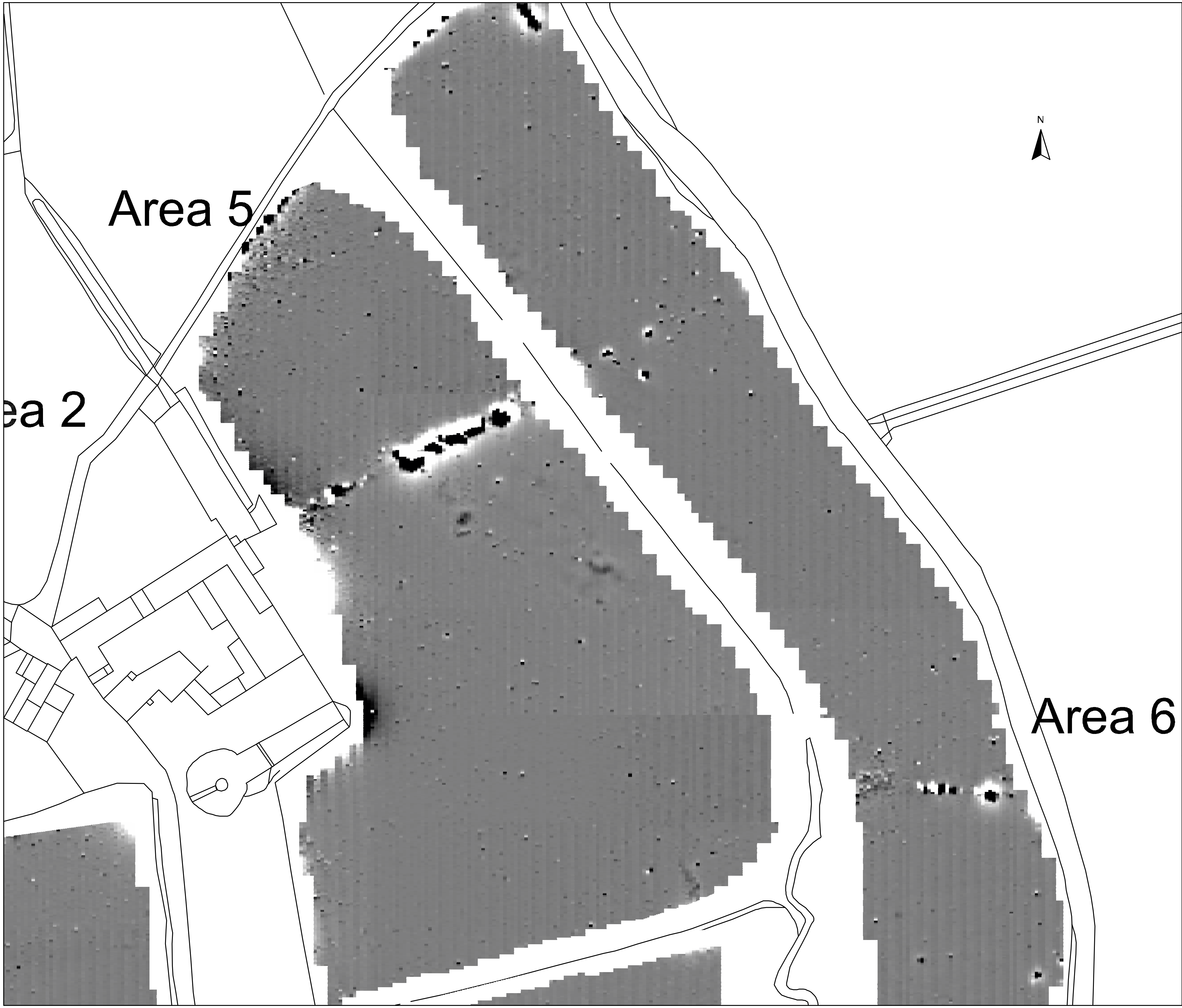
- Positive linear anomaly - possible ditch-like feature
- Negative linear anomaly - material of low magnetic susceptibility
- Discrete positive response - possible pit-like feature
- Weak positive response - of uncertain origin
- Magnetic debris - spread of magnetically thermoremnant/ferrous material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

SCALE 1:1250

0m 10 20 30 40 50m

SCALE TRUE AT A3

FIG 11



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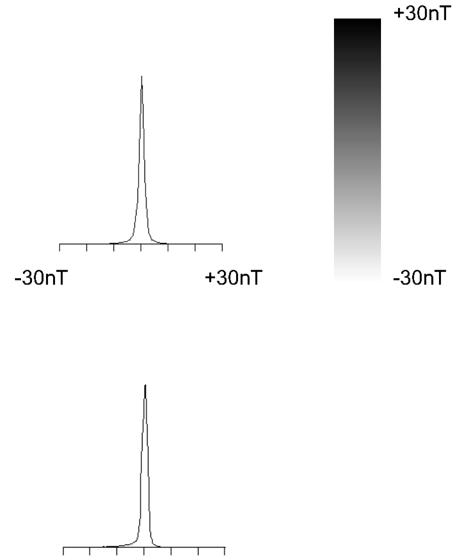
Geophysical Survey
The Crown Estate,
Nerrols, North Taunton

Greyscale plot of raw magnetometer data - Area 5 and Area 6 north



SCALE 1:1000

0m 10 20 30 40 50m

SCALE TRUE AT A3

FIG 12

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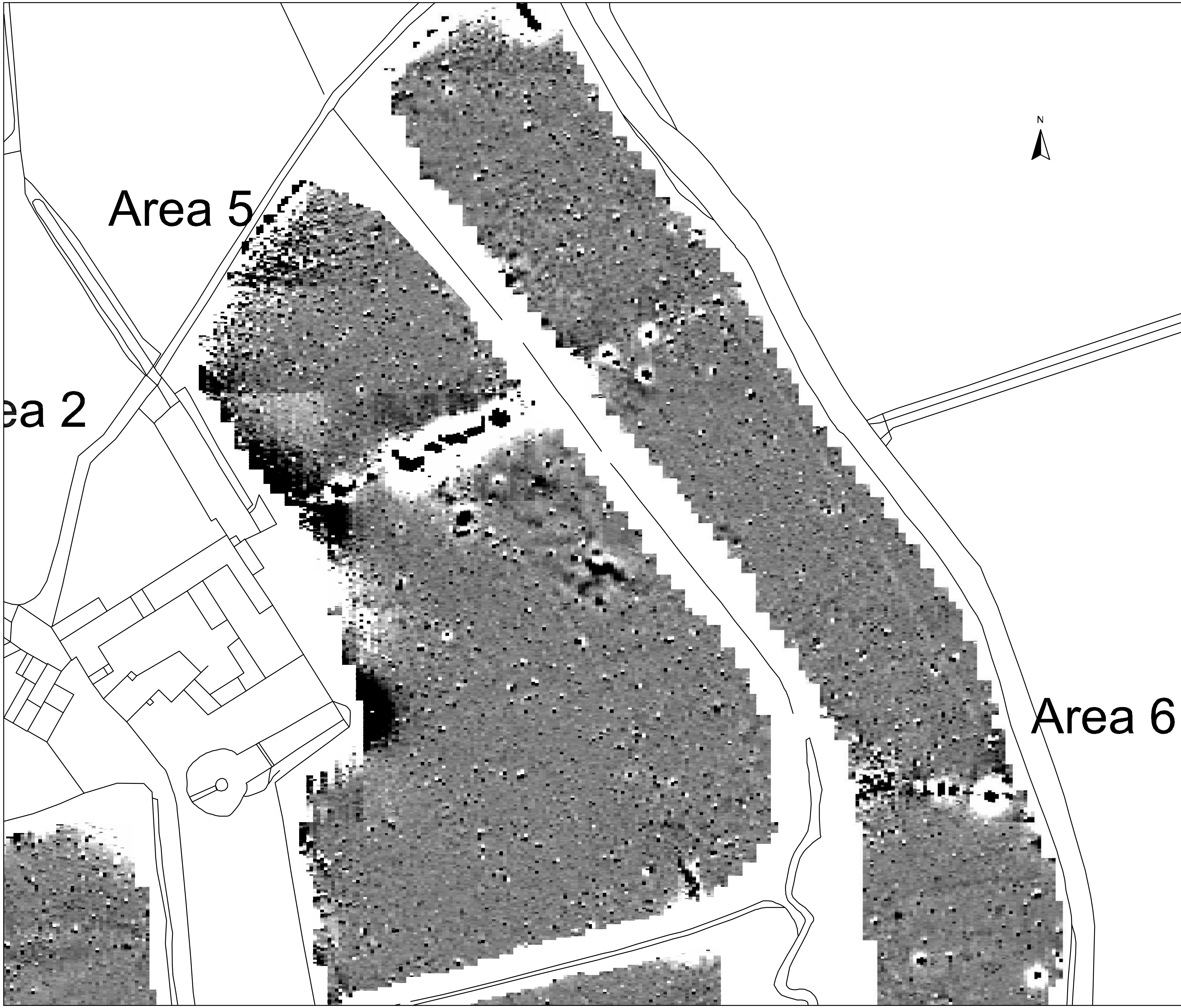
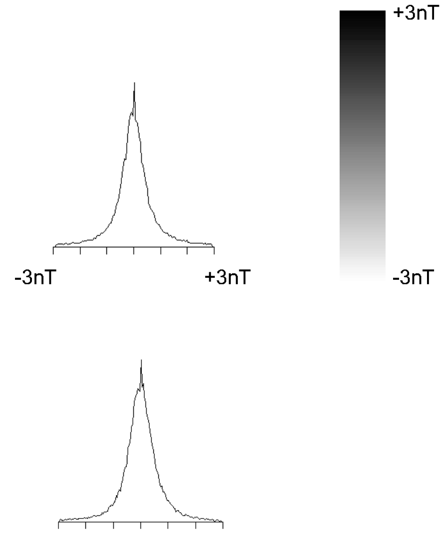
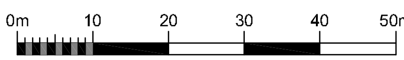
The Crown Estate,
Nerrols, North Taunton

Greyscale plot of processed magnetometer data -
Area 5 and Area 6 north



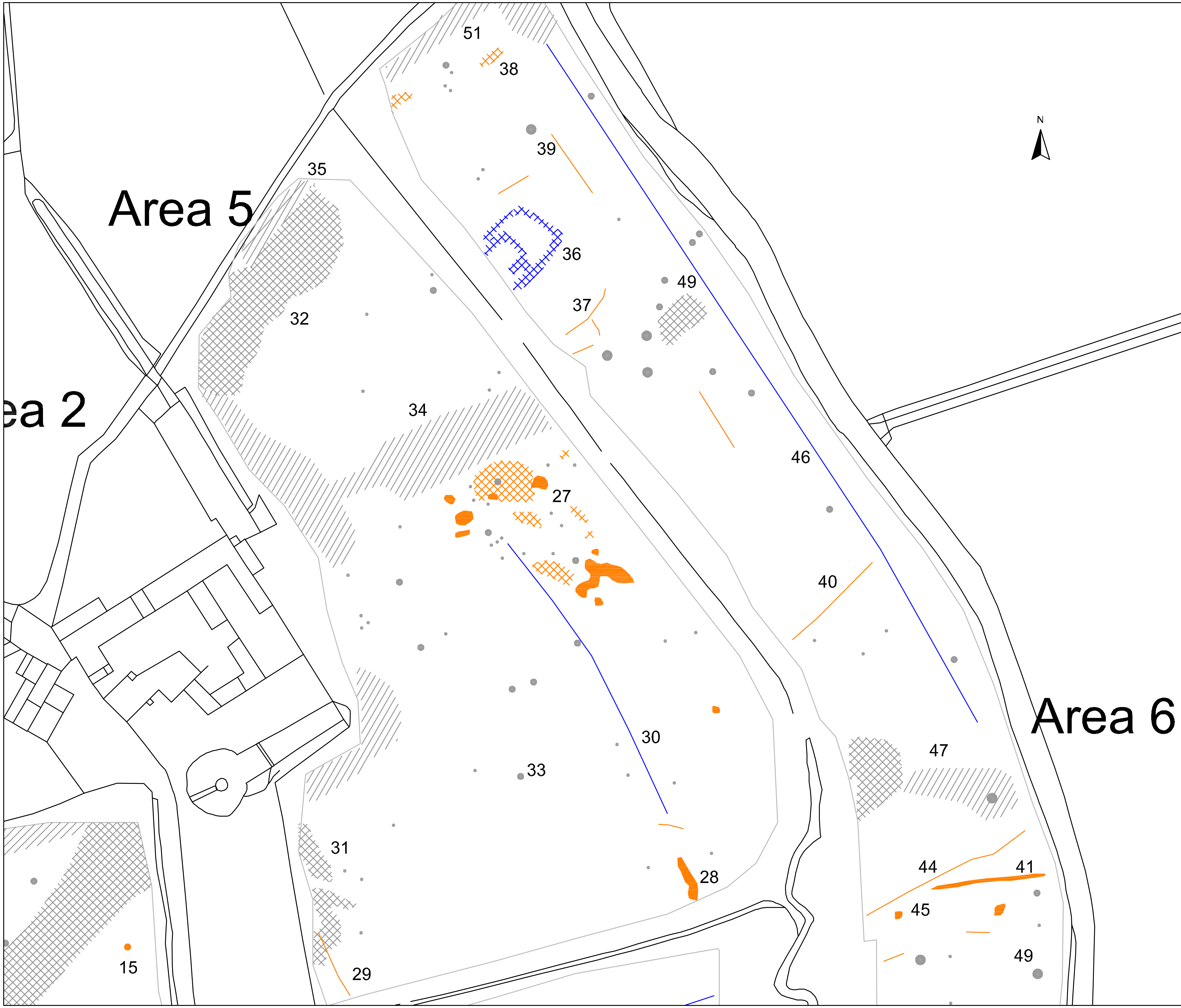


SCALE 1:1000



SCALE TRUE AT A3

FIG 13



Archaeological Surveys Ltd

Geophysical Survey
The Crown Estate,
Nerrols, North Taunton

Abstraction and interpretation of magnetometer anomalies - Area 5 and Area 6 north

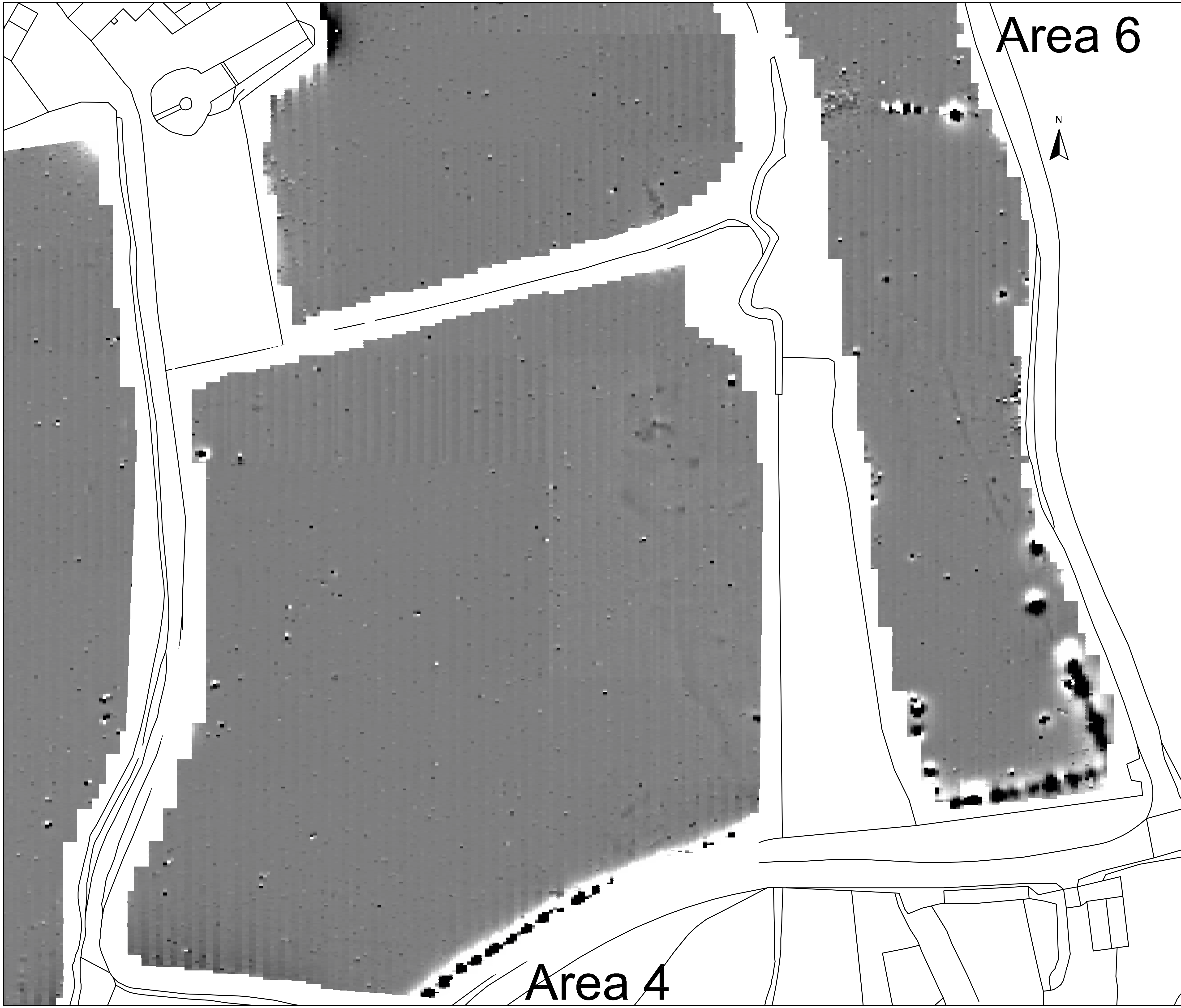
- Positive linear anomaly - possible ditch-like feature
- Negative linear anomaly - material of low magnetic susceptibility
- Discrete positive response - possible pit-like feature
- Weak positive response - of uncertain origin
- Negative response - material of low magnetic susceptibility
- Magnetic 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

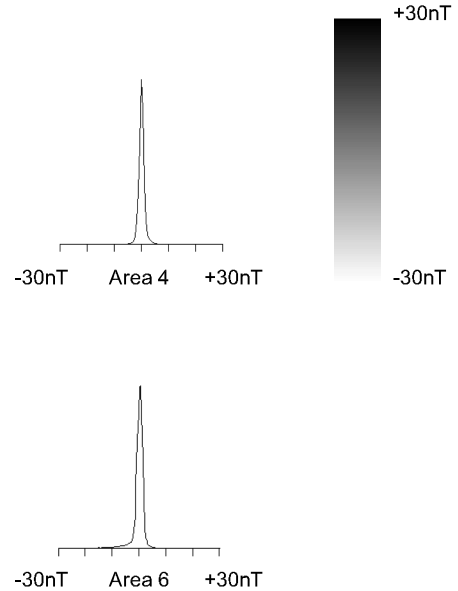
FIG 14



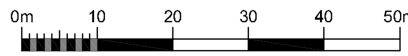
Archaeological Surveys Ltd

Geophysical Survey
The Crown Estate,
Nerrols, North Taunton

Greyscale plot of raw magnetometer data - Area 4 and Area 6 south

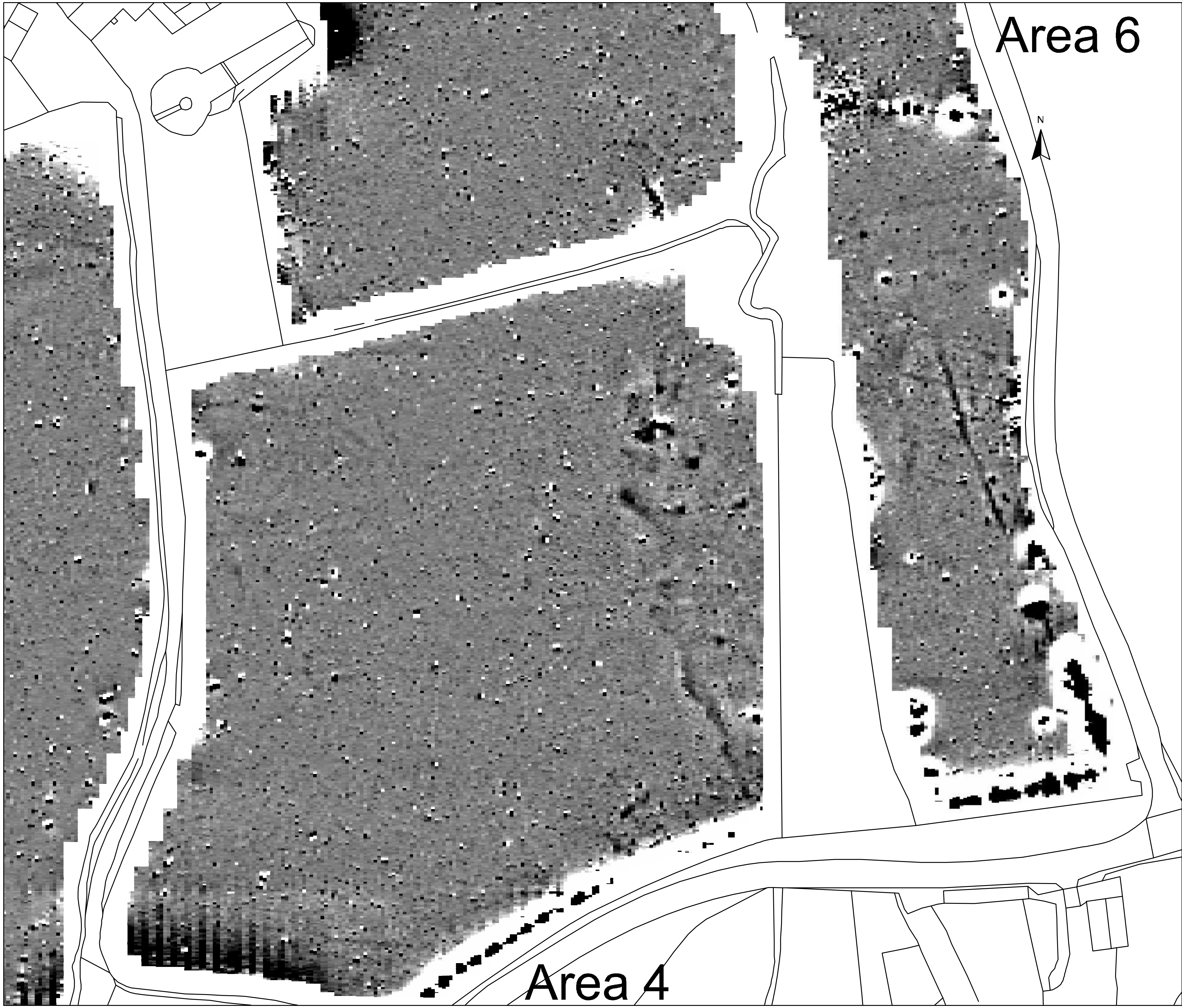


SCALE 1:1000



SCALE TRUE AT A3

FIG15



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Geophysical Survey
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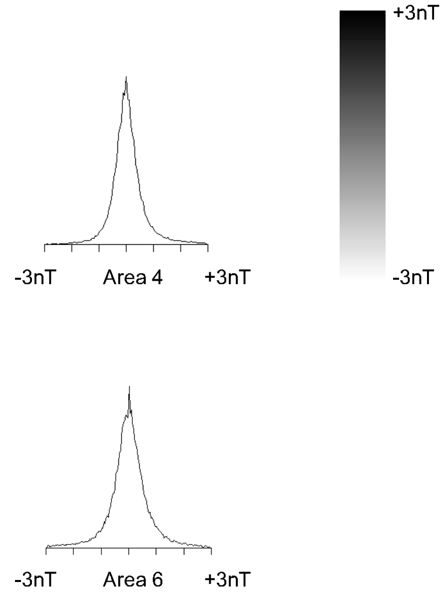
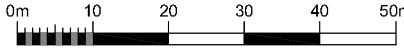
Nerrols, North Taunton

Greyscale plot of processed magnetometer data - Area 6 south

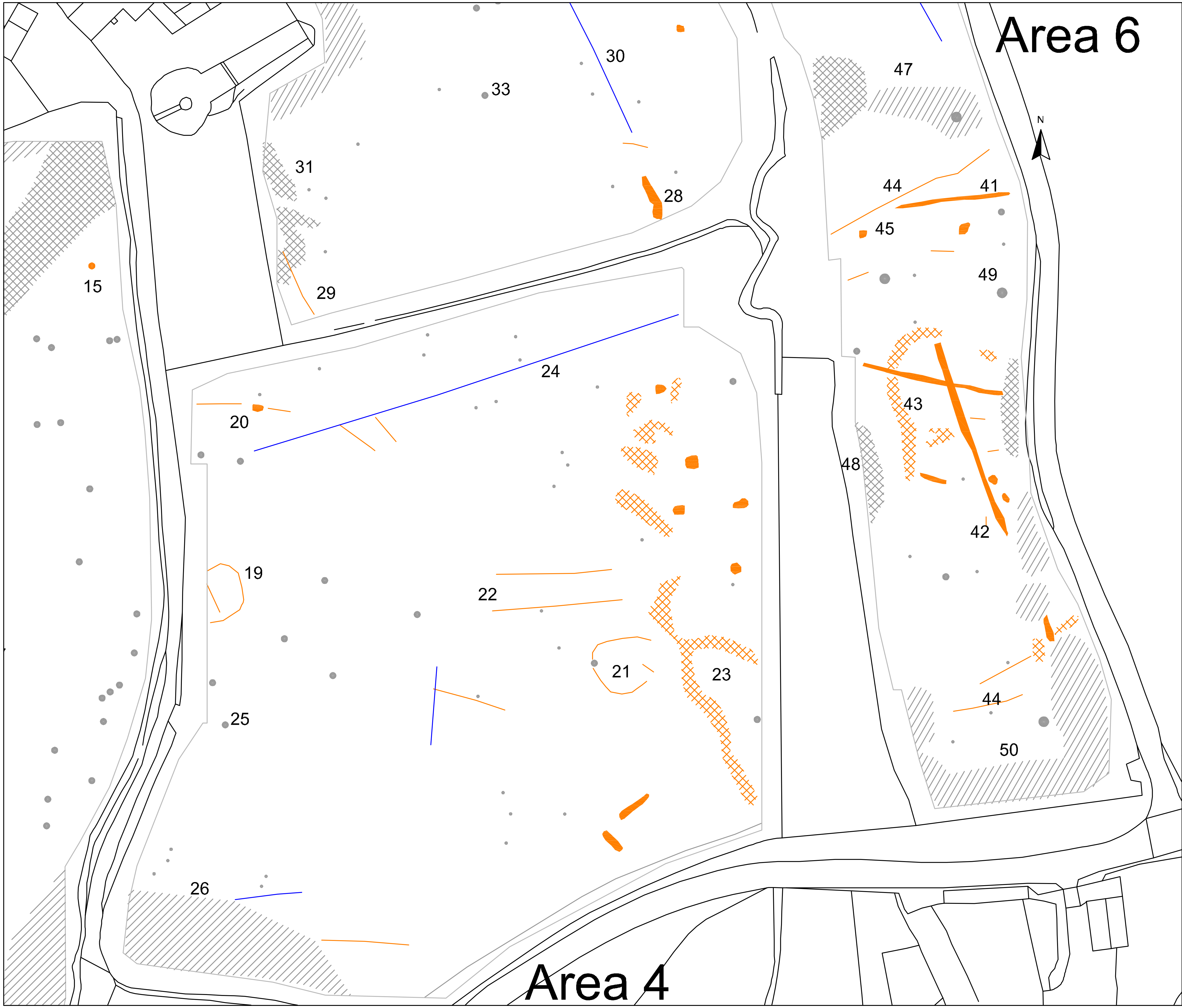


SCALE 1:1000



SCALE TRUE AT A3

FIG 16



Archaeological Surveys Ltd

Geophysical Survey
The Crown Estate,
Nerrols, North Taunton

Abstraction and interpretation of magnetometer anomalies - Area 4 and Area 6 south

- Positive linear anomaly - possible ditch-like feature
- Negative linear anomaly - material of low magnetic susceptibility
- Discrete positive response - possible pit-like feature
- Weak positive response - of uncertain 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 17