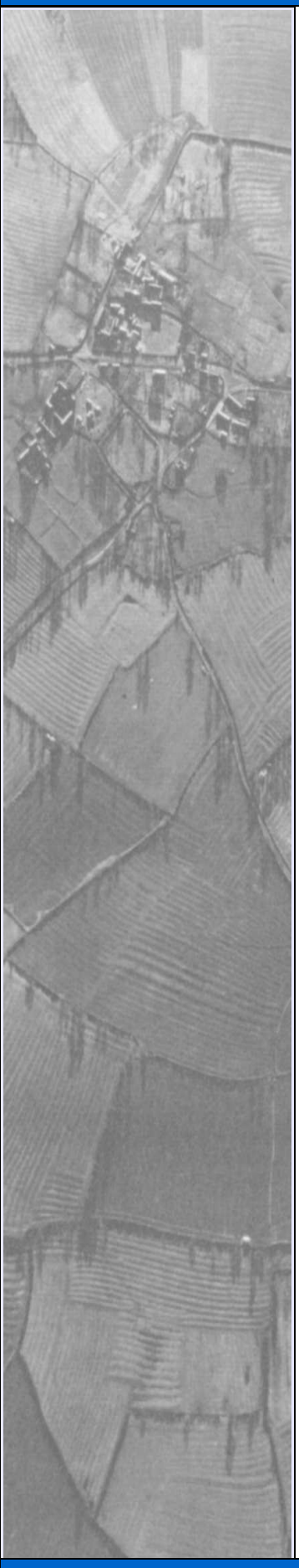

Collation Farm
Wind turbine cable route
Kilkhampton, Cornwall

MAGNETOMETER SURVEY REPORT

for

Neo Environmental Ltd

David Sabin and Kerry Donaldson

February 2014

Ref. no. 527

ARCHAEOLOGICAL SURVEYS LTD

Collation Farm
Wind turbine cable route
Kilkhampton, Cornwall

Magnetometer Survey Report

for

Neo Environmental Ltd

Fieldwork by David Sabin
Report by David Sabin BSc (Hons) MIFA and Kerry Donaldson BSc (Hons)

Survey date – 17th February 2014
Ordnance Survey Grid Reference – **SS 24649 10268 to SS 24591 09769**

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SUMMARY

A detailed magnetometer survey was carried out by Archaeological Surveys Ltd, along a proposed cable route associated with a wind turbine site at Collation Farm, Kilkhampton in Cornwall. The survey was commissioned by Neo Environmental Ltd in order to determine the location and extent of any archaeological features along a 500m length of cable route between the site of a proposed substation and an overhead electricity cable. The survey was undertaken within a 30m wide corridor crossing three fields, although a short section at the southern end was unsurveyable due to waterlogged ground conditions and the presence of agricultural machinery. The survey located a positive curvilinear anomaly that appears to relate to a ring ditch with a diameter of 18m. The southern half of the ring ditch is clearly defined, with the northern part either fragmented or possibly truncated by a later field boundary. The survey areas contain a number of positive linear, discrete and amorphous anomalies, and while it is possible that some relate to cut features, such as ditches and pits, their lack of coherent morphology prevents confident interpretation. Several of the anomalies are likely to relate to natural features and others may relate to agricultural activity.

1 INTRODUCTION

1.1 Survey background

1.1.1 Archaeological Surveys Ltd was commissioned by Neo Environmental Ltd to undertake a magnetometer survey of an area of land to the north of Collation Farm, Kilkhampton, Cornwall. The survey covers a 30m wide corridor centred on a proposed cable route associated with a wind turbine. The route leads from the site of a proposed substation next to Collation Farm and connects to an existing 11kV overhead cable approximately 500m to the north. A previous magnetometer survey (Archaeological Surveys, 2013) was undertaken over the site of the proposed turbine location and is not part of the scope of this report .

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 construction of the cable trench. The methodology is considered an efficient and effective approach to archaeological prospection.

1.2.2 The survey and report generally follow the recommendations set out by: English Heritage (2008) *Geophysical survey in archaeological field evaluation;* and Institute for Archaeologists (2002) *The use of Geophysical Techniques in Archaeological Evaluations*. The work has been carried out to the Institute for Archaeologists (2011) *Standard and Guidance for Archaeological Geophysical Survey.*

1.3 Site location, description and survey conditions

1.3.1 The site is located to the north east of Collation Farm to the south of Kilkhampton in north Cornwall. It consists of a 30m wide corridor centred on the location of the proposed cable route at SS 24649 10268 in the north and extends for 500m towards the site of a substation at SS 24591 09769, see Figures 01 and 02.

1.3.2 The geophysical survey covers approximately 1.5ha within a 30m wide corridor, with 480m of the length surveyable. The southernmost part of the corridor was not surveyable due to waterlogged ground conditions and the presence of agricultural machinery. The survey was carried out within three survey areas (Areas 1-3) representing three separate fields. The survey progressed from north to south with Area 1, at the northern end of the route, containing a beet crop and Areas 2 and 3 containing grazed pasture. The southern end of Area 3 is on elevated land sloping down towards the north.

1.3.3 The ground conditions across the site were poor due to waterlogged and boggy ground. Weather conditions during the survey were very poor due to heavy rain and strong wind.

1.4 Site history and archaeological potential

1.4.1 The survey corridor lies with in an area of “Anciently Enclosed Land”. Within the wider vicinity are a number of land enclosures and defended settlements dating from the prehistoric through to the medieval periods. Post-medieval settlement and land use is also located in the close vicinity. A previous magnetometer survey over the site of an associated proposed wind turbine 200m to the south west, located a number of anomalies that appear to relate to two sets of former land divisions (Archaeological Surveys, 2013). There is potential for the survey to locate land divisions and other other possible cut features should they exist within the site.

1.5 Geology and soils

1.5.1 The underlying geology is alternate beds of sandstone with mudstone and siltstone from the Bude formation (BGS, 2014).

1.5.2 The overlying soils across the site are from the Neath association which are typical brown earths. These consist of well drained, fine loamy soils often over rock formed over Carboniferous sandstone and shale (Soil Survey of England and Wales, 1983).

1.5.3 Magnetometer surveys carried out on similar soils and geology show that the soils are highly magnetically susceptible and that the material fill of cut features provides strongly magnetic anomalies. The geology can also produce naturally formed anomalies that can be difficult to distinguish from those of an anthropogenic origin.

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

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

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

2.2.4 It can be very difficult to obtain optimum balance for the sensors due to localised magnetic vectors that may be associated with large ferrous objects, geological/pedological features, 'magnetic debris' within the topsoil and natural

temperature fluctuations. Imperfect balance results in a heading error often visible as striping within the data; this can be effectively removed by software processing and generally has little effect on the data unless extreme.

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

Sensor type and serial numbers	Bartington Grad - 01 – 1000 Nos. 085 and 396
Date of certified calibration/service	Sensors 085 and 396 – October 2013 (Due Oct 2016)
Bandwidth	12Hz (100nT range) both sensors
Noise	<100pT peak to peak
Adjustable errors	<2nT

Table 1: Bartington fluxgate gradiometer sensor calibration results

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

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

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

2.3 Data processing and presentation

2.3.1 Magnetometry data downloaded from the Grad 601-2 data logger are analysed and processed in specialist software known as TerraSurveyor (formerly 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 TerraSurveyor; 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 ±20nT to improve greyscale resolution,
- clipping of processed data at ±10nT 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.

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

2.3.5 Graphic raster images in bitmap format (.BMP) are initially prepared in TerraSurveyor. Regardless of survey orientation, data captured along each traverse are displayed and processed by TerraSurveyor 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 353° anticlockwise to restore north to the top of the image.

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.

2.3.7 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 three survey areas covering approximately 1.5ha. The survey was carried out from north

(Area 1) to south (Area 3).

3.1.2 Magnetic anomalies located can be generally classified as positive curvilinear anomalies of archaeological potential, positive and negative anomalies of an uncertain origin, anomalies relating to land management, linear anomalies of an agricultural origin and areas of magnetic debris.

3.1.3 Anomalies located within each survey area have been numbered and are described below.

3.2 Statement of data quality

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

3.3 Data interpretation

3.3.1 The list of sub-headings below attempts to define a number of separate categories that reflect the range and type of features located during the survey. A basic explanation of the characteristics of the magnetic anomalies is set out for each category in order to justify interpretation, a basic key is indicated to allow cross referencing to the abstraction and interpretation plot. CAD layer names are included to aid reference to associated digital files (.dwg/.dxf). Sub-headings are then used to group anomalies with similar characteristics for each survey area.

Report sub-heading CAD layer names and plot colour	**Description and origin of anomalies**
Anomalies with archaeological potential AS-ABST MAG POS CURVILINEAR RING DITCH	Anomalies have the characteristics (mainly morphological) of ring ditches. These may be associated with former prehistoric round houses (drip gullies) or round barrows (external ditches).
Anomalies with an uncertain origin AS-ABST MAG POS LINEAR UNCERTAIN AS-ABST MAG POS DISCRETE UNCERTAIN AS-ABST MAG POS UNCERTAIN AS-ABST MAG NEG UNCERTAIN	The category applies to a range of anomalies where there is not enough evidence to confidently suggest an origin. Anomalies in this category may well be related to archaeologically significant features, but equally relatively modern features, geological/pedological features and agricultural features should be considered. Positive anomalies are indicative of magnetically enhanced soils that may form the fill of 'cut' features or may be produced by accumulation within layers or 'earthwork' features; soils subject to burning may also produce positive anomalies. Negative anomalies are produced by material of comparatively low magnetic susceptibility such as stone and subsoil.
Anomalies relating to land management AS-ABST MAG BOUNDARY	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. The multiple dipolar response indicates a ceramic land drain.
Anomalies with an agricultural origin	The anomalies are often linear and form a series of parallel responses or are parallel to extant land boundaries. Where the

AS-ABST MAG AGRICULTURAL	response is broad, former ridge and furrow is likely; narrow response is often related to modern ploughing.
Anomalies associated with magnetic debris AS-ABST MAG DEBRIS	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.

Table 2: List and description of interpretation categories

3.4 List of anomalies - Area 1

Area centred on OS NGR 224646 110248, see Figures 03 & 04.

Anomalies with an uncertain origin

(1) – A fragmented positive linear anomaly with a north south orientation may relate to a cut feature. Although weaker than anomaly (5), located in Area 2 to the south, it is on a similar orientation.

(2) – The survey area contains a number of short positive linear anomalies with no coherent pattern or orientation.

(3) – A number of discrete positive responses are located in the southern part of the survey area. While they may appear “pit-like” it is possible that they are associated with ground disturbance through agricultural activity.

Anomalies with an agricultural origin

(4) - The survey area contains a number of parallel linear anomalies that relate to agricultural activity.

3.5 List of anomalies - Area 2

Area centred on OS NGR 224639 110183, see Figures 03 & 04.

Anomalies with an uncertain origin

(5) – A short positive linear anomaly with a response of over 30nT is located in the central part of the survey area. It is generally stronger and broader than the

majority of linear anomalies encountered, and it is on a similar orientation to anomaly (1) visible in Area 1 to the north.

(6) – The survey area contains a number of weakly positive linear anomalies (2-4nT) with no particular layout or form. It is possible that some relate to agricultural activity or natural features.

(7) – Discrete positive anomalies with a response of 10-20nT may indicate pit-like features; however, it is not possible to determine their origin.

(8) – Broad positive and associated negative responses are located at the southern edge of the survey area. It is possible that these relate to natural features, possibly associated with waterlogging or a former water channel. This part of the survey area lies within the base of a small valley.

3.6 List of anomalies - Area 3

Area centred on OS NGR 224641 109969, see Figures 03 – 05.

Anomalies of archaeological potential

(9) – A positive curvilinear anomaly is located in the southern part of the survey area. The response is strongest (15nT) and most distinct in the south, with fragmentation and truncation in the north. Two short positive linear anomalies may be associated with it in the north. The anomaly appears to relate to a fragmented ring ditch with a diameter of approximately 18m and may indicate a former round barrow.

Anomalies with an uncertain origin

(10) – A number of discrete positive responses and positive linear anomalies are located within the confines of, or adjacent to anomaly (9). It is possible that some to the north of (9) are a fragmented continuation of the ring ditch, and others may relate to associated cut features.

(11) – Located to the west and north of anomaly (9) are a number of positive linear anomalies. There appears to be some curvilinear and rectilinear elements; however, it is not possible to determine if they relate to cut features or naturally formed anomalies.

(12) – The central part of the area contains a number of positive linear, discrete and amorphous anomalies. These do not have a coherent pattern or morphology and their origin cannot be confidently determined, although the northern edge is delimited by a positive linear anomaly and a patch of magnetic debris, which may be associated with a former land boundary indicated on Ordnance Survey mapping.

(13) – Located at the northern end of the survey area are amorphous anomalies with some associated magnetic debris. The anomalies may relate to natural features associated with waterlogging, with some infill with magnetic material (see anomaly 16).

Anomalies relating to land management

(14) – A negative linear anomaly, flanked by positive linear anomalies is evident in the southern part of the survey area. It relates to a removed mapped field boundary, and it is possible that it has truncated the northern part of the ring ditch (9).

Anomalies with an agricultural origin

(15) – A series of parallel linear anomalies oriented almost north south are evident within the southern half of the survey area. These appear to be associated with agricultural activity.

Anomalies associated with magnetic debris

(16) – A zone of magnetic debris can be seen in the northern part of the survey area. It is within the vicinity of a formerly mapped field boundary and is likely to relate to magnetically thermoremnant material that has been used for ground make-up or consolidation.

4 CONCLUSION

4.1.1 The magnetometer survey located the remnants of a positive curvilinear anomaly that probably relates to a former ring ditch with a 18m diameter. Only the southern half is clearly defined, with the northern half either fragmented or truncated, possibly by the insertion of a later field boundary which has subsequently been removed. Other positive anomalies may be associated with the ring ditch, either as part of the fragmented northern response, or as pit-like features within and immediately to the south. A number of positive linear, rectilinear and curvilinear responses are visible to the west and north of the ring ditch, but they lack a coherent morphology and cannot be confidently interpreted. The ring ditch is located on the edge of an elevated and relatively flat area with land sloping down immediately to the north.

4.1.2 A number of positive amorphous, discrete and linear anomalies have been located throughout the survey corridor, and while they may appear to relate to ditch-like and pit-like features, it is likely that many are related to natural variability in the nature of the underlying solid geology.

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 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.

Edge Match

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

FFT (Fast Fourier Transform) spectral filtering

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

Appendix C – survey and data information

Area 1 raw magnetometer data

COMPOSITE
Filename: J527-mag-Area1-raw.xcp
Instrument Type: Bartington (Gradiometer)
Units: nT
Direction of 1st Traverse: 315 deg
Collection Method: ZigZag
Sensors: 2 @ 1.00 m spacing.
Dummy Value: 32702

Dimensions
Composite Size (readings): 120 x 60
Survey Size (meters): 30 m x 60 m
Grid Size: 30 m x 30 m
X Interval: 0.25 m
Y Interval: 1 m

Stats
Max: 20.00
Min: -19.13
Std Dev: 4.75
Mean: 3.58
Median: 3.50
Composite Area: 0.18 ha
Surveyed Area: 0.1472 ha

PROGRAM
Name: TerraSurveyor
Version: 3.0.23.0

Processes: 2
1 Base Layer
2 Clip from -19.13 to 20.00 nT

Source Grids: 2
1 Col:0 Row:0 grids\01.xgd
2 Col:0 Row:1 grids\02.xgd

Area 1 processed magnetometer data

COMPOSITE
Filename: J527-mag-Area1-proc.xcp

Stats
Max: 10.00
Min: -10.00
Std Dev: 4.33
Mean: 0.04
Median: 0.02
Composite Area: 0.18 ha
Surveyed Area: 0.1472 ha

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

Area 2 raw magnetometer data

COMPOSITE
Filename: J527-mag-Area2-raw.xcp
Instrument Type: Bartington (Gradiometer)
Units: nT
Direction of 1st Traverse: 315 deg
Collection Method: ZigZag
Sensors: 2 @ 1.00 m spacing.
Dummy Value: 32702

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

Stats
Max: 20.00
Min: -18.67
Std Dev: 5.25
Mean: 3.17
Median: 2.47
Composite Area: 0.36 ha
Surveyed Area: 0.2057 ha

Processes: 2
1 Base Layer
2 Clip from -18.67 to 20.00 nT

Source Grids: 4
1 Col:0 Row:0 grids\01.xgd
2 Col:0 Row:1 grids\02.xgd
3 Col:0 Row:2 grids\03.xgd
4 Col:0 Row:3 grids\04.xgd

Area 2 processed magnetometer data

COMPOSITE
Filename: J527-mag-Area2-proc.xcp

Stats
Max: 10.00
Min: -10.00
Std Dev: 4.24
Mean: 0.46
Median: 0.10
Composite Area: 0.36 ha
Surveyed Area: 0.2057 ha

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

Area 3 raw magnetometer data

COMPOSITE
Filename: J527-mag-Area3-raw.xcp
Instrument Type: Bartington (Gradiometer)
Units: nT
Direction of 1st Traverse: 315 deg
Collection Method: ZigZag
Sensors: 2 @ 1.00 m spacing.
Dummy Value: 32702

Dimensions
Composite Size (readings): 120 x 360
Survey Size (meters): 30 m x 360 m
Grid Size: 30 m x 30 m
X Interval: 0.25 m
Y Interval: 1 m

Stats
Max: 20.00
Min: -20.00
Std Dev: 3.76
Mean: 0.36
Median: 0.25
Composite Area: 1.08 ha
Surveyed Area: 0.97065 ha

Processes: 2
1 Base Layer
2 Clip from -20.00 to 20.00 nT

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

Area 3 processed magnetometer data

COMPOSITE
Filename: J527-mag-Area3-proc.xcp

Stats
Max: 10.00
Min: -10.00
Std Dev: 3.02
Mean: 0.14
Median: 0.00
Composite Area: 1.08 ha
Surveyed Area: 0.97065 ha

Processes: 3
1 Base Layer
2 DeStripe Median Traverse: Grids: All Threshold: 2 SDs
3 Clip from -10.00 to 10.00

Appendix D – digital archive

Archaeological Surveys Ltd hold the primary digital archive at their offices in 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.

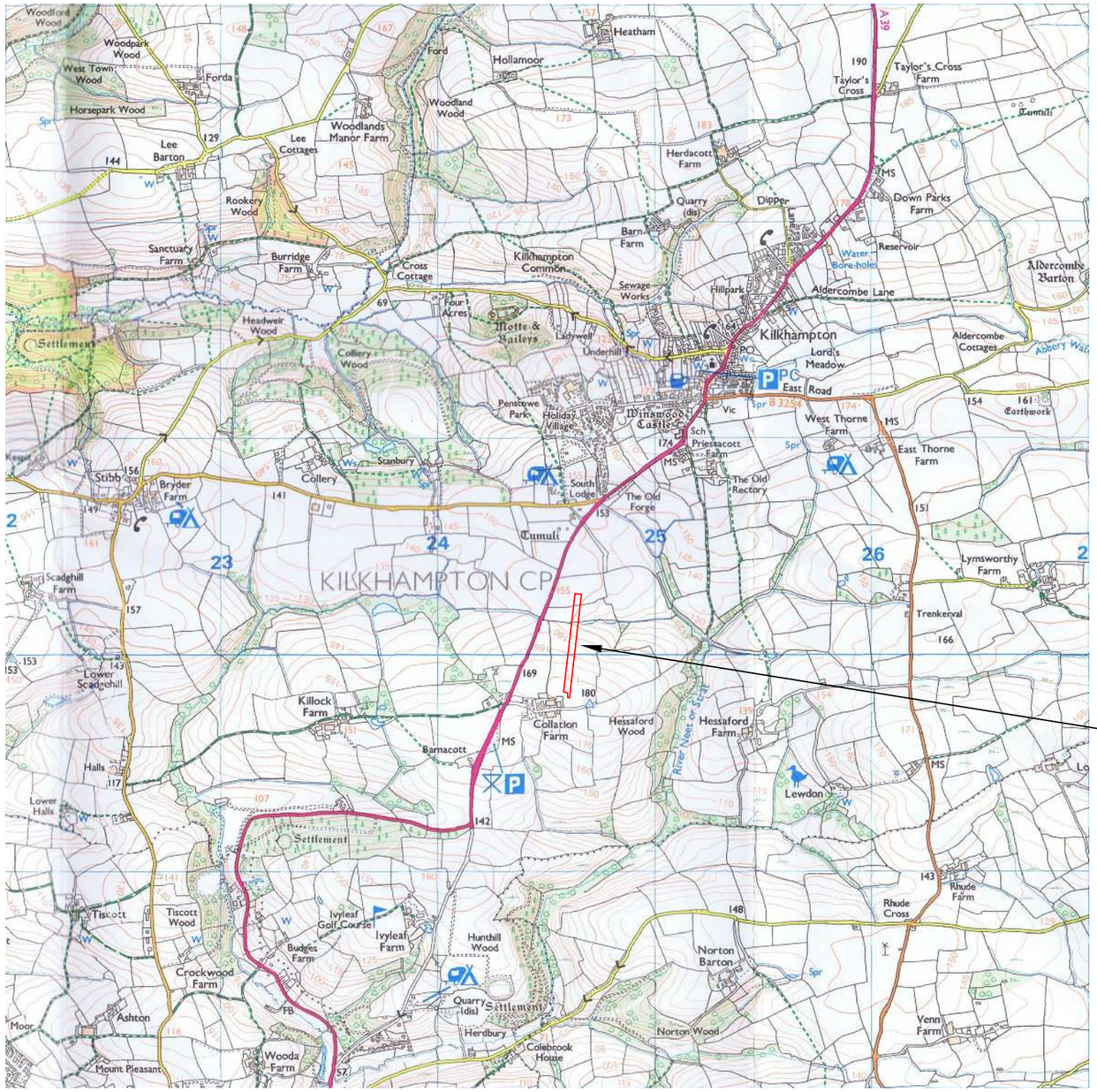
Surveys are reported on in hardcopy (recycled paper) using A4 for text and A3 for plots (all plots are scaled for A3). The distribution of both hardcopy report and digital data is considered the responsibility of the Client unless explicitly stated in the survey Brief, Written Scheme of Investigation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

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

- TerraSurveyor version 3.0.23.0 (geophysical data analysis),
- ProgeCAD Professional 2009 (report graphics),
- AutoCAD LT 2007 (report figures),
- OpenOffice.org 3.0.1 Writer (document text),
- PDF Creator version 0.9 (PDF archive).

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

- TerraSurveyor 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.



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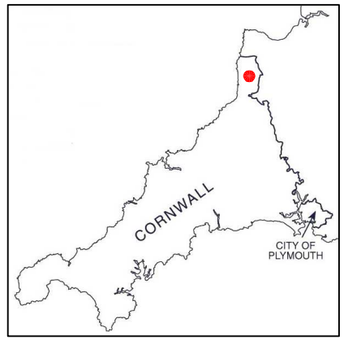
Kilkhampton, Cornwall

Map of survey area



Survey location

Site centred on OS NGR
SS 24622 10037

SCALE 1:25 000

0m 500m 1000m

SCALE TRUE AT A3

FIG 01

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Referencing information

Grid coordinates based on Ordnance Survey OSGB36 datum

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

Survey grid size = 30m

Survey start and traverse direction

01 Grid reference number and filename

Proposed cable route

SCALE 1:2000

0m 20 40 60 80 100m

SCALE TRUE AT A3

FIG 02

N

Area 1

Area 2

Area 3

Area 3

224649

224664.78

110268

110273.86

224661.32

110244.06

110214.26

224657.85

224650.32

110154.66

110124.86

224647.46

224609.36

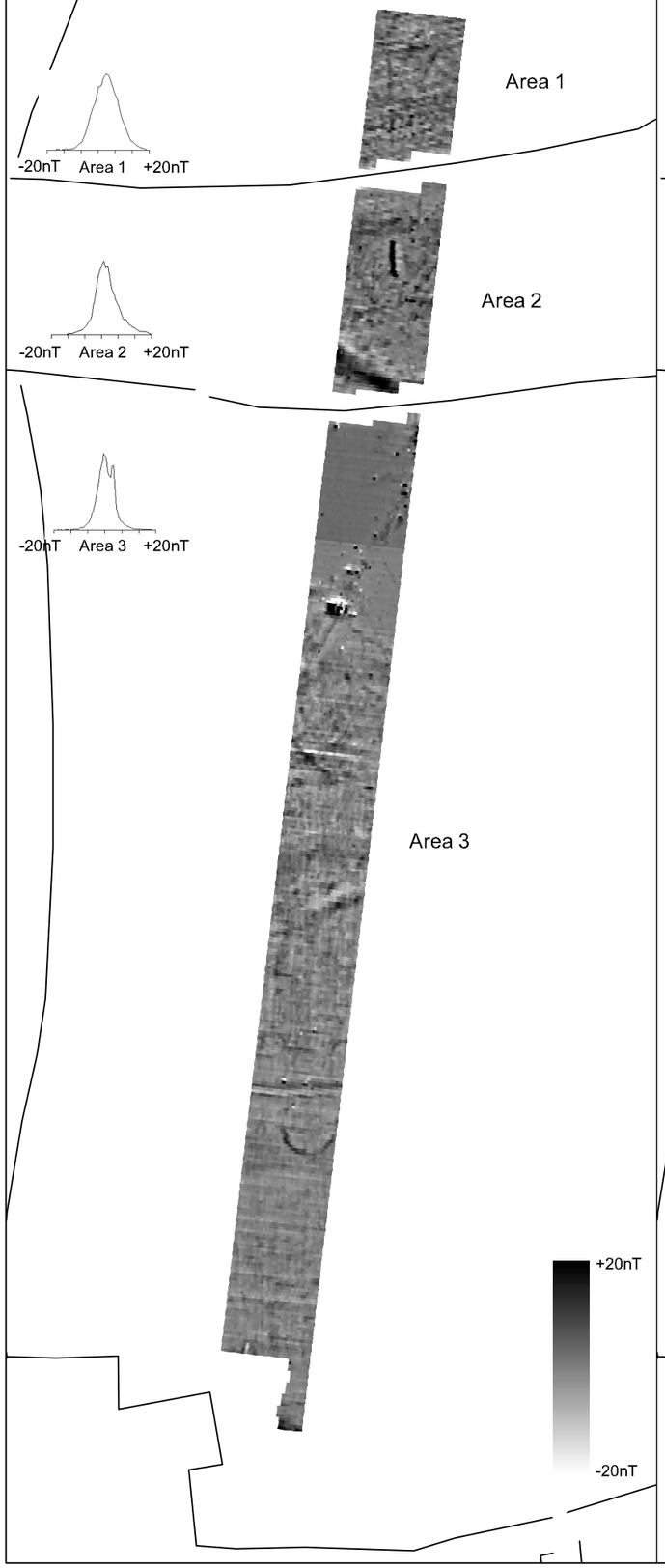
109797.07

Unsurveyable

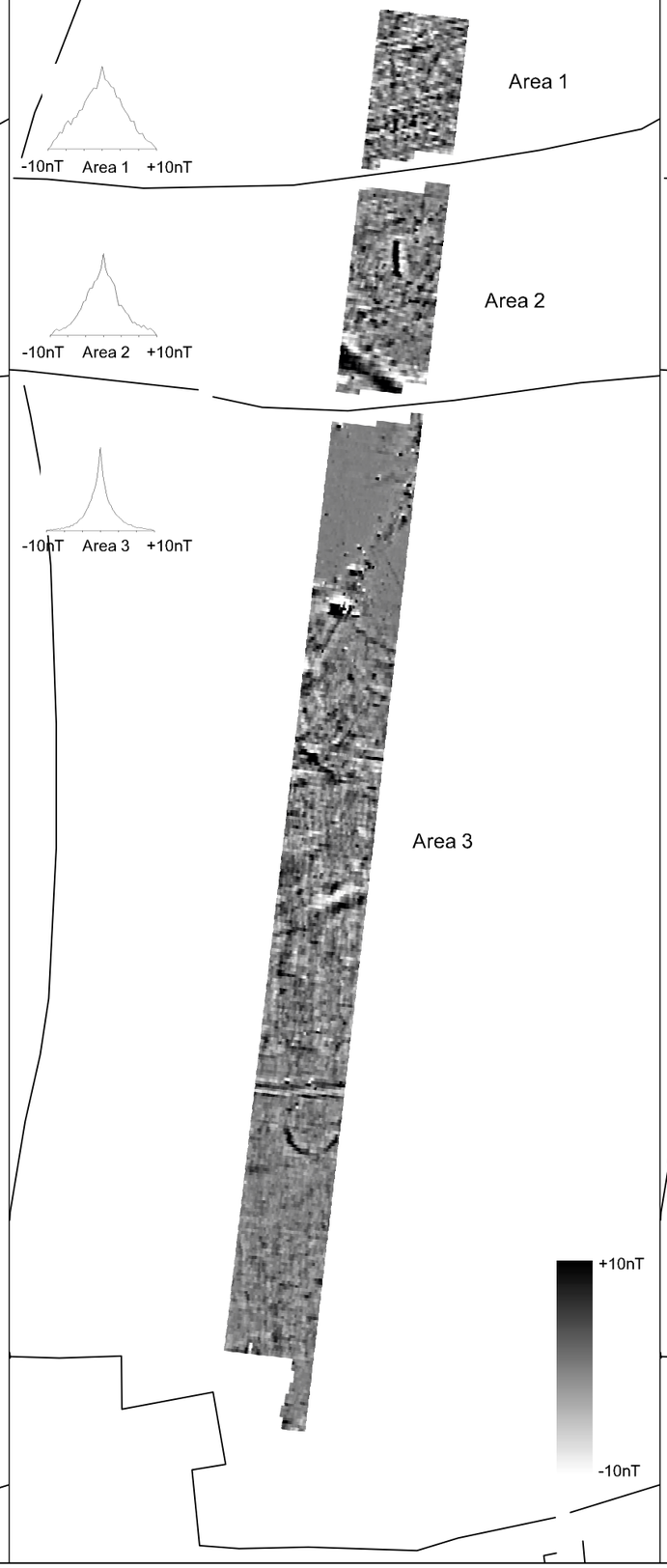
224597

109769

Greyscale plot of raw magnetometer data



Greyscale plot of processed magnetometer data



Abstraction and interpretation of magnetometer anomalies

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Magnetometer data and abstraction and interpretation of magnetometer anomalies

- Positive curvilinear anomaly - ring ditch
- Positive linear anomaly - possible ditch-like feature
- Linear anomaly - of agricultural origin
- Negative linear anomaly - material of low magnetic susceptibility
- Discrete positive response - possible pit-like feature
- Positive/negative linear anomaly -former field boundary
- Positive anomaly - magnetically enhanced material
- Negative anomaly - material with low magnetic susceptibility
- Magnetic debris - spread of magnetically thermoremnant/ferrous material

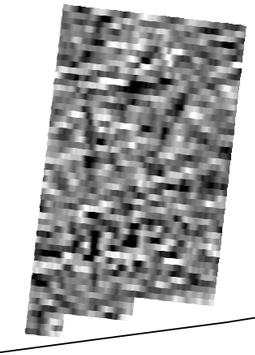
SCALE 1:2000

0m 20 40 60 80 100m

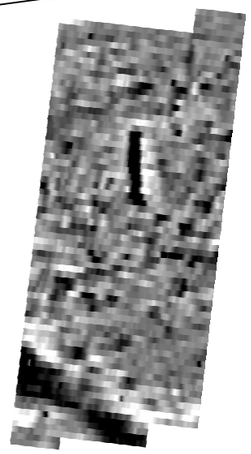
SCALE TRUE AT A3

FIG 03

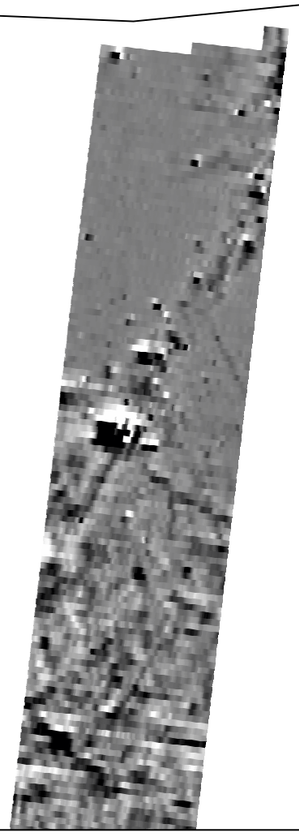
Greyscale plot of processed magnetometer data - north



Area 1



Area 2

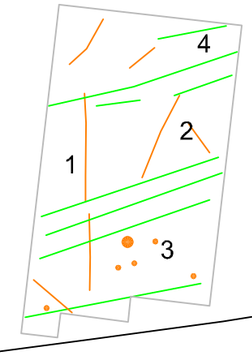


Area 3

+10nT

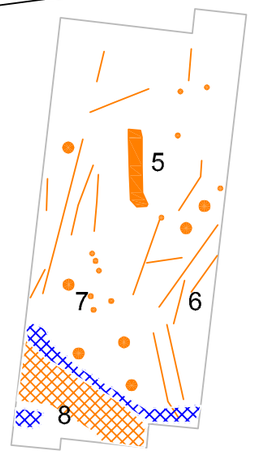
-10nT

Abstraction and interpretation of magnetometer anomalies - north

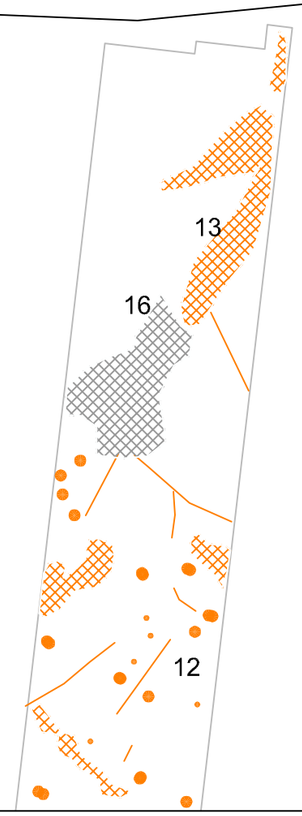


Area 1

N



Area 2



Area 3

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Processed magnetometer data and abstraction and interpretation of magnetometer anomalies - Areas 1, 2 & 3 north

- Positive curvilinear anomaly - ring ditch
- Positive linear anomaly - possible ditch-like feature
- Linear anomaly - of agricultural origin
- Negative linear anomaly - material of low magnetic susceptibility
- Discrete positive response - possible pit-like feature
- Positive/negative linear anomaly -former field boundary
- Positive anomaly - magnetically enhanced material
- Negative anomaly - material with low magnetic susceptibility
- Magnetic debris - spread of magnetically thermoremnant/ferrous material

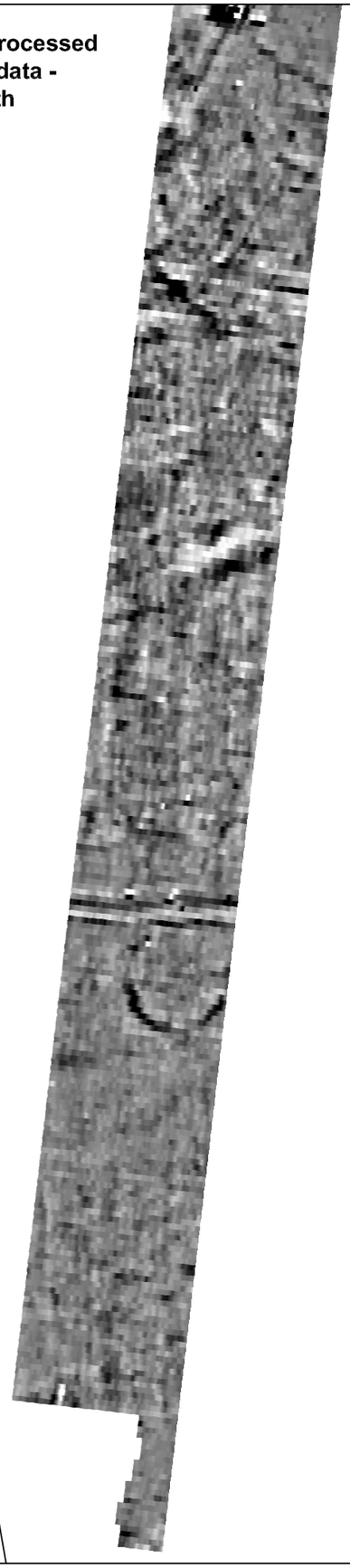
SCALE 1:1000

0m 10 20 30 40 50m

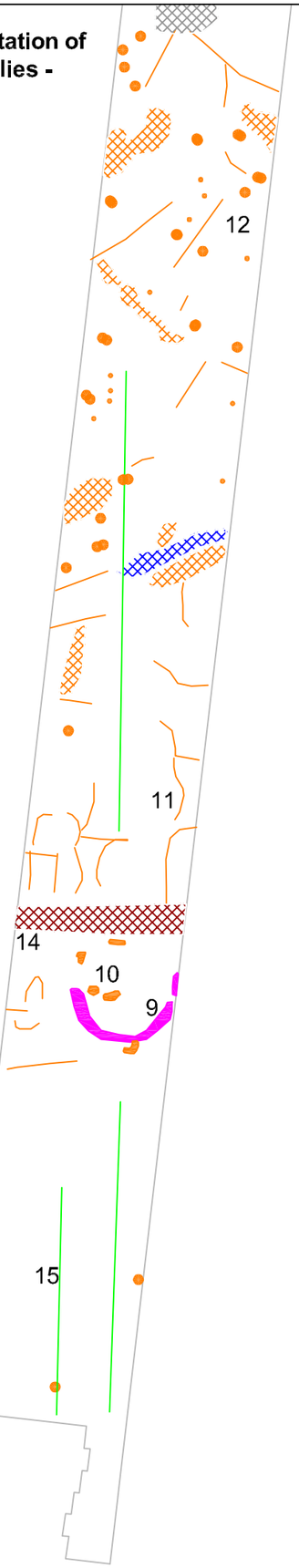
SCALE TRUE AT A3

FIG 04

Greyscale plot of processed magnetometer data - Area 3 south



Abstraction and interpretation of magnetometer anomalies - Area 3 south



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Processed magnetometer data and abstraction and interpretation of magnetometer anomalies - Area 3 south

- Positive curvilinear anomaly - ring ditch
- Positive linear anomaly - possible ditch-like feature
- Linear anomaly - of agricultural origin
- Discrete positive response - possible pit-like feature
- Positive/negative linear anomaly -former field boundary
- Positive anomaly - magnetically enhanced material
- Negative anomaly - material with low magnetic susceptibility

SCALE 1:1000

0m 10 20 30 40 50m

SCALE TRUE AT A3

FIG 05