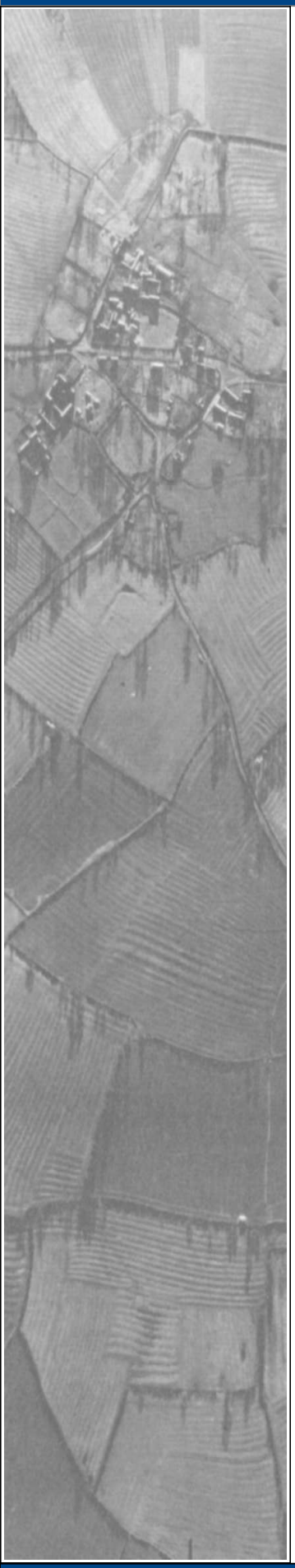

Nyland
Cheddar
Somerset

MAGNETOMETER SURVEY REPORT

for

South West Heritage Trust

Kerry Donaldson & David Sabin

June 2021

Ref. no. J863

ARCHAEOLOGICAL SURVEYS LTD

Nyland
Cheddar
Somerset

MAGNETOMETER SURVEY REPORT

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South West Heritage Trust

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Report checked by David Sabin
Primary archive location - Archaeological Surveys Ltd, Yatesbury, Wiltshire

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SUMMARY

A geophysical survey, comprising detailed magnetometry, was carried out over 3ha at Nyland, near Cheddar in Somerset, at the request of the South West Heritage Trust. The site contains a narrow limestone ridge surrounded by lower ground. The results of the survey indicate the presence of a number of geophysical anomalies on the north eastern side of the limestone ridge that could relate to archaeological features. These include an arc of discrete positive responses and a curvilinear anomaly situated on a narrow plateau towards the summit of the ridge, and a group of positive and negative responses at the base of the slope to the north east, which could be associated with industrial activity. Further north east are a linear group of three pit-like features. In the north western part of the site, positive linear anomalies could relate to cut features associated with the Romano-British settlement identified from previous archaeological investigations within the adjacent farm complex. Other anomalies are weak and poorly defined, but could relate to further cut features.

1 INTRODUCTION

1.1 Survey background

1.1.1 Archaeological Surveys Ltd was commissioned by Bob Croft, Head of Historic Environment and Estates for the South West Heritage Trust, to undertake a magnetometer survey of an area of land at Nyland near Cheddar in Somerset.

1.2 Survey objectives and techniques

1.2.1 The objective of the survey was to use magnetometry in order to assess the archaeological potential of the site. The methodology is considered an efficient and effective approach to archaeological prospection.

1.2.2 Geophysical survey can provide useful information on the archaeological potential of a site; however, the outcome of any survey relies on a number of factors and as a consequence results can vary. The success in meeting the aims and objectives of a survey is, therefore, often impossible to predetermine.

1.3 Standards, guidance and recommendations for the use of this report

1.3.1 The survey and report follow the recommendations set out by: European Archaeological Council (2015) *Guidelines for the Use of Geophysics in Archaeology;* Institute for Archaeologists (2002) *The use of Geophysical Techniques in Archaeological Evaluations.* The work has been carried out to the Chartered Institute for Archaeologists (2014) *Standard and Guidance for Archaeological Geophysical Survey.*

1.3.2 Archaeological Surveys Ltd provide a detailed geophysical survey report and it is recommended that where possible the contents should be considered in full. The Summary provides a brief overview of the results with more detail available in the Discussion and/or Conclusion. The *List of anomalies* within the Results provides a detailed assessment of the anomalies within separate categories which can be useful in inferring a level of confidence to the interpretation. Quality and factors influencing the interpretation of anomalies is also set out within the results.

1.3.3 It is recommended that the full report should always be considered when using data and interpretation plots; where this is not possible, in the field for example, the abstraction and interpretation plots should retain their colour coding and be used with a corresponding legend.

1.3.4 Where targeting of anomalies by excavation is to be carried out, care should be taken to place trenches over solid lines or features visible on the abstraction and interpretation plots. Archaeological Surveys abstraction and interpretation avoids the use of dashed or dotted line formats, and broken or fragmented lines used in interpretive plots may well correspond closely with truncation of archaeological features.

1.4 Site location, description and survey conditions

1.4.1 The site is located at Court Farm, Nyland, 2km south of Cheddar in Somerset. It is centred on Ordnance Survey National Grid Reference (OS NGR) ST 46450 50650, see Figs 01 and 02. The geophysical survey covers approximately 3ha within two survey areas, divided by a ridge of limestone. Area A lies partially on the north eastern slope of the ridge, extending into the flatter land further to the north east. Area B covers the flatter land to the north west of the slope and is sub-divided by a farm track into two smaller land parcels.

1.4.2 The ground cover in Area A consisted of grazed grass, with rough grass and vegetation encountered near the south eastern end of the ridge. Parts of the ridge also contained exposed rock and uneven ground probably associated with minor quarrying. The steepest parts of the slope were unsurveyable and small areas of very uneven ground were also avoided. Field boundaries consisted of wire fencing and hedgerows with some stone walling extending along the spine of north western part of the ridge. The area also contained a steel trough and area of concrete associated with a former agricultural building.

1.4.3 The southern part of Area B also contained grazed grass, although the northern part to the north west of the farm track was ungrazed and contained long grass in places. Inspection chambers were also noted close to the western side of the northern part of Area B. A zone of heavily rutted and waterlogged ground was avoided in the southern part of Area B and no data were collected on a small area of landscaping adjacent to modern barns. The

steepest parts of the south west facing bank of the limestone ridge were unsurveyable although data were collected along a narrow strip along the spine of the ridge.

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

Plate 1: Area A looking east

Plate 2: Area B looking north west

1.5 Site history and archaeological potential

1.5.1 On the summit of the limestone ridge in the centre of the site, within the field boundary is a possible standing stone or boundary stone (HER no. 16168). Just to the south east of this two small Middle Bronze Age palstaves (HER no. 15382) were recovered by a metal detectorist in 1987. The small hamlet of Nyland overlies a Romano-British settlement (HER no. 10418), identified through excavations of cobbled layers and possible building foundations. Previous archaeological investigations have revealed quantities of Roman pottery (HER nos. 39787 & 28291). Medieval and post medieval pottery were also recorded during a watching brief (HER no. 15345). Ordnance Survey mapping shows that the majority of Area B contained an orchard and a drainage ditch until the later 20th century.

1.5.2 In the surrounding vicinity aerial photographs of the land to the south have revealed a complex and extensive area of cropmarks which have been interpreted as a Romano-British landscape which includes field systems, settlements a canal, causeways and trackways (HER no. 11224). Immediately to the north are further cropmarks of Roman field systems overlain by post medieval drainage channels (HER no. 19197) and a small block of ridge and furrow just to the north (HER no. 19198). The nearest scheduled monument is the Roman settlement site, Anglo-Saxon and Norman royal palace and St Columbanus' Chapel at Cheddar, 2km to the north (Historic England List Entry no. 1017290).

1.5.3 The upper parts of the limestone ridge contain hollows, possible platforms and

uneven ground, and although this may relate to episodic small-scale quarrying, it is possible that some features have archaeological potential.

1.6 Geology and soils

1.6.1 The underlying geology across the lower lying parts of the site are mudstone and halite-stone from the Mercia Mudstone Group with a small area of overlying tidal flat deposits in the south western part of Area B and peat deposits at the southern end of Area B. The north western part of the Carboniferous limestone ridge is comprised of limestone from the Burrington Oolite Subgroup and the Clifton Down Limestone Formation to the south east (BGS, 2017). The summit of the ridge is 24.7m AOD sloping to the base at 10m AOD to the north east and sharply south east to 8m AOD (see Fig 06).

1.6.2 The overlying soil across the site is from the Crwbin association and is a brown ranker. It consists of a very shallow, well drained loamy soil over limestone, often on steep slopes. (Soil Survey of England and Wales, 1983).

1.6.3 Magnetometry carried out over similar geology and soil has produced good results. The site is, therefore, considered suitable for magnetic survey.

2 METHODOLOGY

2.1 Technical synopsis

2.1.1 Magnetometry survey records localised magnetic fields that can be associated with features formed by human activity. Magnetic susceptibility and magnetic thermoremnance (also known as thermoremanence) are factors associated with the formation of localised fields.

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). Additional details are set out in 2.2 below and

within Appendix A.

2.2 Equipment configuration, data collection and survey detail

2.2.1 The detailed magnetic survey was carried out using a SENSYS MAGNETO®MXPDA 5 channel cart-based system. The instrument has 5 fluxgate gradiometers (FGM650) spaced 0.5m apart with readings recorded at 20Hz. The cart is pushed at walking speed and not towed. Each sensor is not zeroed in the field as the vertical axis alignment is precisely fixed leaving sensor offsets that are removed during data processing. The fixing of the vertical alignment ensures the sensors are not unduly influenced by localised magnetic fields and that the vertical component of a magnetic anomaly is measured. The gradiometers have a measurement range of ±8000nT, although the recorded range is ±3000nT, and resolution is around 0.1nT. They are linked to a Leica GS10 RTK GNSS with data recorded by SENSYS MAGNETO®MXPDA software on a rugged PDA computer system.

2.2.2 Due to the fixed offsets within the fluxgate sensors, as a result of the manufacturing and tensioning process, the survey data do not provide a visually useful dataset until a zero median traverse algorithm is applied. It is recognised that this has the potential to affect some anomalies detrimentally by removing linear features orientated parallel to survey transects. However, this has not been noted as a particular problem with the system due to the high resolution data collection, generally long length of traverses and variability within the magnetic characteristics of a linear anomaly.

2.2.3 Data are collected along a series of parallel survey transects to achieve 100% coverage of the surveyable land. The length of each transect is variable and relates to the size of the survey area and other factors including ground conditions. A visual display allows accurate placing of transects and helps maintain the correct separation between adjacent traverses. Data are not collected within fixed grids and data points are considered to be random even though the data are collected in a systematic manner covering all accessible areas (Aspinall, Gaffney and Schmidt, 2009).

2.2.4 Fluxgate sensors are highly sensitive to temperature change and this manifests as drift during the course of a survey. This can be particularly noticeable during the morning as temperatures rise and the equipment warms or cools. Sensor drift within the course of a traverse will appear as a line trending from negative to positive after processing with a zero median traverse algorithm. To remove the potential for temperature drift, data were collected after a 20 minute stabilisation period and traverses were limited to a time of generally <100s.

2.3 Data processing and presentation

2.3.1 Magnetic data collected by the MAGNETO®MXPDA cart-based system are initially prepared using SENSYS MAGNETO®DLMGPS software. The software effectively allocates a geographic position for each data point and

can compensate for fixed offsets present within the FGM650 sensors. The offsets are positive or negative values present on all fluxgate gradiometer sensors. Some systems use manual or electronic balancing to effectively zero the sensors; however, this is a short term measure that is prone to drift through temperature changes and vibration and can easily be incorrectly set due to localised magnetic fields. The FGM650 sensors are very accurately aligned to the vertical magnetic gradient and are highly stable showing negligible drift on long traverses. The offset values are removed using TerraSurveyor software.

2.3.2 Survey tracks are analysed and georeferenced raw data (UTM Z30N) are then exported in ASCII format for further analysis and display within TerraSurveyor. The removal of the offset values (compensation) of the sensors is also carried out in TerraSurveyor using a zero median traverse function. Data are then considered to be minimally processed. Note: without the zero median traverse function it is not possible to create a meaningful data plot as all sensors have a different offset value. Although a zero median traverse algorithm can remove anomalies aligned with the survey tracks, in practice this rarely occurs due to the use of long traverses, high resolution measurement and variability within the magnetic susceptibility of long linear features.

2.3.3 The minimally processed data are collected between limits of ±3000nT and clipped for display at ±3nT and ±5nT. Data are interpolated to a resolution of effectively 0.5m between tracks and 0.15m along each survey track.

2.3.4 Additional data processing has been carried out in the form of high pass filtering. This effectively removes low frequency variation along a traverse that has been caused by large magnetic bodies, cultivation or rapid temperature change. Data treated to additional processing have been compared to unprocessed data to ensure that no significant anomalies have been removed.

2.3.5 Appendix C contains metadata concerning the survey and data attributes and is derived directly from TerraSurveyor. Reference should be made to Appendix B for further information on processing.

2.3.6 A TIF file is produced by TerraSurveyor software along with an associated world file (.TFW) that allows automatic georeferencing (OSGB36 datum) when using GIS or CAD software. The main form of data display used in the report is the minimally processed greyscale plot. With regard to the Sensys MXPDA, minimally processed data are considered by the manufacturer to be data that are compensated by SENSYS MAGNETO DLMGPS software, see 2.3.1 and 2.3.2. Note: traceplots are not considered to be appropriate as they do not provide an accurate or useful assessment of the magnetic anomalies due to the very high density of data collection. In addition, traceplots cannot be meaningfully plotted against base mapping and in areas of complexity traces may be lost or highly confused. Traceplots may be used to demonstrate characteristic magnetic profiles across discrete features where it is considered beneficial.

2.3.7 The raster images are combined with base mapping using ProgeCAD Professional 2021, creating DWG (2018) file formats. All images are externally referenced to the CAD drawing in order to maintain good graphical quality. The CAD plots are effectively georeferenced facilitating relocation of features using GNSS, resection method, etc.

2.3.8 An abstraction and interpretation is drawn and plotted for all geophysical anomalies located by the survey. Anomalies are abstracted using colour coded points, lines and polygons. All plots are scaled to landscape A3 for paper printing. Appendix E sets out CAD layer names with colour and graphic content for each interpretation category, see 3.3.

2.3.9 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.

2.3.10 The abstraction and interpretation procedure has been supported by analysis of a digital terrain model plot derived from the Environment Agency's LiDAR 1m resolution data. Shaded relief plots and contours are created using Surfer 15 (Azimuth:135, Altitude:45, Z factor:10), (Fig 06).

2.3.11 A digital archive is produced with this report, see Appendix D below. The main archive is held at the offices of Archaeological Surveys Ltd.

3 RESULTS

3.1 General assessment of survey results

3.1.1 The detailed magnetic survey was carried out over two survey areas covering approximately 3ha.

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

3.1.3 Anomalies located within each survey area have been numbered and are described in 3.4 and 3.5 below.

3.2 Statement of data quality and factors influencing the interpretation of anomalies

3.2.1 Data are considered representative of the magnetic anomalies present within the site. Minor linear artefacts have been caused by high magnitude magnetic

anomalies and angular changes to the position of the sensors along some traverses. The data have, therefore, been subject to additional filtering in order to suppress this additional noise. Both filtered and unfiltered data are assessed in order to ensure no significant anomalies have been removed or altered.

3.2.2 There are few anomalies on which to base a qualitative assessment of soil magnetic susceptibility and magnetic contrast. The magnitude of those anomalies located is generally low, but it does appear that the soils and underlying geology are capable of producing useful magnetic contrast. A significant portion of Area B, and some parts of Area A, contain high magnitude magnetic debris and disturbance of modern origin that has the potential to obscure weaker anomalies.

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 general explanation of the characteristics of the magnetic anomalies is set out for each category in order to justify interpretation, see Table 1.

Interpretation category	Description and origin of anomalies
Anomalies with archaeological potential	Anomalies have the characteristics (mainly morphological) of a range of archaeological features such as pits, ring ditches, enclosures, etc. The category is used where there is a high level of confidence which may be due to additional supporting information where morphology is unclear or uncharacteristic.
Anomalies with an uncertain origin	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. Morphology may be unclear or uncharacteristic and there may be a lack of additional supporting information. 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	Land drains can appear in a classic herringbone pattern of interconnected multiple dipolar linear anomalies, or as parallel linear anomalies. The multiple dipolar response indicates ceramic land drains.
Anomalies associated with magnetic debris	Magnetic debris often appears as areas containing many small dipolar anomalies that may range from weak to very strong in magnitude. They often occur where there has been dumping or ground make-up and are 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, hearths and nail spreads from former wooden structures or rooves 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	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 these 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 adjacent to strong magnetic sources. Buried services may produce characteristic multiple dipolar anomalies dependant upon their construction.
Anomalies associated with ground disturbance/quarrying	Magnetically variable anomalies which may be negative indicating a response to geology/drift deposits and/or positive indicating an increased depth of topsoil. Very strongly magnetic anomalies are a response to highly magnetic material of modern origin which can be used to infill a quarry depression. It should be considered that former quarry pits may be of archaeological potential.
Anomalies with a natural origin	Naturally formed magnetic anomalies are caused by localised variability in the magnetic susceptibility of soils, subsoils and other drift or solid geologies.

Table 1: List and description of interpretation categories

3.4 List of anomalies - Area A

Area centred on OS NGR 346630 150590, see Figs 03 – 05.

Anomalies of archaeological potential

(1) – Situated towards the summit of the limestone ridge are a number of positive anomalies that appear to be arranged in an arc or 'horseshoe' formation. They appear as a series of three pit-like anomalies to the east and a curvilinear anomaly to the west with other pit-like responses to the north and south, and they are generally situated on a slight platform. Although the origin of these anomalies is uncertain, their morphology could indicate some archaeological potential.

(2) – Located 22m downslope of anomalies (1) on less steeply sloping ground, is a cluster of positive and negative anomalies also with an arc-like formation. They are situated just on the edge of a break of slope where land to the south west rises sharply. The LiDAR imagery also indicates that they are associated with a low mound at the break of slope. The positive anomalies have a moderately strong response, peaking at over 40nT which indicates an association with burning, the negative responses could indicate possible structural remains.

(3) – Approximately 9m to 24m north east of anomalies (2) are three discrete positive anomalies that appear to relate to a line of pits. Two narrow weakly positive linear anomalies extend towards them from (2). The central anomaly has a response of over 10nT, which could indicate an association with burning or burnt material, the others are 3-4nT.

Anomalies with an uncertain origin

(4) – An L-shaped negative rectilinear anomaly is situated partly to the north and north west of anomalies (2) and (3) and also divides them. The negative anomaly would indicate a response to material with a low magnetic susceptibility such as stone or sub-soil, but it is not clear if the response relates to a feature with an archaeological potential, or if it is relatively modern. A number of weakly positive linear anomalies can be seen in the vicinity, but they lack a coherent morphology and cannot be confidently interpreted as cut features.

Anomalies associated with quarrying

(5) – Magnetically variable responses along the south western edge of the survey area correspond former quarrying of the underlying limestone and also shallow geology in places.

Anomalies associated with magnetic debris

(6) – Magnetic debris is associated with a demolished 20th century structure. A

strong, multiple dipolar linear anomaly to the east appears to relate to a buried water pipe.

Anomalies with a natural origin

(7) – A series of parallel linear anomalies can be seen in the southern part of the site. This is a response to the soil filled limestone joints.

3.5 List of anomalies - Area B

Area centred on OS NGR 346630 150645, see Figs 03 – 05.

Anomalies of archaeological potential

(8) – Located in the north western part of Area B are a number of positive linear anomalies that could relate to cut, ditch-like features. Given the proximity to the Romano-British settlement under the existing farm buildings, these anomalies could be associated features.

Anomalies with an uncertain origin

(9) – A number of positive linear anomalies can be seen within Area B. Several are parallel with anomalies (8) and could be associated, others are short and lack a clearly defined morphology but could also be associated with cut features.

(10) – A number of broad positive and negative anomalies are located in the northern part of Area B. Some appear associated with the edge of the limestone ridge which is low at this point.

(11) – Located in the southern part of Area B is a single discrete positive response. This appears to relate to a pit-like feature, but its origin is uncertain.

Anomalies associated with land management

(12) – Weak, multiple dipolar, linear anomalies suggest a response to possible buried ceramic land drains.

Anomalies associated with magnetic debris

(13) – Much of the survey area contains magnetic debris. This is generally modern material used for ground consolidation, ground make-up and infilling of a former drainage channel in the southern part of Area B.

(14) – The entire site contains widespread and numerous strong, discrete, dipolar anomalies. These are a response to ferrous and other magnetically thermoremnant objects, such as brick and tile, within the topsoil.

Anomalies with a modern origin

(15) – A modern pipe/service extends just to the north of the farm track that divides Area B into two.

4 CONCLUSION

4.1.1 Detailed magnetometry within the site has located a number of anomalies that should be considered of archaeological potential. Within Area A, there is a cluster of positive discrete and a curvilinear responses that form an arc, these are located upslope of a second group of anomalies that appear to be associated with a low circular mound on the north eastern edge of the limestone ridge that extends along the centre of the site. This second cluster of anomalies include positive responses that could suggest an association with burning and negative responses that could suggest structural remains, possibly an industrial site. To the north east of these are a line of three pits, one of which could have an association with burning. Other anomalies within Area A appear to be associated with shallow geology and/or quarrying of the limestone ridge. A number of positive linear and negative rectilinear anomalies are of uncertain origin.

4.1.2 Within Area B, to the south west of the limestone ridge, are a number of weakly positive linear anomalies that appear to relate to cut, ditch-like features. Given their close proximity to a Romano-British settlement, these anomalies have a high potential to relate to associated features. Other linear anomalies close by are weak and lack a coherent morphology, but could also relate to cut features. Much of the southern part of Area B has been subject to ground make-up, including the infilling of a former drainage channel with strongly magnetic material.

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Appendix A – basic principles of magnetic survey

Iron minerals are always present to some degree within the topsoil and enhancement associated with human activity is related to increases in the level of magnetic susceptibility and thermoremnant material. Magnetic susceptibility is an induced magnetism within a material when it is in the presence of a magnetic field. This can be thought of as effectively permanent due to the presence of the Earth's magnetic field. Thermoremnant magnetism occurs when ferrous material is heated beyond a specific temperature known as the Curie Point. Demagnetisation occurs at this temperature with re-magnetisation by the Earth's magnetic field upon cooling.

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

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

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

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

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

Appendix B – data processing notes

Clipping

Minimum and maximum values are set and replace data outside of the range with those values. Extreme values are removed improving colour or greyscale contrast associated with data values that may be archaeologically significant. Different ranges are applied to data in order to determine the most suitable for anomaly abstraction and display.

High Pass Filter

Removes low frequency anomalies within the data that are not considered to be archaeologically significant and may be natural in origin. A window passes over the data, the mean of all the data within the window is subtracted from the centre value. The size of the window is adjusted as is the weighting which may be uniform or Gaussian. The process is used to improve the visibility of anomalies of interest.

Zero Median/Mean Traverse

The median (or mean) of data from each traverse is calculated ignoring data outside a threshold value, the median (or mean) is then subtracted from the traverse. The process is used to equalise differences between the offset values of the gradiometer sensors. The process can remove archaeological features that run along a traverse but with the high resolution datasets created by the Sensys FGM650 sensors and the method of data collection this has not been a notable problem. In fact, the removal of offsets using software avoids carrying out a balancing procedure on site, which inevitably can never be done in magnetically clean

conditions and results in improperly aligned fluxgate sensors and/or electronic adjustment values.

Appendix C – survey and data information

Area A minimally processed data

Filename: J863-mag-AreaA-proc.xcp
Instrument Type: Sensys DLMGPS
Survey corner coordinates (X/Y):OSGB36
Northwest corner: 346371.35, 150718.26 m
Southeast corner: 346617.20, 150520.56 m
Collection Method: Randomised
Sensors: 5
Dummy Value: 32702
Dimensions
Survey Size (meters): 246 m x 198 m
X&Y Interval: 0.15 m
Source GPS Points: Active: 565700, Recorded: 565700
Stats
Max: 3.32
Min: -3.30
Std Dev: 1.20
Mean: -0.01
Median: 0.00
Composite Area: 4.8605 ha
Surveyed Area: 1.9066 ha
PROGRAM
Name: TerraSurveyorPre
Version: 3.0.36.24
GPS based Proce4
1 Base Layer.
2 Unit Conversion Layer (Lat/Long to UTM).
3 DeStripe Median Traverse:
4 Clip from -3.00 to 3.00

Area A filtered data

Filename: J863-mag-AreaA-proc-hpf.xcp
Stats
Max: 3.32
Min: -3.30
Std Dev: 1.15
Mean: 0.00
Median: 0.00
GPS based Proce5
1 Base Layer.
2 Unit Conversion Layer (Lat/Long to UTM).
3 DeStripe Median Traverse:
4 High pass Uniform (median) filter: Window dia: 300
5 Clip from -3.00 to 3.00

Area B minimally processed data

Filename: J863-mag-AreaB-proc.xcp
Northwest corner: 346267.87, 150715.58 m
Southeast corner: 346436.02 150544.73 m
Dimensions
Survey Size (meters): 168 m x 171 m
X&Y Interval: 0.15 m
Source GPS Points: Active: 296000, Recorded: 296000
Stats
Max: 3.32
Min: -3.30
Std Dev: 1.84
Mean: -0.07
Median: 0.03
Composite Area: 2.8728 ha
Surveyed Area: 0.96893 ha
GPS based Proce4
1 Base Layer.
2 Unit Conversion Layer (Lat/Long to UTM).
3 DeStripe Median Traverse:
4 Clip from -3.00 to 3.00

Area B minimally filtered data

Filename: J863-mag-AreaB-proc-hpf.xcp
Stats
Max: 5.53
Min: -5.50
Std Dev: 2.58
Mean: -0.12
Median: 0.01
GPS based Proce5
1 Base Layer.
2 Unit Conversion Layer (Lat/Long to UTM).
3 DeStripe Median Traverse:
4 High pass Uniform (median) filter: Window dia: 300
5 Clip from -5.00 to 5.00

Appendix D – digital archive

Archaeological Surveys Ltd hold the primary digital archive at their offices in Wiltshire. Data are backed-up onto an on-site data storage drive and at the earliest opportunity data are copied to CD ROM for storage on-site and off-site.

A PDF copy will be supplied to the Somerset Historic Environment Record with greyscale images and abstraction layers made available on request. The report will also be uploaded to the Online AccesS to the Index of archaeological investigationS (OASIS).

Archive contents:

File type	Naming scheme	Description
Data	J863-mag-**[area number/name]**.asc J863-mag-**[area number/name]**.xcp J863-mag-**[area number/name]**-proc.xcp	Raw data as ASCII CSV TerraSurveyor raw data TerraSurveyor minimally processed data
Graphics	J863-mag-**[area number/name]**-proc.tif	Image in TIF format
Drawing	J863-**[version number]**.dwg	CAD file in 2018 dwg format
Report	J863 report.odt	Report text in LibreOffice odt format

Table 2: Archive metadata

Appendix E – CAD layers for abstraction and interpretation plots

The table below sets out Archaeological Surveys Ltd CAD layer names with associated colours and graphical content. Where CAD files are available layers may be extracted for further CAD/GIS use. Note: hatched polygon boundaries are contained within layers with the RGB colour code 254, 255, 255 (near white) in order to prevent their visibility.

Report sub-heading and associated CAD layer names	Colour with RGB index	Layer content
Anomalies with archaeological potential		
AS-ABST MAG POS DISCRETE ARCHAEOLOGY	Red 255,0,0	Solid donut, point or polygon (solid)
AS-ABST MAG POS LINEAR ARCHAEOLOGY	Red 255,0,0	Polyline or polygon (solid)
AS-ABST MAG NEG LINEAR ARCHAEOLOGY	127,0,255	Line, polyline or polygon (solid)
Anomalies with an uncertain origin		
AS-ABST MAG POS LINEAR UNCERTAIN	255,127,0	Line, polyline or polygon (solid)
AS-ABST MAG NEG LINEAR UNCERTAIN	Blue 0,0,255	Line, polyline or polygon (solid)
AS-ABST MAG POS DISCRETE UNCERTAIN	255,127,0	Solid donut, point or polygon (solid)
AS-ABST MAG POS UNCERTAIN	255,127,0	Polygon (cross hatched ANSI37)
AS-ABST MAG NEG UNCERTAIN	Blue 0,0,255	Polygon (cross hatched ANSI37)
Anomalies relating to land management		
AS-ABST MAG LAND DRAIN	Cyan 0,255,255	Line or polyline
Anomalies associated with magnetic debris		
AS-ABST MAG DEBRIS	132, 132, 132	Polygon (cross hatched ANSI37)
AS-ABST MAG STRONG DIPOLAR	132, 132, 132	Solid donut, point or polygon (solid)
Anomalies with a modern origin		
AS-ABST MAG DISTURBANCE	132, 132, 132	Polygon (hatched ANSI31)
AS-ABST MAG SERVICE	132, 132, 132	Line or polyline
Anomalies with a natural origin		
AS-ABST MAG NATURAL FEATURES	Yellow 255,255,0	Polygon (cross hatched ANSI37)

Table 3: CAD layering

Appendix F – copyright and intellectual property

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Archaeological Surveys
Specialist Geophysical Surveyors

Geophysical Survey
Nyland
Cheddar
Somerset

Map of survey area

Survey location

Site centred on OS NGR
ST 46450 50650

SCALE 1:25 000

0m 500m 1000m

SCALE TRUE AT A3

DRAWN BY	CHECKED BY	
KTD	DJS	FIG 01

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Referencing information

Referencing grid to OSGB36 datum at 50m intervals

346400 150700

Survey tracks

Survey track start

Survey track stop

SCALE 1:1250

0m 10 20 30 40 50m

SCALE TRUE AT A3

DRAWN BY	CHECKED BY	
KTD	DJS	FIG 02

346250 346300 346350 346400 346450 346500 346550 346600

150750 150700 150650 150600 150550 150500 150450

N

7.9m

6.7m

0.91m RH

Nyland Farm House

Area B

Area A

Court Farm

Nyland

Tanks

Drain

Drain

FW

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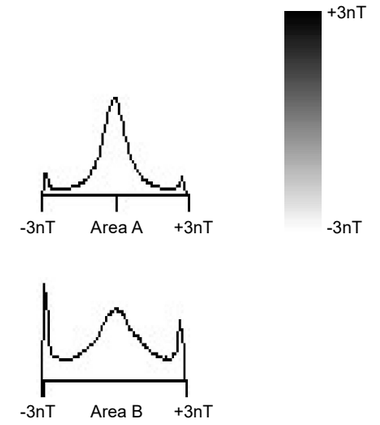
Greyscale plot of minimally processed magnetometer data



N

7.9m

6.7m

0.91m RH

Nyland Farm House

Area B

Area A

Tanks

Court Farm

Nyland

okery
arm

Drain

Drain

FW

SCALE 1:1250

0m 10 20 30 40 50m

SCALE TRUE AT A3

DRAWN BY	CHECKED BY	
KTD	DJS	FIG 03

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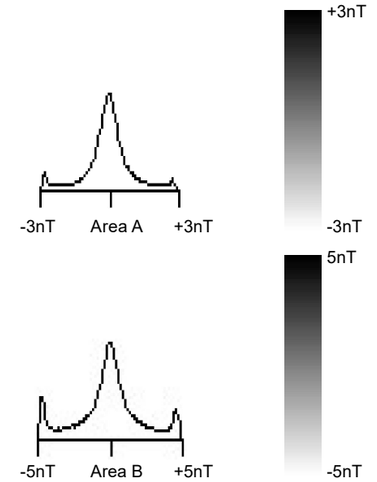
Greyscale plot of filtered magnetometer data



SCALE 1:1250

0m 10 20 30 40 50m

SCALE TRUE AT A3

DRAWN BY	CHECKED BY	
KTD	DJS	FIG 04

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Abstraction and interpretation of magnetic anomalies

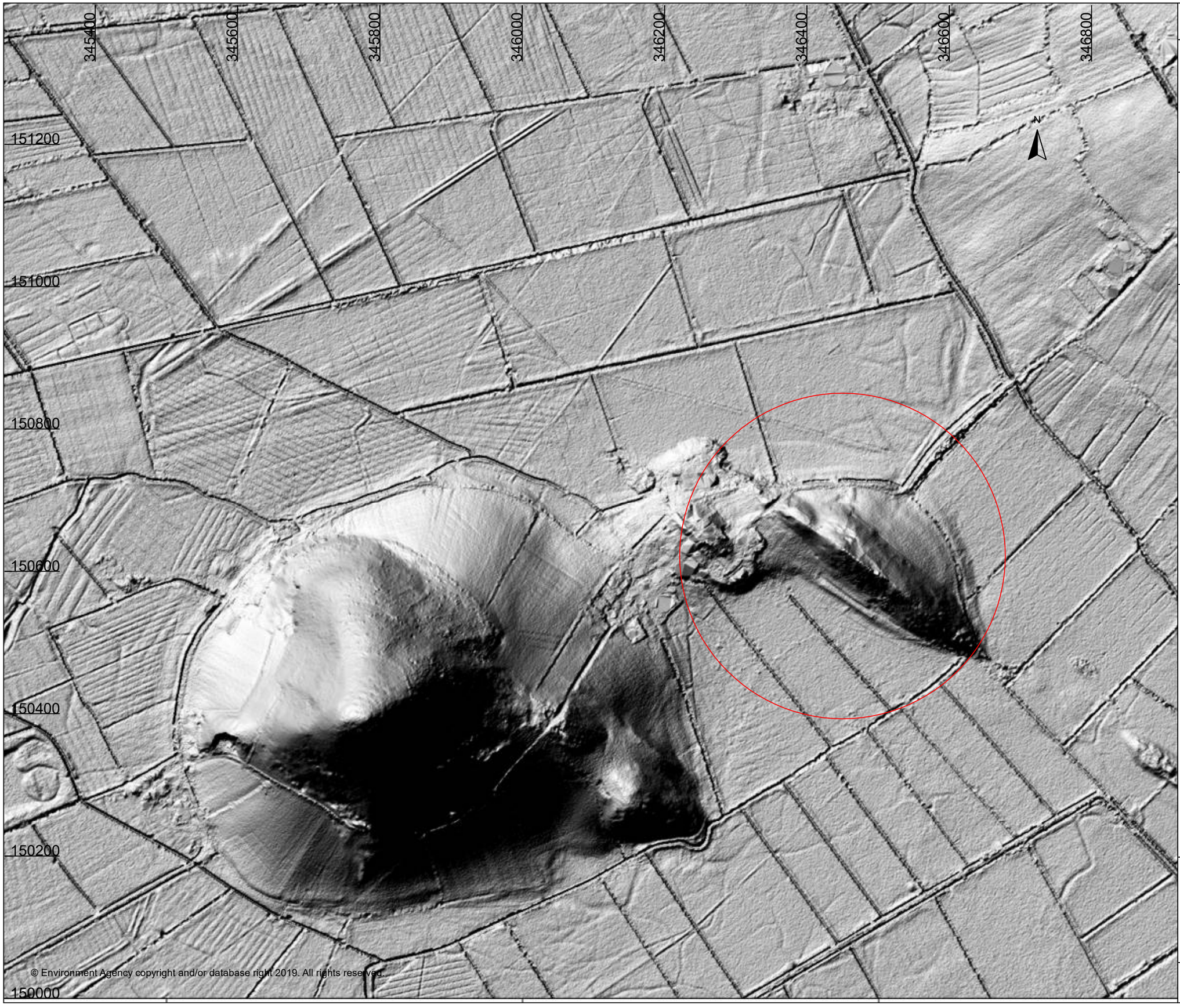
- Positive linear anomaly - cut/magnetically enhanced feature of archaeological potential
- Negative linear anomaly - material of low magnetic susceptibility of archaeological potential
- Positive linear anomaly - possible ditch-like feature
- Negative linear anomaly - material of low magnetic susceptibility
- Positive/weak multiple dipolar linear anomaly - possible land drain
- Positive linear anomaly - of natural origin
- Discrete positive response - cut/magnetically enhanced feature of archaeological potential
- Discrete positive response - material of low magnetic suceptibility of archaeological potential
- Discrete positive response - possible pit-like feature
- Positive anomaly - magnetically enhanced material
- Negative anomaly - material of low magnetic susceptibility
- Variable magnetic response - quarrying/shallow geology
- 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

DRAWN BY	CHECKED BY	
KTD	DJS	FIG 05



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Digital Terrain Model

Derived from Environment Agency's LiDAR data 1m resolution

SCALE 1:5000

0m 100 200m

SCALE TRUE AT A3

DRAWN BY	CHECKED BY	
KTD	DJS	FIG 06