

MFMO18



MIDDLE FARM, FEATHERBED LANE, MIXBURY, OXFORDSHIRE

GEOPHYSICAL SURVEY

commissioned by PR and IC Rymer

January 2019

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PROJECT INFO:

HA Project Code **MFMO18** / NGR **SP 6066 3286** / Parish **Mixbury** / Local Authority
Oxfordshire / OASIS Ref. **headland5-339817**

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PROJECT SUMMARY

Headland Archaeology (UK) Ltd undertook a geophysical (magnetometer) survey of a 7 hectare site at Middle Farm, south of Mixbury, Oxfordshire, where a new poultry unit is proposed. The survey has confirmed the presence of a large polygonal enclosure in the north-western corner of the application area, previously identified as a cropmark. In addition, the survey has identified a circular anomaly within the enclosure interpreted as the remains of a former roundhouse. The partial remains of a possible second roundhouse, as well as several pit type responses, are also identified within the enclosure clearly indicating the enclosure as a site of human occupation, possibly of Iron Age date. Curvilinear and linear anomalies are also located some of which correspond with cropmarks. These anomalies are interpreted as of possible archaeological origin. On the basis of the geophysical survey, the archaeological potential of the north-western corner of the application area is assessed as high and moderate to low in all other parts.

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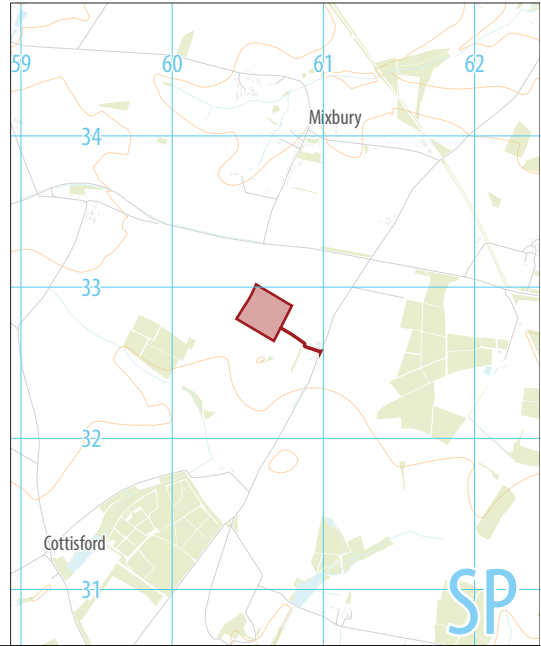
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Middle Farm
Featherbed Lane
Mixbury
Oxfordshire

0 200km
1:12,500,000 @ A4



0 100m
1:5,000 @ A4

application area



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MIDDLE FARM, FEATHERBED LANE, MIXBURY, OXFORDSHIRE

GEOPHYSICAL SURVEY

1 INTRODUCTION

Headland Archaeology was commissioned by Ian Pick Associates on behalf of PR and RC Rymer (the Client), to undertake a geophysical (magnetometer) survey at Middle Farm, Featherbed Lane, Mixbury, Oxfordshire, where a new poultry unit is proposed. The work has been recommended by Richard Oram, Planning Archaeologist at Oxfordshire County Council in response to a Planning Application (Ref 18/00067/SCOP). The results of the survey will inform future archaeological strategy at the site.

The work was undertaken in accordance with a Written Scheme of Investigation (Harrison 2018) which was submitted to and approved by the Planning Archaeologist, with guidance within the National Planning Policy Framework (MHCLG 2018) and in line with current best practice (Chartered Institute for Archaeologists 2016, Europae Archaeologia Consilium 2016).

The survey was carried out on the 17th and 18th December 2018.

1.1 SITE LOCATION, TOPOGRAPHY AND LAND-USE

The application area (AA) is located north-west of Middle Farm and west of Featherbed Lane (centred on SP 6066 3286) approximately 1km south of Mixbury (see Illus 1). It comprises a square block of land, covering approximately 7 hectares, within a single arable field. Hedges define the AA to the eastern, western and northern sides. Arable farmland extends to all sides.

1.2 GEOLOGY AND SOILS

The bedrock geology comprises White Limestone Formation which is overlain in the east by glaciofluvial deposits sand and gravel (Illus 2). No superficial deposits are recorded in the west (NERC 2018).

The soils in the east of the AA are classified in the Soilscape 17 Association, characterised as slowly permeable seasonally wet loams and clays, and in the west in the Soilscape 5 Association, characterised as freely-draining loams (Cranfield University 2018).

2 ARCHAEOLOGICAL BACKGROUND

A detailed archaeological background is currently being prepared (BSA Heritage forthcoming) and this will be included within the Environmental Statement.

However, an undated polygonal enclosure, recorded as part of the Northamptonshire National Mapping Programme (NMP), is located within the north-west of the AA (Illus 2) and is recorded on the Oxfordshire Historic Environment Record (HER MOX4798).

Linear and rectilinear cropmarks within the south and east of the AA are thought to be modern in origin. An oval enclosure to the immediate south-west of the AA may be archaeological in origin.

Analysis of historical Ordnance Survey (OS) maps (Old-maps 2018) indicates that a single field boundary has been removed within the AA since the publication of the first edition OS map in 1881.

3 AIMS, METHODOLOGY AND PRESENTATION

The general aim of the geophysical survey was to provide sufficient information to establish the presence/absence, character and extent of any archaeological remains within the AA. This will, therefore,

enable an assessment to be made of the impact of the proposed development on any sub-surface archaeological remains if present.

The specific archaeological objectives of the geophysical survey were:

- › to provide information about the nature and possible interpretation of any magnetic anomalies identified;
- › to, therefore, model the presence/absence and extent of any buried archaeological features; and
- › to prepare a report summarising the results of the survey.

3.1 MAGNETOMETER SURVEY

Magnetic survey methods rely on the ability of a variety of instruments to measure very small magnetic fields associated with buried archaeological remains. A feature such as a ditch, pit or kiln can act like a small magnet, or series of magnets, that produce distortions (anomalies) in the earth's magnetic field. In mapping these slight variations, detailed plans of sites can be obtained as buried features often produce reasonably characteristic anomaly shapes and strengths (Gaffney & Gater 2003). Further information on soil magnetism and the interpretation of magnetic anomalies is provided in Appendix 1.

The survey was undertaken using four Bartington Grad601 sensors mounted at 0.5m intervals (0.5m traverse interval) onto a rigid carrying frame. The system was programmed to take readings at a frequency of 10Hz (allowing for a 10–15cm sample interval) on roaming traverses (swaths) 4m apart (Illus 3). These readings were stored on an external weatherproof laptop and later downloaded for processing and interpretation. The system was linked to a Trimble R8s Real Time Kinetic (RTK) differential Global Positioning System (dGPS) outputting in NMEA mode to ensure a high positional accuracy for each data point.

MLGrad601 and MultiGrad601 (Geomar Software Inc.) software was used to collect and export the data. Terrasurveyor V3.0.32.4 (DWConsulting) software was used to process and present the data.

3.2 REPORTING

A general site location plan is shown in Illus 1 at a scale of 1:5,000. Illus 2 is a 1:4,000 survey location plan showing the superficial geology whilst Illus 3 shows the direction of survey as GPS swaths and the proposed poultry units. Fully processed greyscale data and an overall site interpretation are presented in Illus 4–5 at a scale of 1:4,000. Large scale minimally processed (XY trace plot) data, fully processed (greyscale) data and an accompanying interpretative plot are presented at a scale of 1:1,000 in Illus 6–11 inclusive.

Technical information on the equipment used, data processing and magnetic survey methodology is given in Appendix 1. Appendix 2 details the survey location information and Appendix 3 describes the composition and location of the site archive. Data processing details are presented in Appendix 4. A copy of the OASIS entry

(Online Access to the Index of Archaeological Investigations) is reproduced in Appendix 5.

The survey methodology, report and any recommendations comply with the Written Scheme of Investigation (Harrison 2018), guidelines outlined by Europae Archaeologia Consilium (EAC 2016) and by the Chartered Institute for Archaeologists (CIfA 2016). All illustrations from Ordnance Survey mapping are reproduced with the permission of the controller of Her Majesty's Stationery Office (© Crown copyright).

The illustrations in this report have been produced following analysis of the data in 'raw' and processed formats and over a range of different display levels. All illustrations are presented to most suitably display and interpret the data from this site based on the experience and knowledge of management and reporting staff.

4 RESULTS AND DISCUSSION

Ground conditions were good across the entire survey area leading to a high standard of data.

The survey has detected a variable magnetic background across the AA. The variability is pronounced where the superficial glaciofluvial deposits are present; where there is no covering of the sands and gravels the magnetic background is much more homogenous. Against this background, linear, curvilinear and discrete anomalies have been identified and these are discussed below and cross-referenced to specific examples on the interpretive figures, where appropriate.

4.1 FERROUS ANOMALIES

Ferrous anomalies, characterised as individual 'spikes', are typically caused by ferrous (magnetic) material, either on the ground surface or in the plough-soil. Little importance is normally given to such anomalies, unless there is any supporting evidence for an archaeological interpretation, as modern ferrous debris is common on most sites, often being present as a consequence of manuring or tipping/infilling. There is no obvious clustering to these ferrous anomalies which might indicate an archaeological origin. Far more probable is that the 'spike' responses are likely caused by the random distribution of ferrous debris in the upper soil horizons.

A line of three equidistantly spaced high magnitude discrete anomalies parallel with the southern boundary of the AA are due to the proximity of telegraph poles (Illus 5 and 11).

Magnetic disturbance around the field edges is due to ferrous material within, or adjacent to, the field boundaries and is of no archaeological interest.

4.2 AGRICULTURAL ANOMALIES

A single linear trend anomaly aligned north-west/south-east immediately north of, and parallel with, the southern boundary of the AA locates a former field boundary (Illus 5 and 11) shown on the first edition mapping.

Other linear trend anomalies aligned parallel with or at right angles to the modern field boundaries are due to modern ploughing.

4.3 GEOLOGICAL ANOMALIES

Numerous discrete low-magnitude anomalies have been identified throughout the PDA. The frequency and distribution of these anomalies precludes against an archaeological interpretation and the anomalies are thought to be caused by localised variation in the depth and composition of the topsoil, particularly where there are superficial deposits (to the east of the AA), or possibly by soil filled, naturally occurring depressions in the bedrock limestone geology (to the west of the AA).

4.4 PROBABLE ARCHAEOLOGICAL ANOMALIES

Unless specified all the linear anomalies described are likely to be due to soil filled cut features, such as ditches, forming clear patterns of enclosure and land division. Against a variable magnetic background, it is difficult to confidently discriminate between discrete anomalies which may be due to archaeological features, such as pits, which may be indicative of occupational activity and those that are probably due to localised geological variation. For this reason, most of the discrete anomalies within enclosures have been ascribed a possible archaeological origin with those outside, except where the responses are particularly broad or high in magnitude, interpreted as of non-archaeological origin.

In the north-western corner of the field, a polygonal enclosure (E1 – Illus 5 and 8) is clearly identified with its apex pointing to the north-east. This matches a previously identified cropmark. A break in the magnetic response along the eastern side locates a probable entrance.

Within the enclosure, a faint, low magnitude, circular anomaly (RD1 – Illus 5 and 8) locates a likely roundhouse with an entrance to the eastern side. A partial curvilinear anomaly, RD22, just to the east of RD1 is possibly the partial remains of a second roundhouse. Several discrete, pit type, anomalies in the vicinity of the roundhouses are possibly also of archaeological origin and are indicative of settlement activity within the enclosure.

4.5 POSSIBLE ARCHAEOLOGICAL ANOMALIES

Approximately 50m east of E1 a short curving anomaly (Illus 5 and 8 – D1) is identified adjacent to the northern boundary of the AA. This is interpreted as of possible archaeological origin.

Slightly oblique to the eastern boundary of the AA are parallel linear trends (D2 and D3, see Illus 5, 8 and 11). These anomalies are slightly oblique to the alignment of the current field boundary and for this reason, they have been interpreted as of possible archaeological origin. However, an agricultural origin is considered equally plausible and indeed these anomalies have previously been identified as cropmarks being interpreted as of likely modern origin.

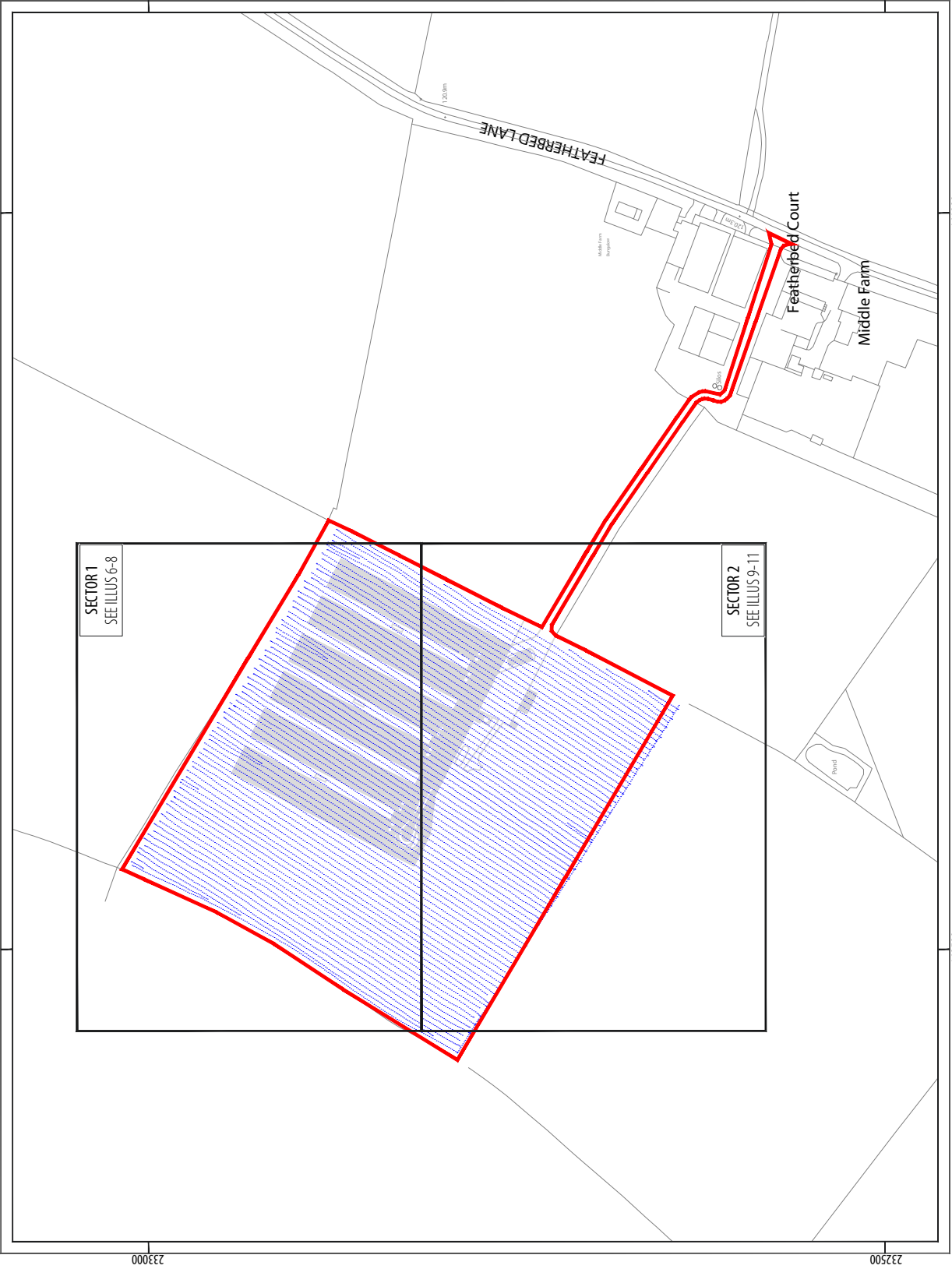
5 CONCLUSION

The survey has successfully evaluated the AA and has confirmed the presence of an enclosure of possible Iron Age date in the north-western quarter of the AA. Ring ditch and pit type anomalies within the enclosure are clearly indicative of human settlement activity. This part of the AA is assessed as of high archaeological potential, although only the south-eastern edge of the enclosure would be directly impacted by the proposed development. Elsewhere in the AA other linear anomalies hint at further archaeological activity although this interpretation is far from certain. Consequently, the remainder of the AA is assessed as of moderate or low potential.

6 REFERENCES

- Chartered Institute for Archaeologists (CIfA) 2016 *Standard and guidance for archaeological geophysical survey* (Reading) http://www.archaeologists.net/sites/default/files/CifAS%26GGeophysics_2.pdf accessed 19 December 2018
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application area
GPS swaths

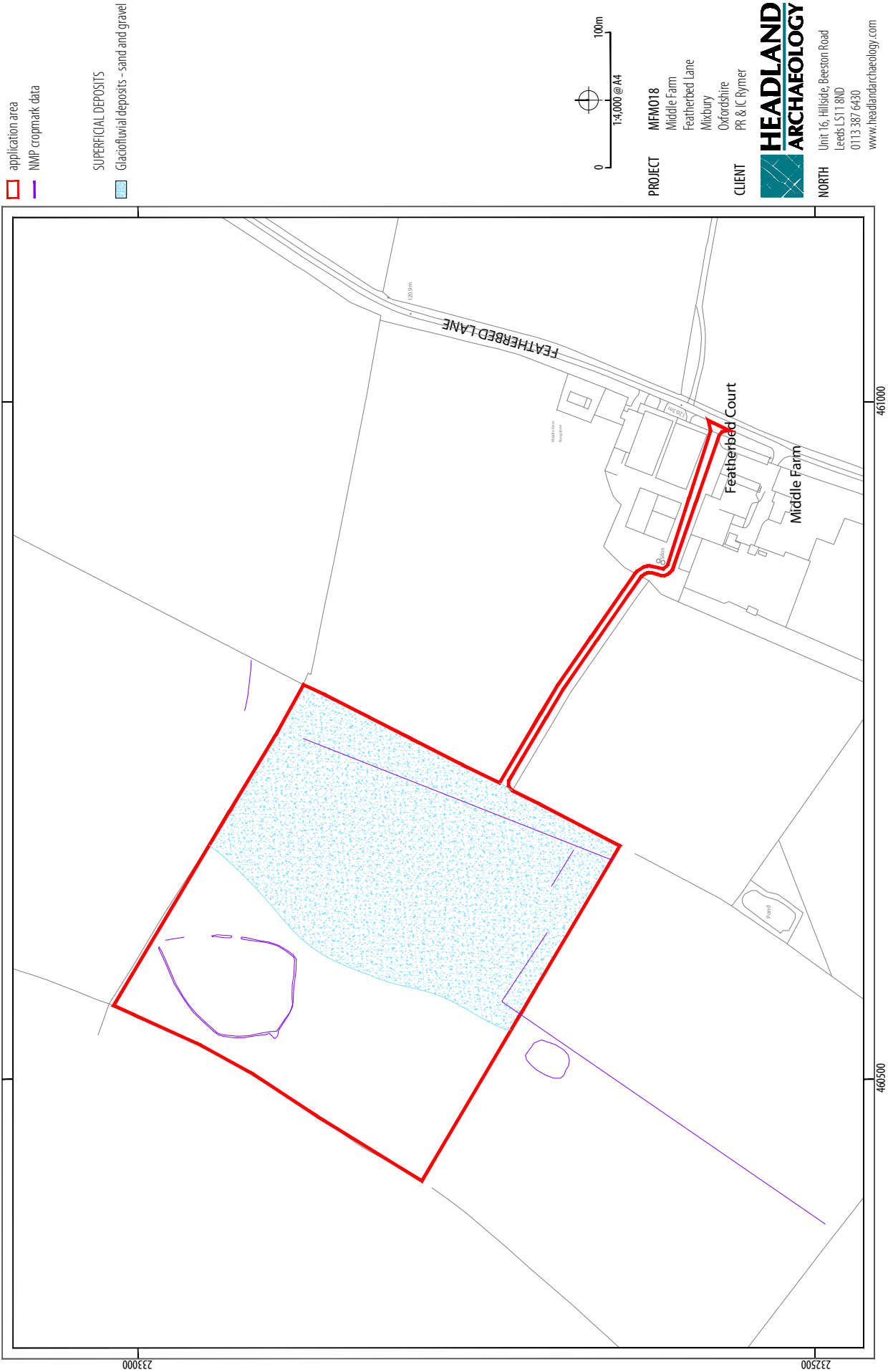


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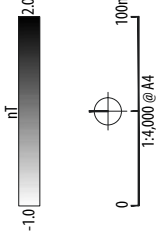
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ILLUS 2 Survey location showing geology and NMP cropmark data (1:4,000)



ILLUS 3 Survey location showing GPS swaths and proposed poultry units (1:4,000)

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ILLUS 4 Processed greyscale magnetometer data (1:4000)

TYPE OF ANOMALY	INTERPRETATION
• dipolar isolated	ferrous material
● magnetic disturbance	ferrous material
— linear trend	agricultural
— linear	former field boundary
- - - linear trend	geological variation
⊗ magnetic enhancement	geology
⊙ magnetic enhancement	archaeology?
● magnetic enhancement	archaeology

ABBREVIATIONS

D	ditch
E	enclosure
FB	former boundary
RD	ring-ditch
TP	telegraph pole

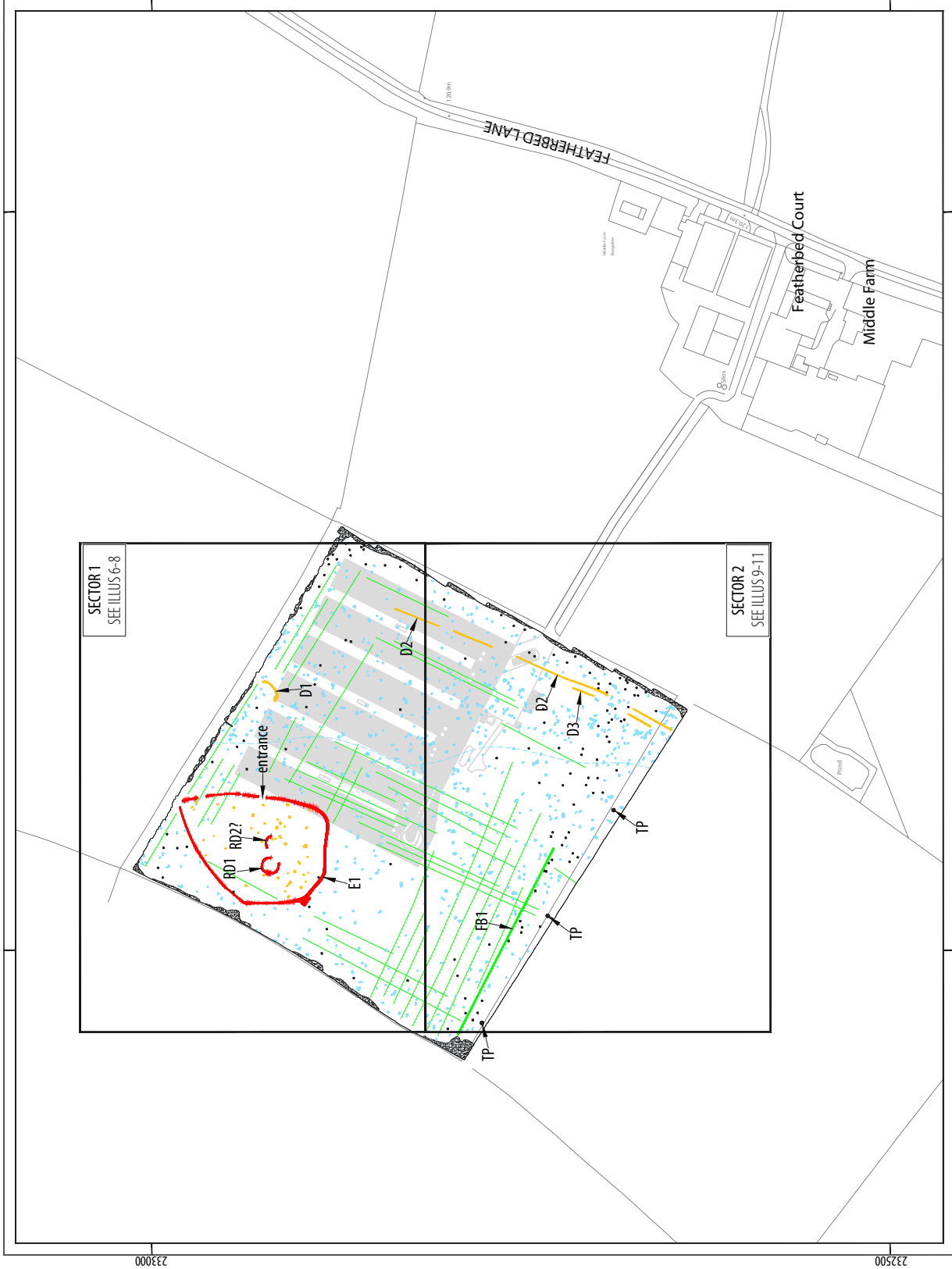


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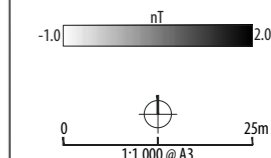
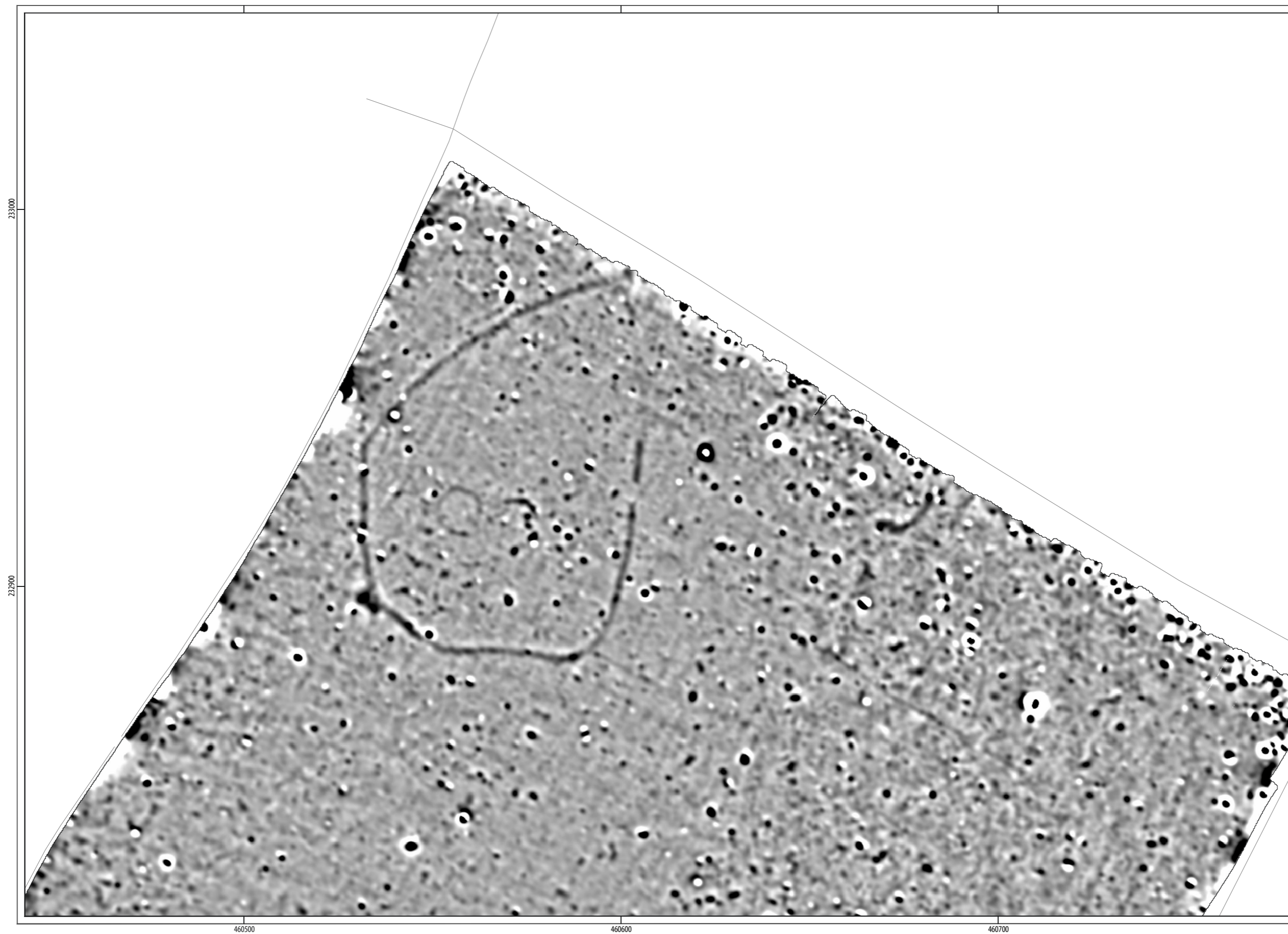
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NORTH



ILLUS 5 Interpretation of magnetometer data showing proposed poultry units (1:4000)

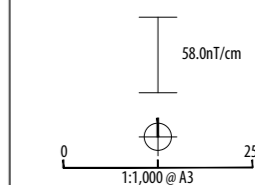
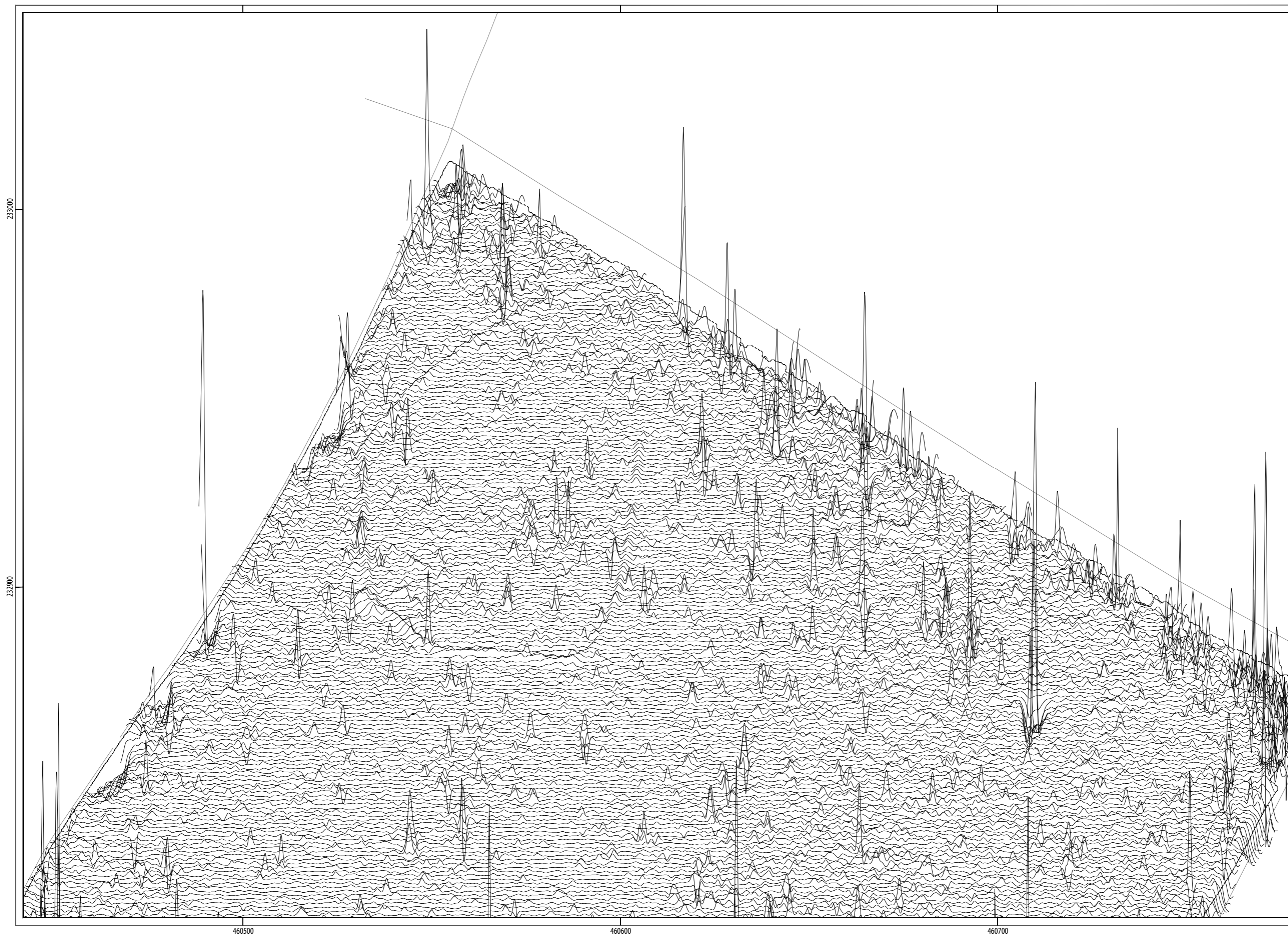


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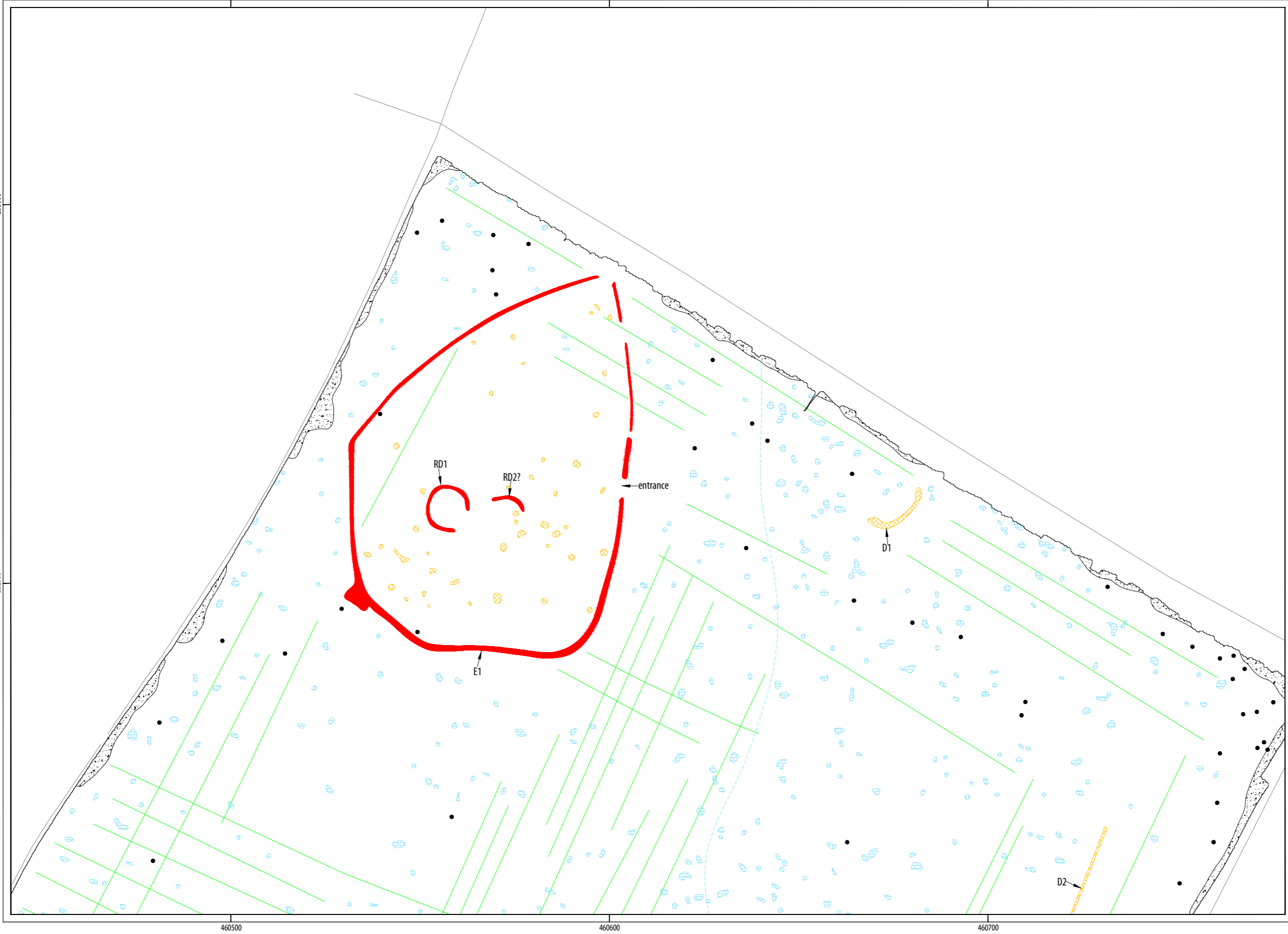
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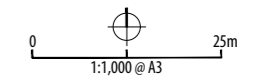
ILLUS 7 XY trace plot of minimally processed magnetometer data; Sector 1 (1:1,000)



TYPE OF ANOMALY	INTERPRETATION
● dipolar isolated	ferrous material
● magnetic disturbance	ferrous material
— linear trend	agricultural
- - - linear trend	geological variation
● magnetic enhancement	geology
● magnetic enhancement	archaeology?
● magnetic enhancement	archaeology

ABBREVIATIONS

D	ditch
E	enclosure
RD	ring-ditch

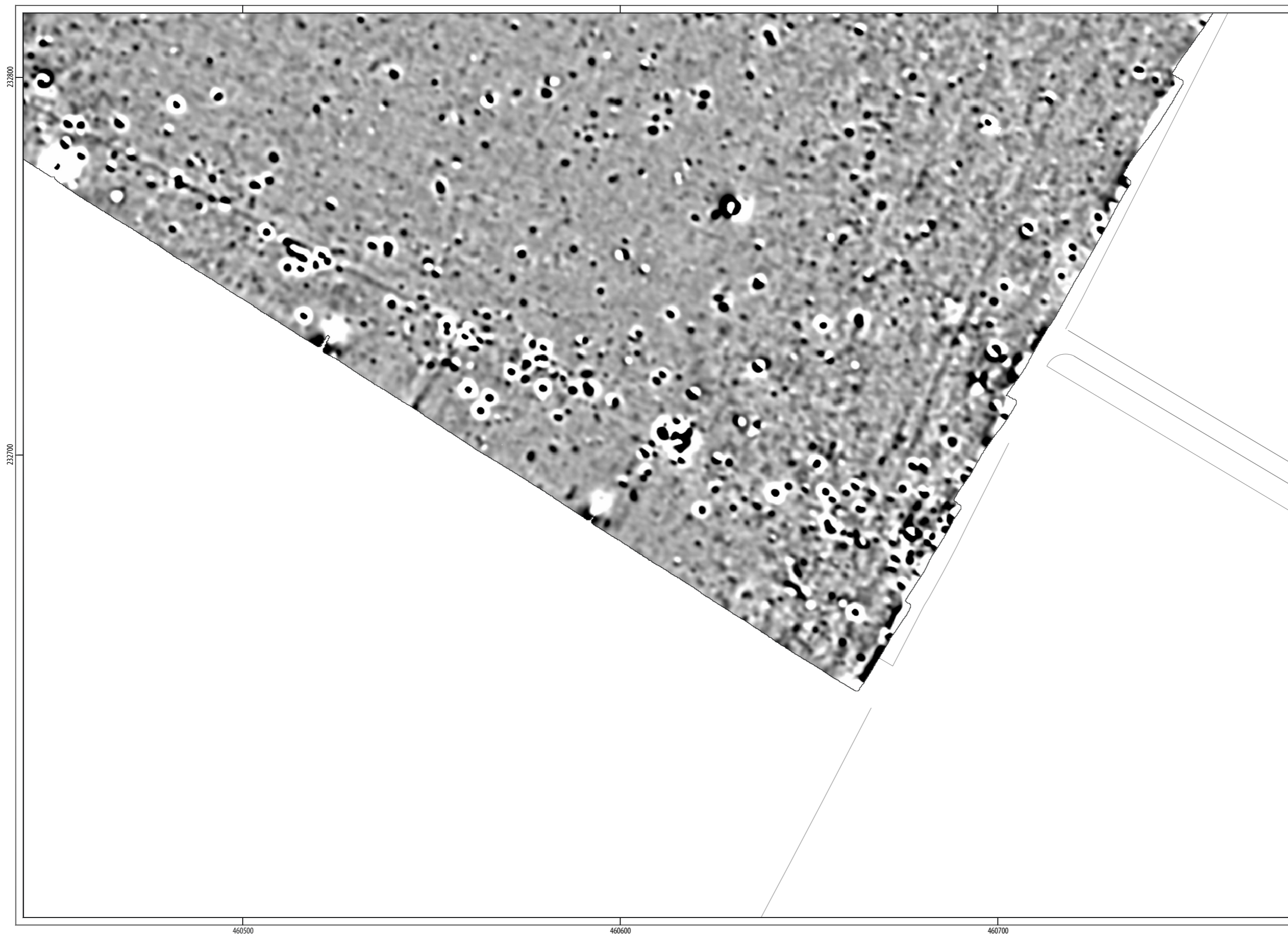


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ILLUS 8 Interpretation of magnetometer data; Sector 1 (1:1,000)

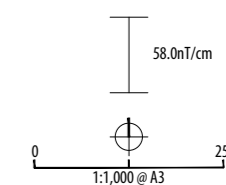
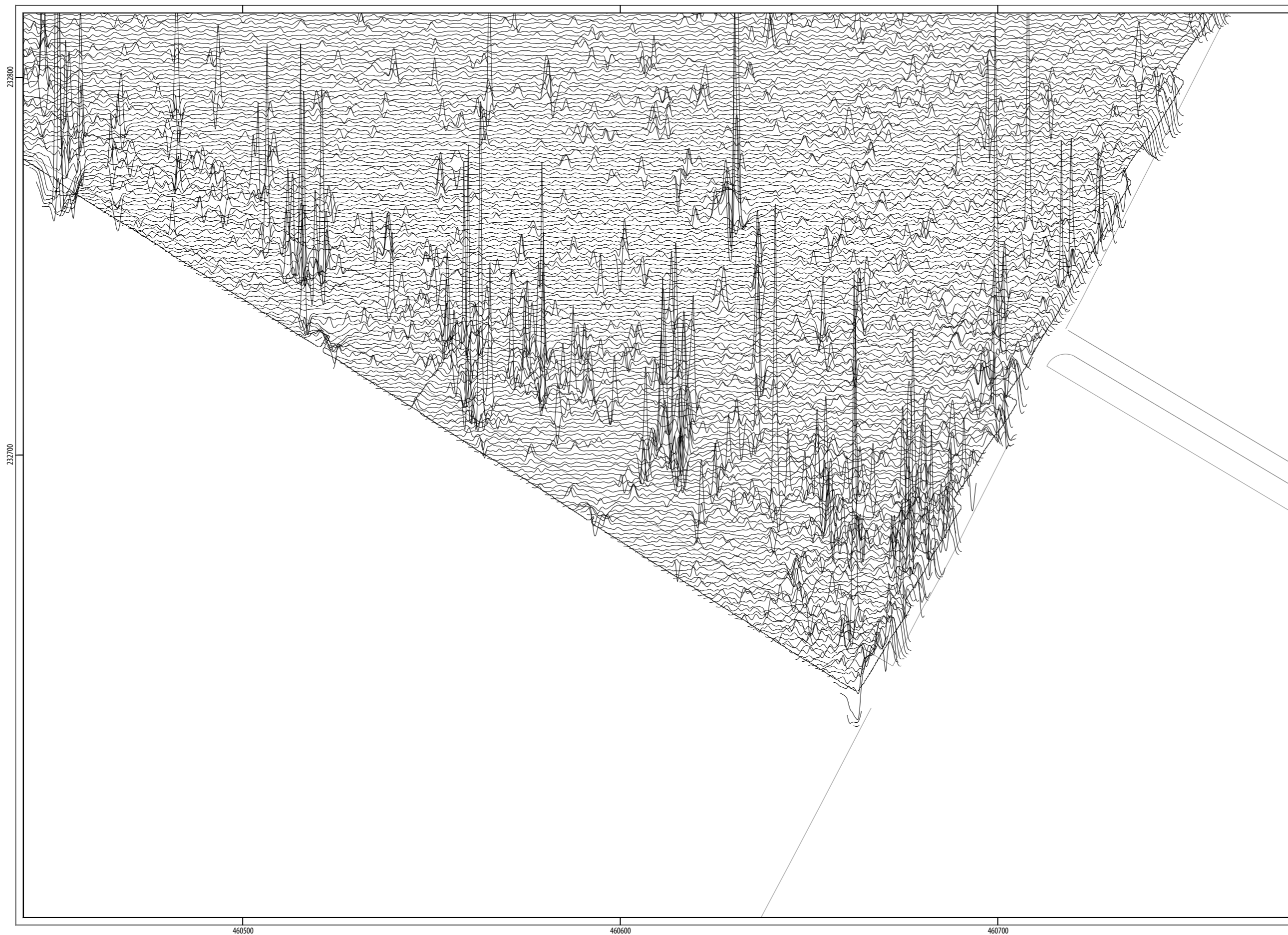


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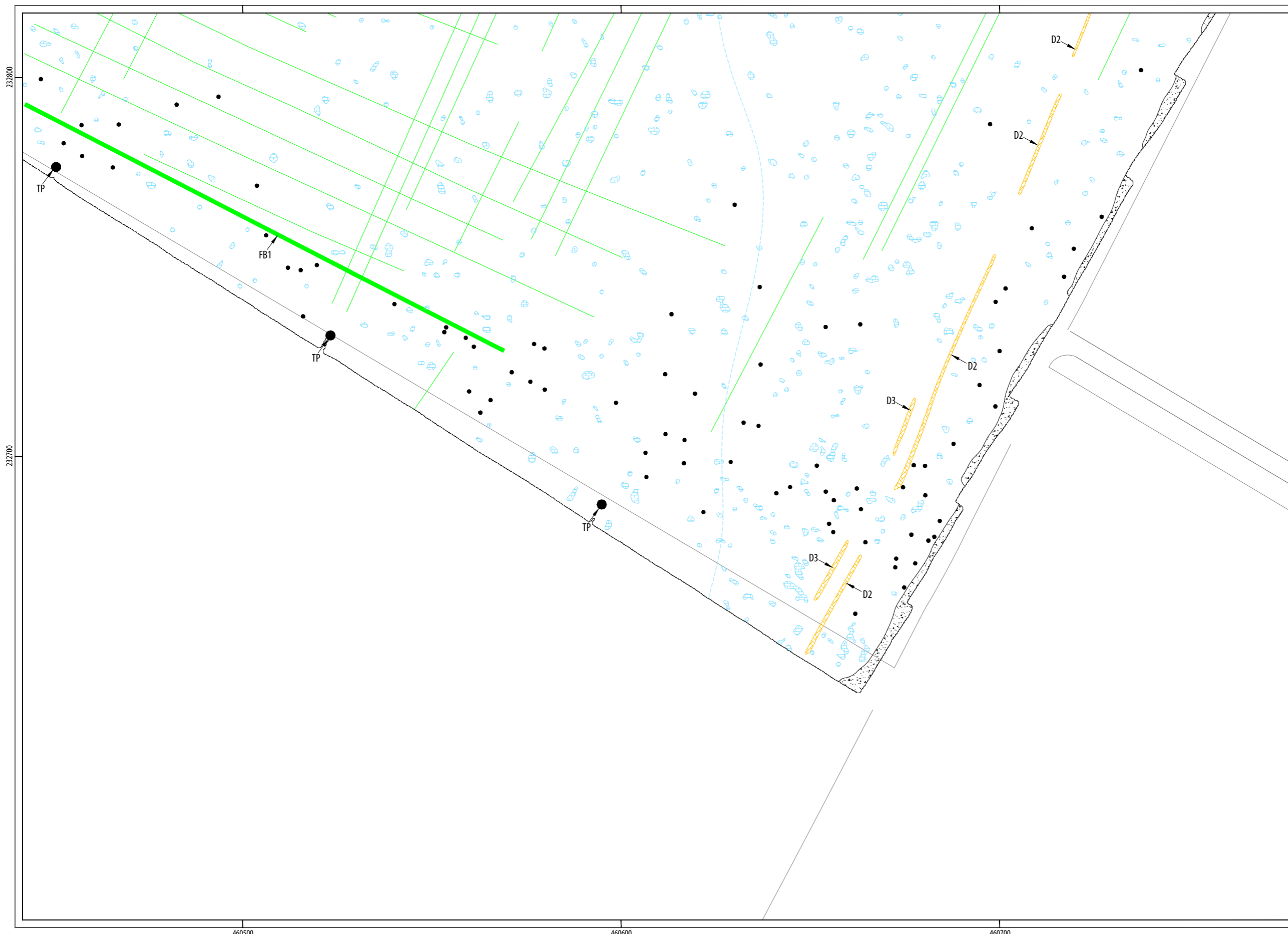


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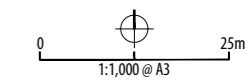
ILLUS 10 XY trace plot of minimally processed magnetometer data; Sector 2 (1:1,000)



TYPE OF ANOMALY	INTERPRETATION
● dipolar isolated	ferrous material
● magnetic disturbance	ferrous material
— linear trend	agricultural
— linear	former field boundary
- - - linear trend	geology
⊕ magnetic enhancement	geology
⊗ magnetic enhancement	archaeology?

ABBREVIATIONS

- D ditch
- FB former boundary
- TP telegraph pole



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7 APPENDICES

APPENDIX 1 MAGNETOMETER SURVEY

Magnetic susceptibility and soil magnetism

Iron makes up about 6% of the earth's crust and is mostly present in soils and rocks as minerals such as maghaemite and haematite. These minerals have a weak, measurable magnetic property termed magnetic susceptibility. Human activities can redistribute these minerals and change (enhance) others into more magnetic forms so that by measuring the magnetic susceptibility of the topsoil, areas, where human occupation or settlement has occurred, can be identified by virtue of the attendant increase (enhancement) in magnetic susceptibility. If the enhanced material subsequently comes to fill features, such as ditches or pits, localised isolated and linear magnetic anomalies can result whose presence can be detected by a magnetometer (fluxgate gradiometer).

In general, it is the contrast between the magnetic susceptibility of deposits filling cut features, such as ditches or pits, and the magnetic susceptibility of topsoils, subsoils and rocks into which these features have been cut, which causes the most recognisable responses. This is primarily because there is a tendency for magnetic ferrous compounds to become concentrated in the topsoil, thereby making it more magnetic than the subsoil or the bedrock. Linear features cut into the subsoil or geology, such as ditches, that have been silted up or have been backfilled with topsoil will therefore usually produce a positive magnetic response relative to the background soil levels. Discrete feature, such as pits, can also be detected.

The magnetic susceptibility of a soil can also be enhanced by the application of heat. This effect can lead to the detection of features such as hearths, kilns or areas of burning.

Types of magnetic anomaly

In the majority of instances, anomalies are termed 'positive'. This means that they have a positive magnetic value relative to the magnetic background on any given site. However, some features can manifest themselves as 'negative' anomalies that, conversely, means that the response is negative relative to the mean magnetic background.

Where it is not possible to give a probable cause of an observed anomaly a '?' is appended.

It should be noted that anomalies interpreted as modern in origin might be caused by features that are present in the topsoil or upper

layers of the subsoil. Removal of soil to an archaeological or natural layer can, therefore, remove the feature causing the anomaly.

The types of response mentioned above can be divided into five main categories that are used in the graphical interpretation of the magnetic data:

Isolated dipolar anomalies (iron spikes) These responses are typically caused by ferrous material either on the surface or in the topsoil. They cause a rapid variation in the magnetic response giving a characteristic 'spiky' trace. Although ferrous archaeological artefacts could produce this type of response, unless there is supporting evidence for an archaeological interpretation, little emphasis is normally given to such anomalies, as modern ferrous objects are common on rural sites, often being present as a consequence of manuring.

Areas of magnetic disturbance These responses can have several causes often being associated with burnt material, such as slag waste or brick rubble or other strongly magnetised/fired material. Ferrous structures such as pylons, mesh or barbed wire fencing and buried pipes can also cause the same disturbed response. A modern origin is usually assumed unless there is other supporting information.

Linear trend This is usually a weak or broad linear anomaly of unknown cause or date. These anomalies are often caused by agricultural activity, either ploughing or land drains being a common cause.

Areas of magnetic enhancement/positive isolated anomalies Areas of enhanced response are characterised by a general increase in the magnetic background over a localised area whilst discrete anomalies are manifest by an increased response (sometimes only visible on an XY trace plot) on two or three successive traverses. In neither instance is there the intense dipolar response characteristic exhibited by an area of magnetic disturbance or of an 'iron spike' anomaly (see above). These anomalies can be caused by infilled discrete archaeological features such as pits or post-holes or by kilns. They can also be caused by pedological variations or by natural infilled features on certain geologies. Ferrous material in the subsoil can also give a similar response. It can often, therefore, be very difficult to establish an anthropogenic origin without intrusive investigation or other supporting information.

Linear and curvilinear anomalies Such anomalies have a variety of origins. They may be caused by agricultural practice (recent ploughing trends, earlier ridge and furrow regimes or land drains), natural geomorphological features such as palaeochannels or by infilled archaeological ditches.

APPENDIX 2 SURVEY LOCATION INFORMATION

An initial survey base station was established using a Trimble VRS differential Global Positioning System (dGPS). The magnetometer data were georeferenced using a Trimble RTK differential Global Positioning System (Trimble R8s model).

Temporary sight markers were laid out using a Trimble VRS differential Global Positioning System (Trimble R8s model) to guide the operator and ensure full coverage. The accuracy of this dGPS equipment is better than 0.01m.

The survey data were then super-imposed onto a base map provided by the client to produce the displayed block locations. However, it should be noted that Ordnance Survey positional accuracy for digital map data has an error of 0.5m for urban and floodplain areas, 1.0m for rural areas and 2.5m for mountain and moorland areas. This potential error must be considered if coordinates are measured off hard copies of the mapping rather than using the digital coordinates.

Headland Archaeology cannot accept responsibility for errors of fact or opinion resulting from data supplied by a third party.

APPENDIX 3 GEOPHYSICAL SURVEY ARCHIVE

The geophysical archive comprises an archive disk containing the raw data in XYZ format, a raster image of each greyscale plot with associated world file, and a PDF of the report.

The project will be archived in-house in accordance with recent good practice guidelines (http://guides.archaeologydataservice.ac.uk/g2gp/Geophysics_3). The data will be stored in an indexed archive and migrated to new formats when necessary.

APPENDIX 4 DATA PROCESSING

The gradiometer data has been presented in this report in processed greyscale and minimally processed XY trace plot format.

Data collected using RTK GPS-based methods cannot be produced without minimal processing of the data. The minimally processed data has been interpolated to project the data onto a regular grid and de-striped to correct for slight variations in instrument calibration drift and any other artificial data.

A high pass filter has been applied to the greyscale plots to remove low frequency anomalies (relating to survey tracks and modern agricultural features) in order to maximise the clarity and interpretability of the archaeological anomalies.

The data has also been clipped to remove extreme values and to improve data contrast.

APPENDIX 5 OASIS DATA COLLECTION FORM: ENGLAND

PROJECT DETAILS	
Project name	Middle Farm, Featherbed Lane, Mixbury, Oxford
Short description of the project	Headland Archaeology (UK) Ltd undertook a geophysical (magnetometer) survey of a 7 hectare site at Middle Farm, south of Mixbury, Oxfordshire, where a new poultry unit is proposed. The survey has confirmed the presence of a large polygonal enclosure in the north-western corner of the application area, previously identified as a cropmark. In addition, the survey has identified a circular anomaly within the enclosure interpreted as the remains of a former roundhouse. The partial remains of a possible second roundhouse as well as several pit type responses are also identified within the enclosure clearly indicating the enclosure as a site of human occupation, possibly of Iron Age date. Curvilinear and linear anomalies are also located some of which correspond with cropmarks. These anomalies are interpreted as of possible archaeological origin. On the basis of the geophysical survey, the archaeological potential of the north-western corner of the application area is assessed as high and moderate to low in all other parts.
Project dates	Start: 17-12-2018 End: 18-12-2018
Previous/future work	No / Yes
Any associated project reference codes	MFMO18 - Contracting Unit No.
Any associated project reference codes	18/00067/SCOP – Planning Application No. MOX4798 - Related HER No
Type of project	Field evaluation
Site status	None
Current Land use	Cultivated Land 4 - Character Undetermined
Monument type	N/A None
Significant Finds	N/A None
Methods & techniques	'Geophysical Survey'
Development type	Farm infrastructure (e.g. barns, grain stores, equipment stores, etc.)
Prompt	National Planning Policy Framework - NPPF
Position in the planning process	Between deposition of an application and determination
Solid geology (other)	White Limestone Formation
Drift geology	Glacial sand and gravel
Techniques	Magnetometry
PROJECT LOCATION	
Country	England
Site location	OXFORDSHIRE CHERWELL MIXBURY Middle Farm, Featherbed Lane, Mixbury, Oxfordshire
Study area	7 Hectares
Site coordinates	SP 6066 3286 51.990447836752 -1.116489110759 51 59 25 N 001 06 59 W Point
PROJECT CREATORS	
Name of Organisation	Headland Archaeology
Project brief originator	Local Authority Archaeologist and/or Planning Authority/advisory body
Project design originator	Headland Archaeology
Project director/manager	Harrison, D
Project supervisor	Vansassenbrouck, O
Type of sponsor/funding body	Developer
PROJECT ARCHIVES	
Physical Archive Exists?	No
Digital Archive recipient	In house

Digital Contents	'Survey'
Digital Media available	'Geophysics'/ 'Text'
Paper Archive Exists?	No

PROJECT BIBLIOGRAPHY 1

Publication type	Grey literature (unpublished document/manuscript)
Title	Middle Farm, Featherbed Lane, Mixbury, Oxfordshire; Geophysical Survey
Author(s)/Editor(s)	Webb, A.
Date	2018
Issuer or publisher	Headland Archaeology
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