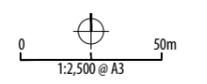


TYPE OF ANOMALY	INTERPRETATION
• dipolar isolated	ferrous material
• magnetic disturbance	ferrous material
— linear trend	ridge and furrow
— linear trend	agricultural
— linear trend	field drain
— linear	former field boundary
— linear trend	geological variation
• magnetic enhancement	geology
• magnetic enhancement	archaeology?
• magnetic enhancement	archaeology

ABBREVIATIONS
 E - enclosure
 FB - former boundary
 TR? - trackway?



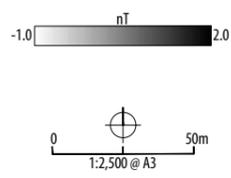
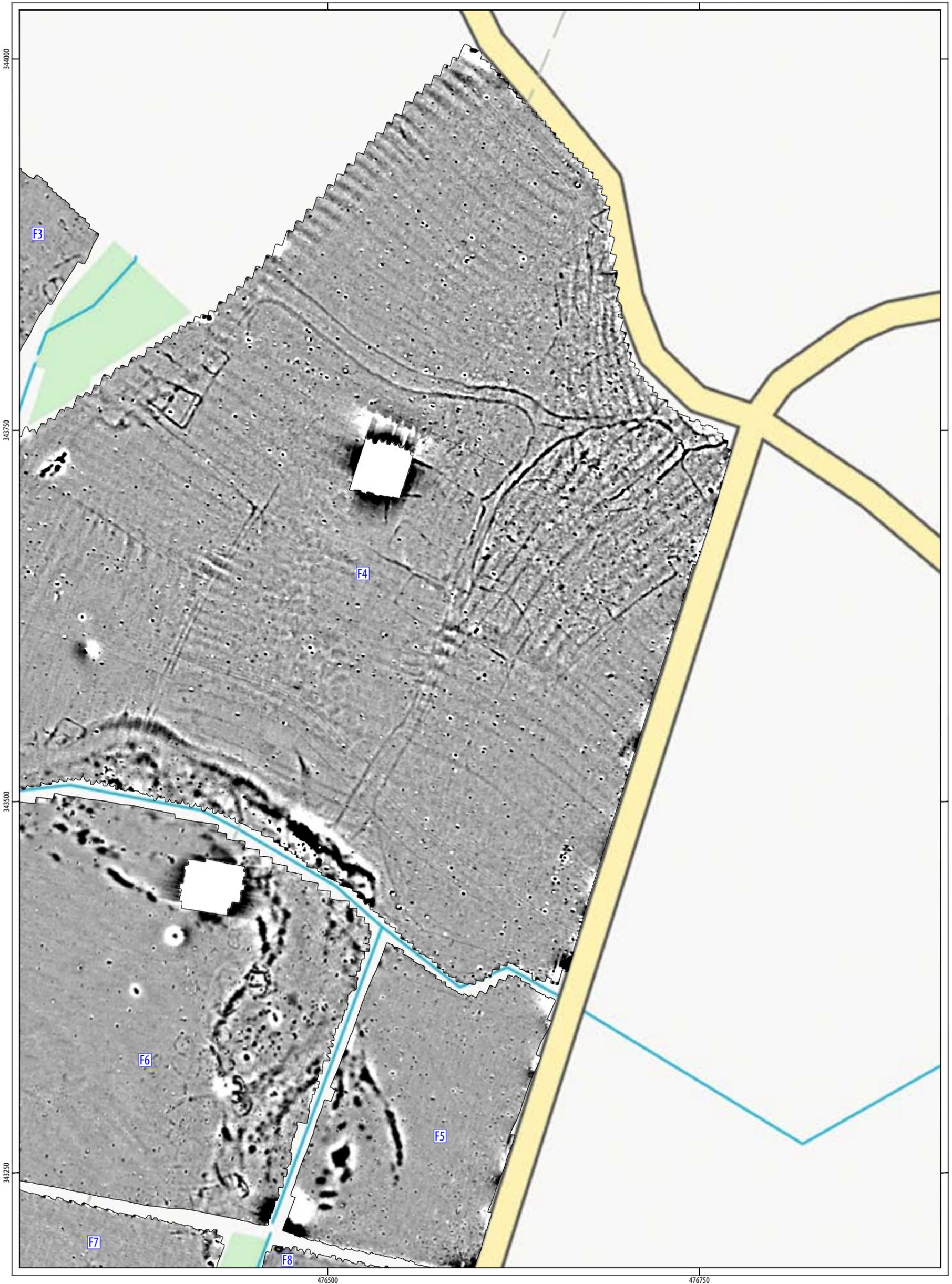
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ILLUS 14 Interpretation of magnetometer data; Sector 2

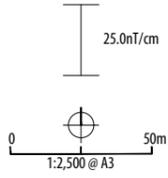
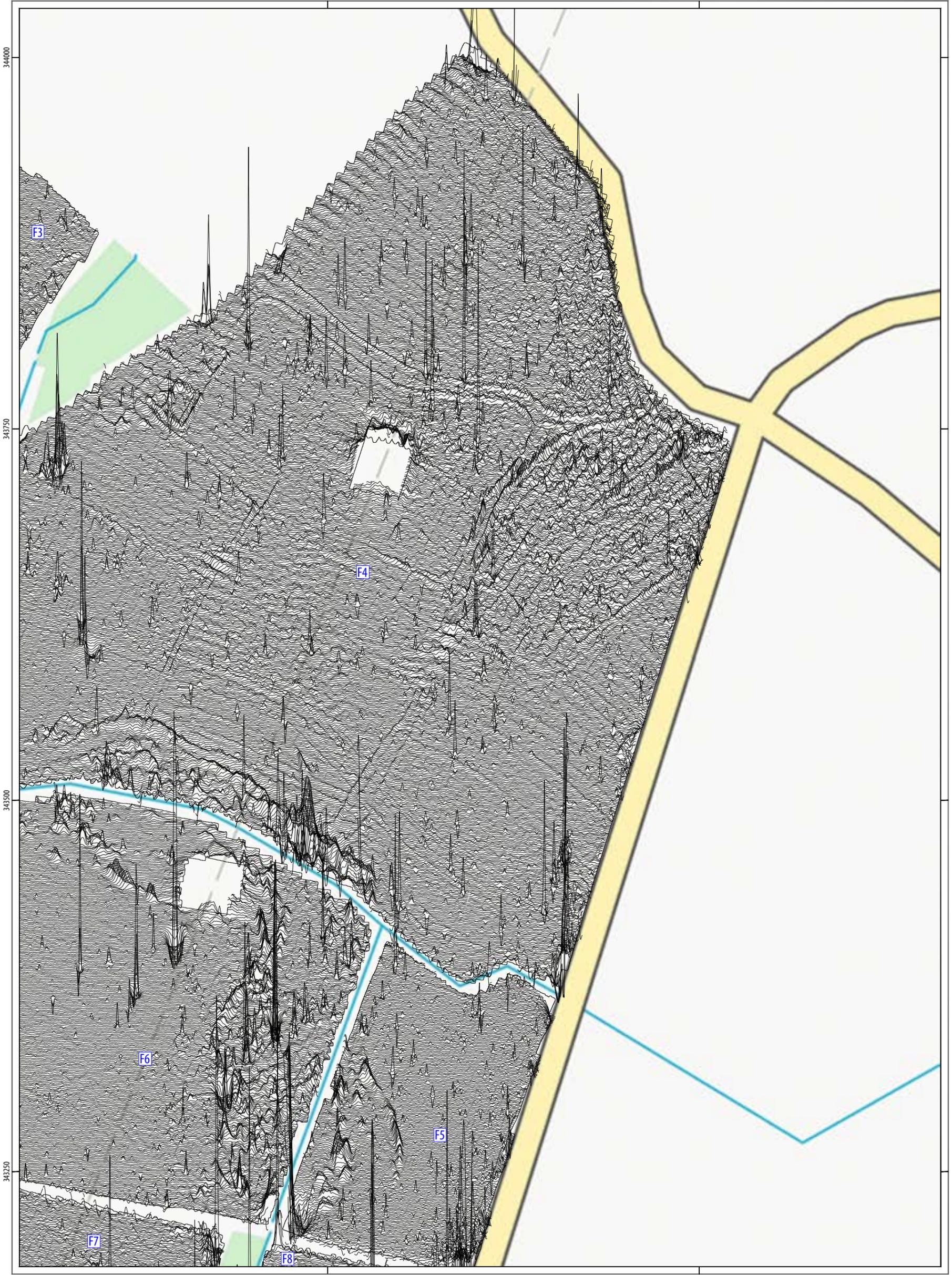


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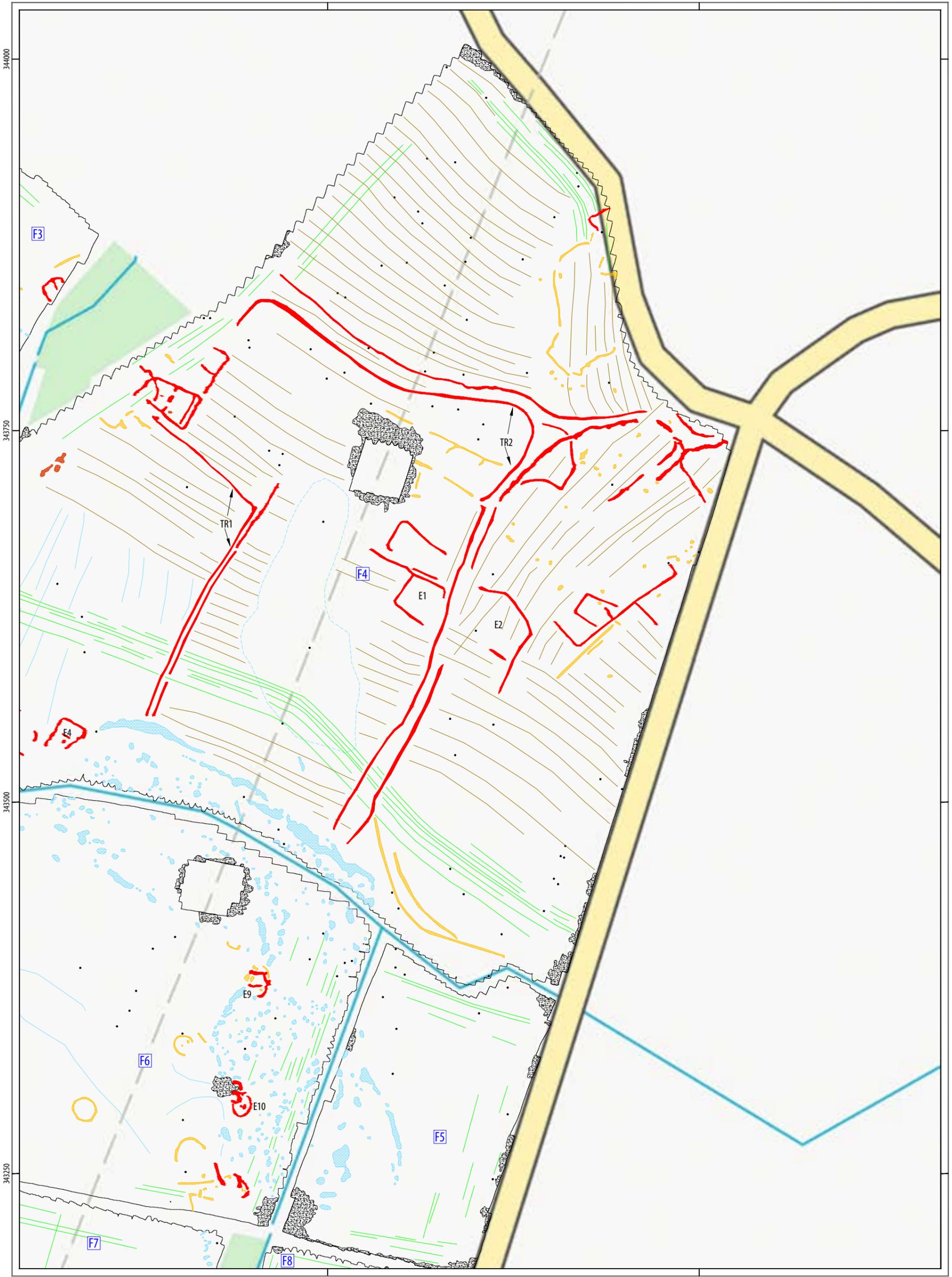
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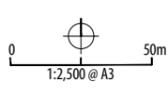
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ILLUS 16 XY trace plot of minimally processed magnetometer data; Sector 3



TYPE OF ANOMALY	INTERPRETATION	TYPE OF ANOMALY	INTERPRETATION	ABBREVIATIONS
● dipolar isolated	ferrous material	⊗ magnetic enhancement	archaeology?	E - enclosure
● magnetic disturbance	ferrous material	⊙ magnetic enhancement	kiln/burning	TR - trackway
— linear trend	ridge and furrow	● magnetic enhancement	archaeology	
— linear trend	agricultural			
— linear trend	geological variation			
— linear trend	geology			
⊗ magnetic enhancement				



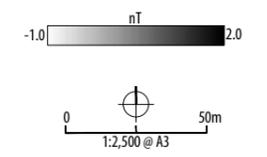
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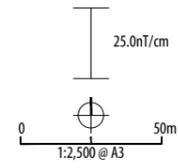
ILLUS 17 Interpretation of magnetometer data; Sector 3



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ILLUS 18 Processed greyscale magnetometer data; Sector 4



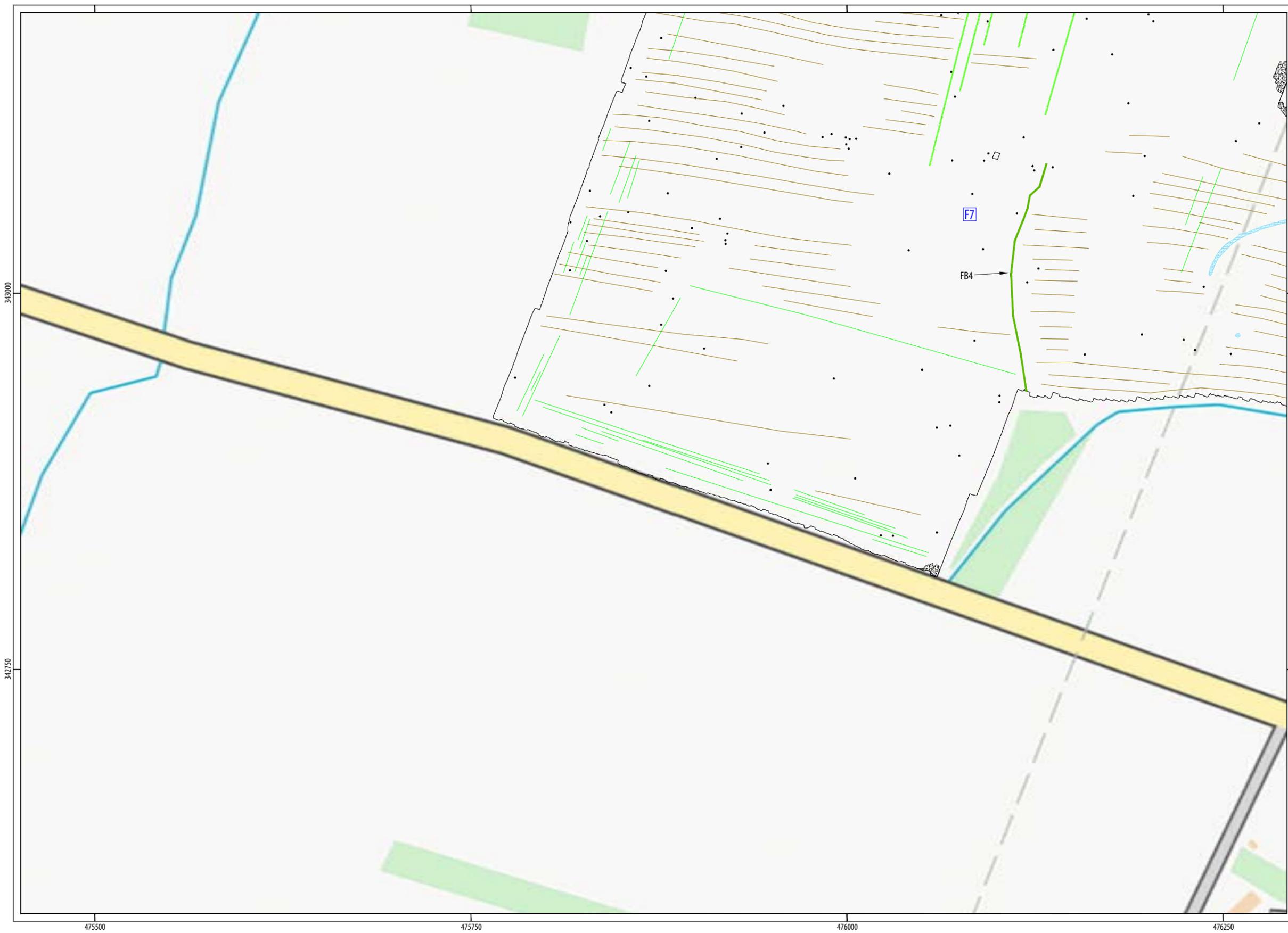
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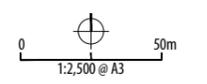
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ILLUS 19 XY trace plot of minimally processed magnetometer data; Sector 4



TYPE OF ANOMALY	INTERPRETATION
● dipolar isolated	ferrous material
● magnetic disturbance	ferrous material
— linear trend	ridge and furrow
— linear trend	agricultural
— linear trend	field drain
— linear	former field boundary
⊕ magnetic enhancement	geology

ABBREVIATIONS
FB - former boundary



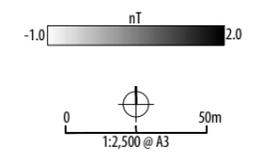
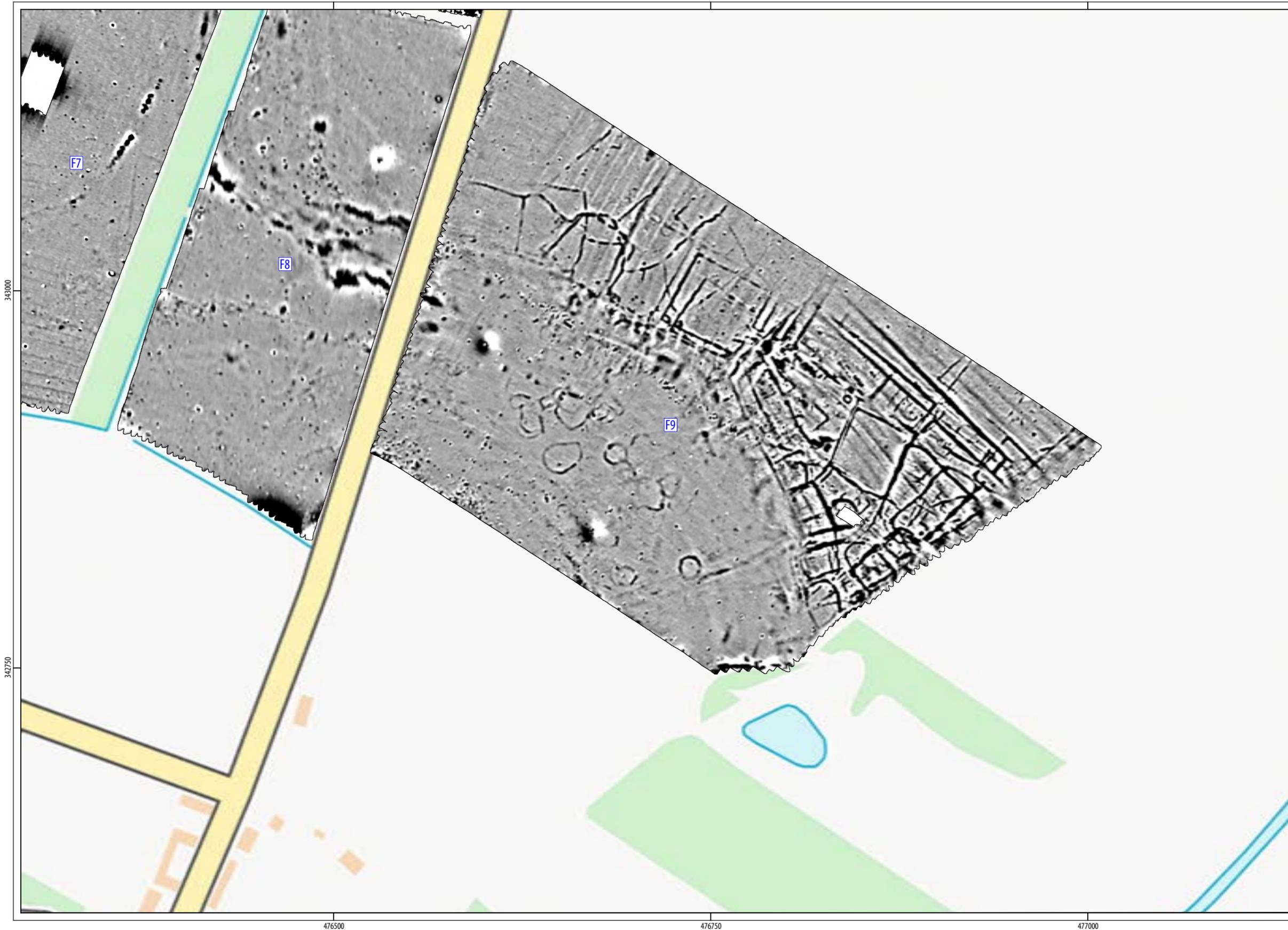
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ILLUS 20 Interpretation of magnetometer data; Sector 4



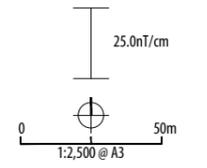
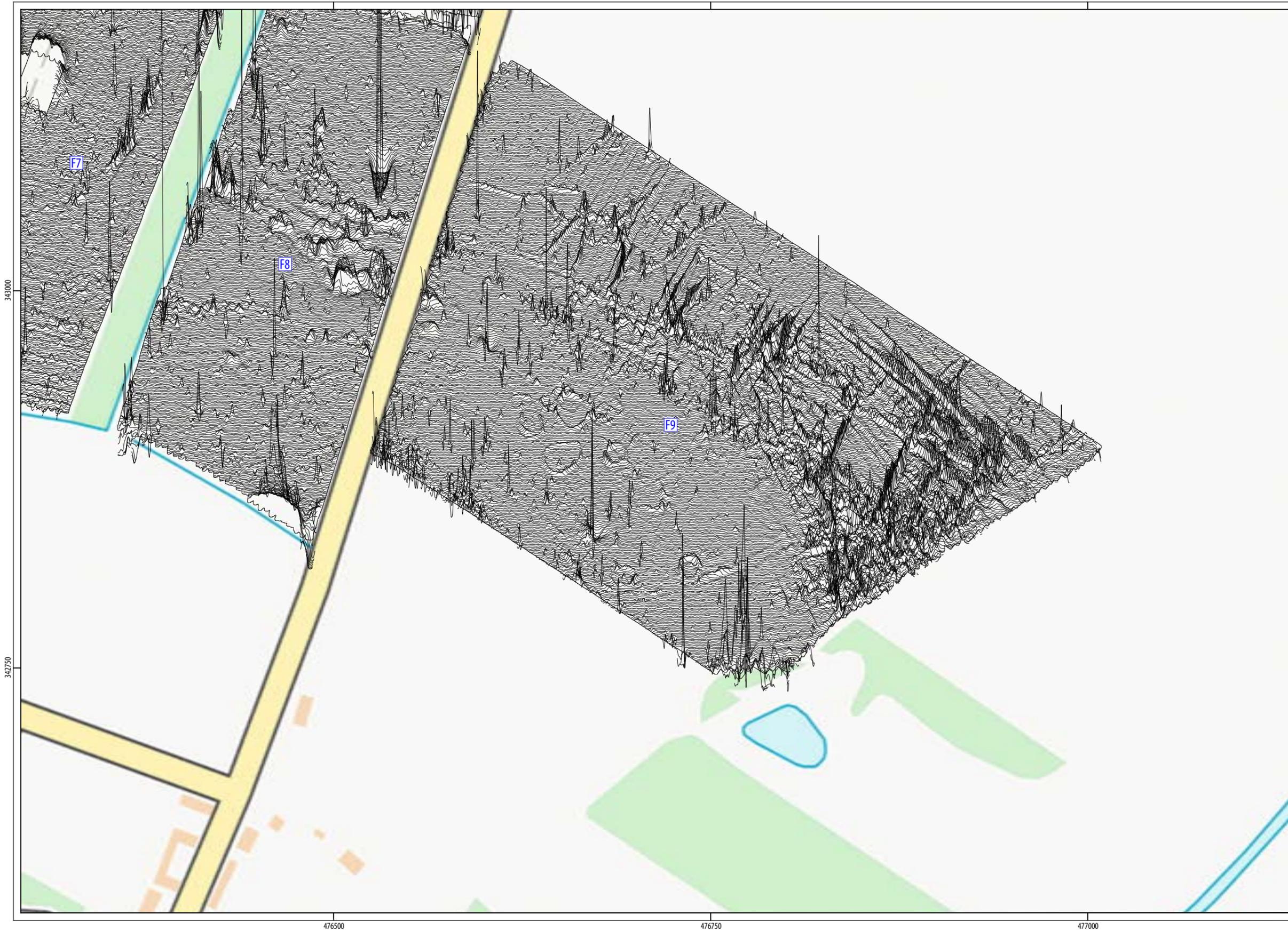
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ILLUS 21 Processed greyscale magnetometer data; Sector 5



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ILLUS 22 XY trace plot of minimally processed magnetometer data; Sector 5



TYPE OF ANOMALY	INTERPRETATION
• dipolar isolated	ferrous material
● magnetic disturbance	ferrous material
— linear trend	ridge and furrow
— linear trend	agricultural
— linear	former field boundary
— linear trend	geological variation
⊕ magnetic enhancement	geology
⊗ magnetic enhancement	archaeology?
⊠ magnetic enhancement	kiln/burning
● magnetic enhancement	archaeology

ABBREVIATIONS
 FB - former boundary

ABBREVIATIONS
 D - ditch
 E - enclosure
 FB - former boundary
 TR? - trackway?

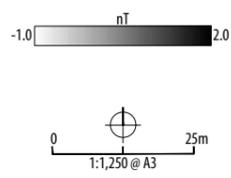
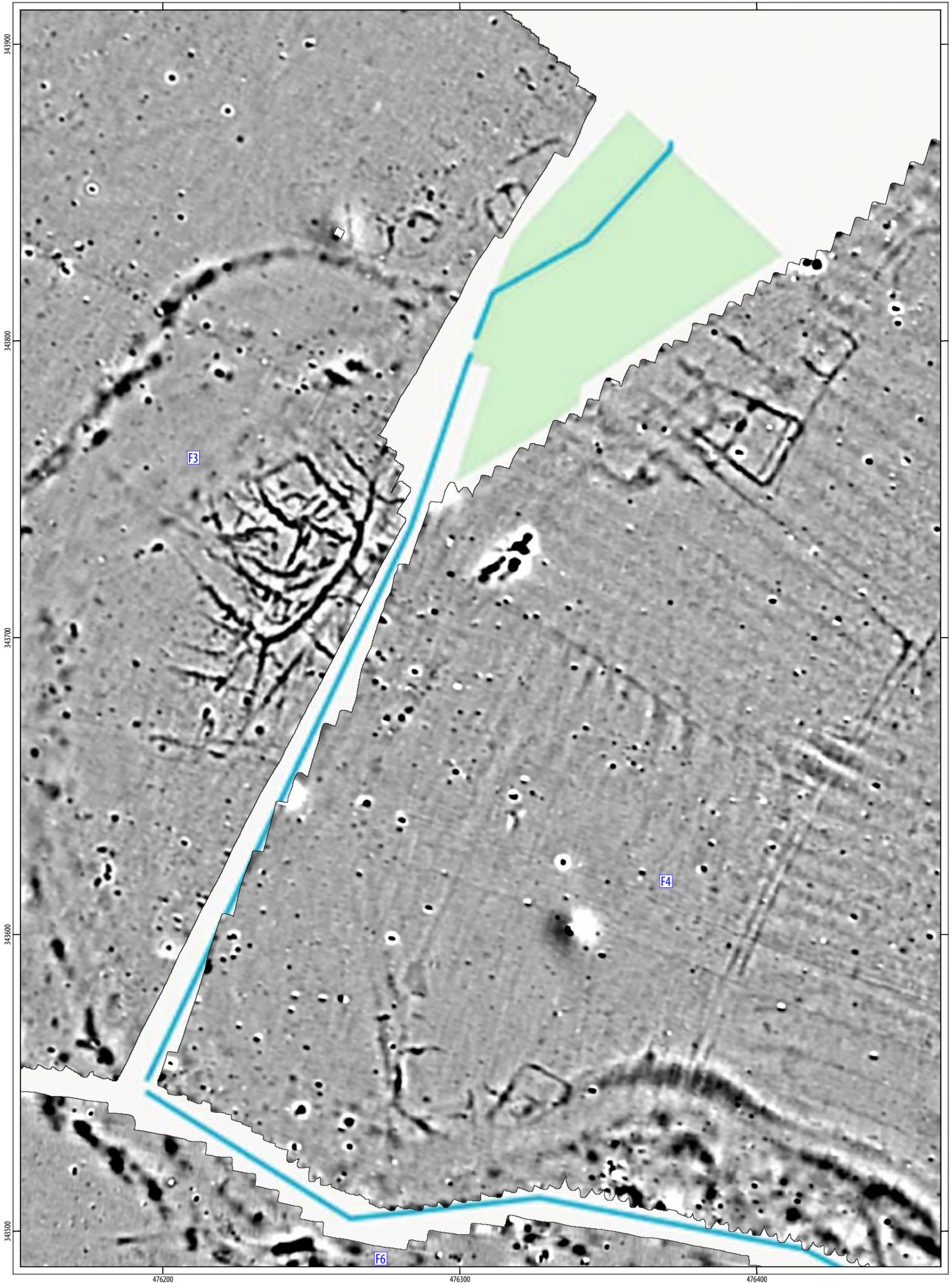


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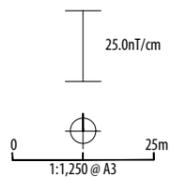
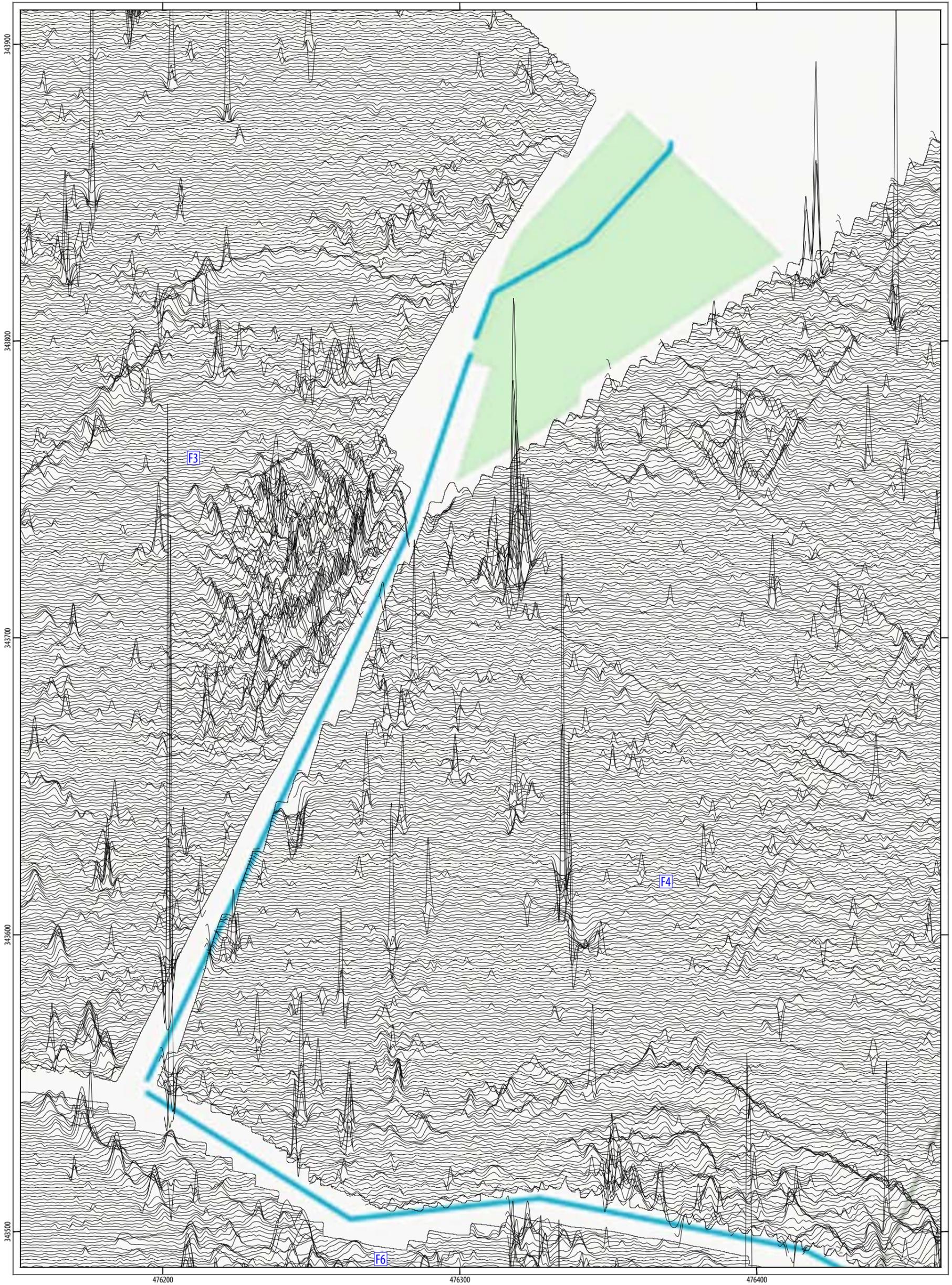


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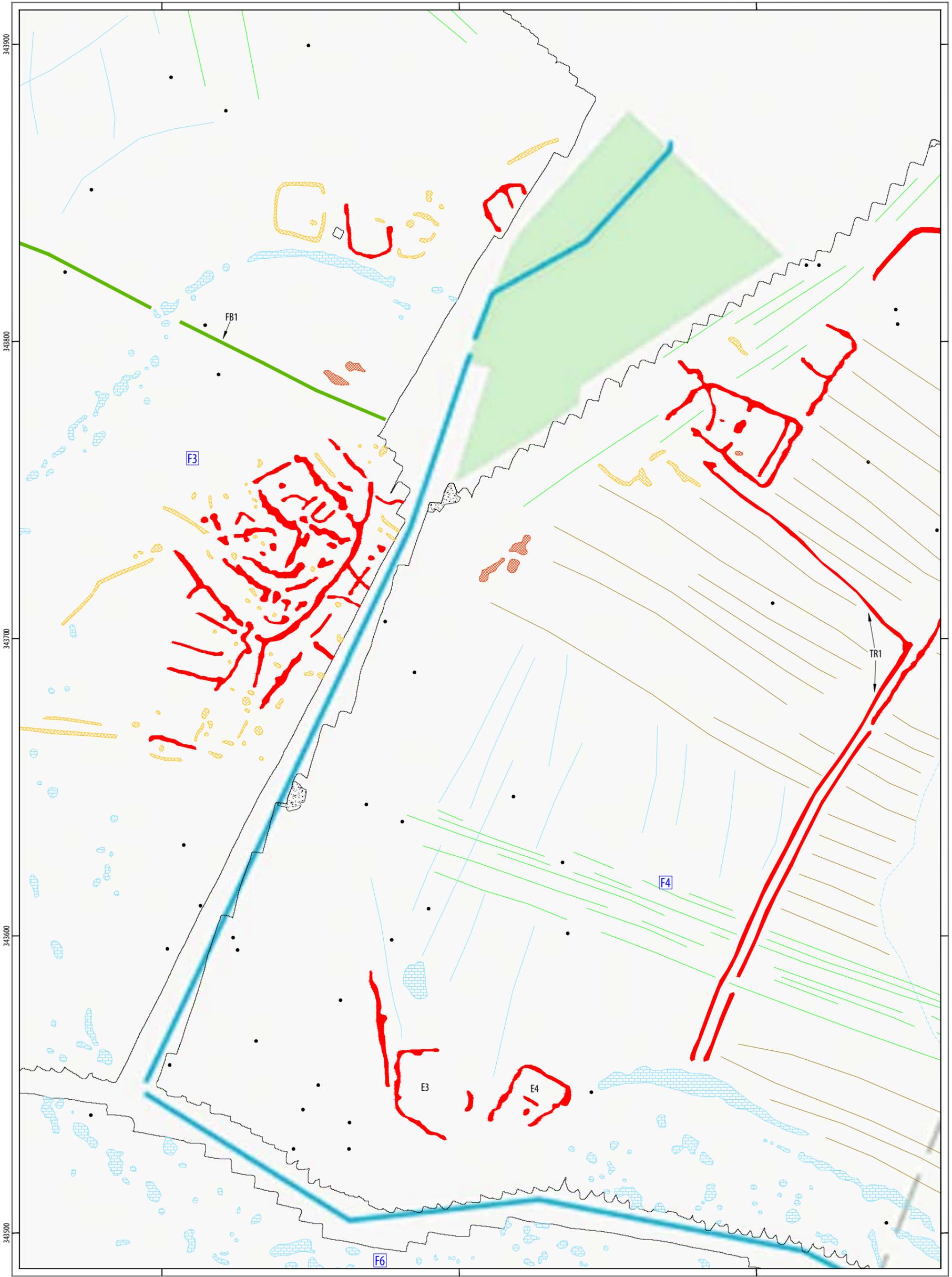


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● dipolar isolated	ferrous material	⊕ magnetic enhancement	geology
● magnetic disturbance	ferrous material	⊗ magnetic enhancement	archaeology?
— linear trend	ridge and furrow	⊗ magnetic enhancement	kiln/burning
— linear trend	agricultural	● magnetic enhancement	archaeology
— linear	former field boundary		
— linear trend	geological variation		

ABBREVIATIONS
E - enclosure
FB - former boundary
TR - trackway

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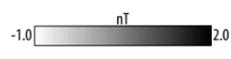
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ILLUS 26 Interpretation of magnetometer data; AAA1 West

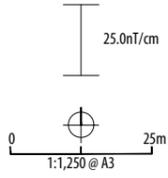


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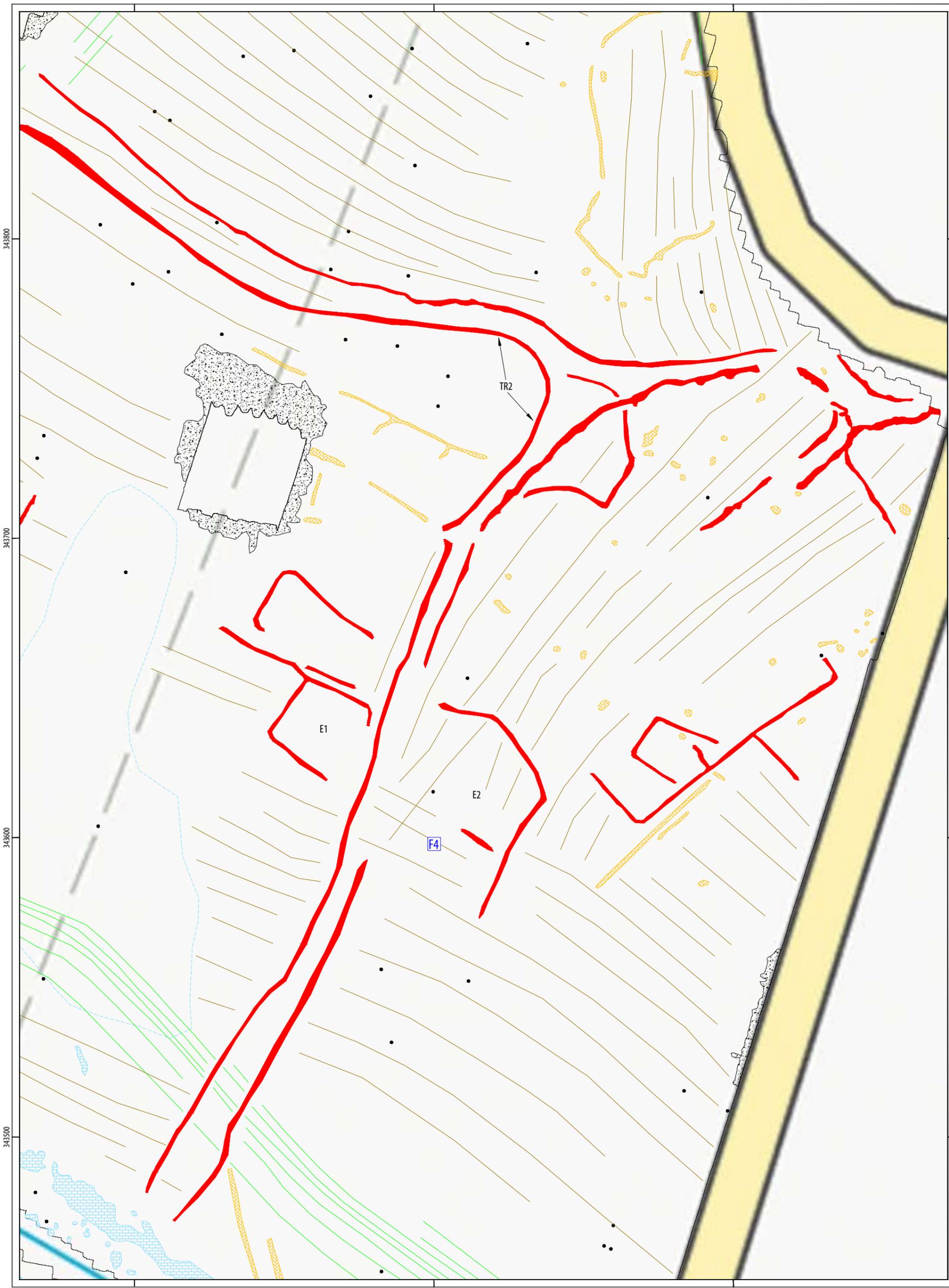
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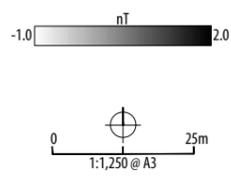
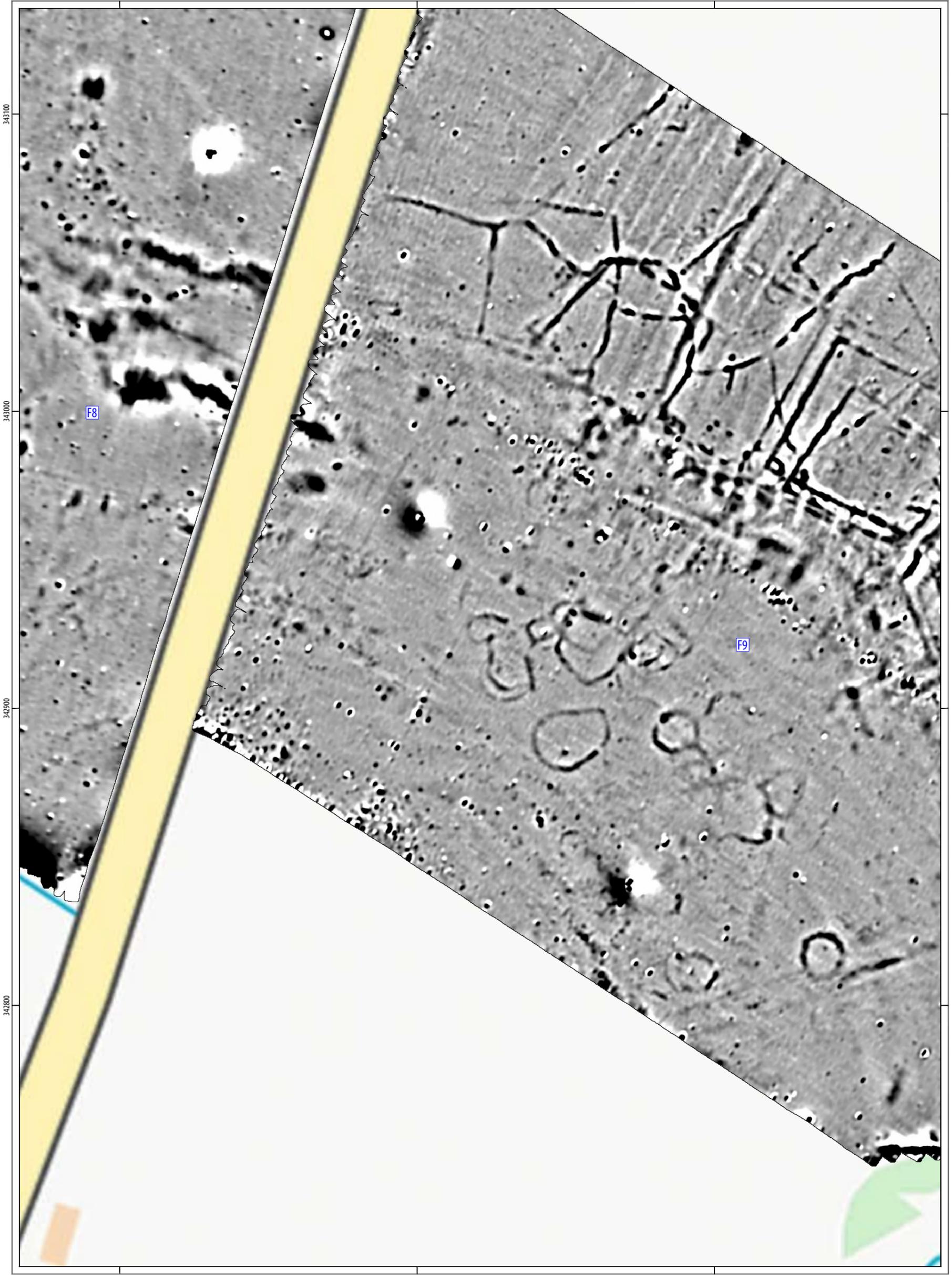
ILLUS 28 XY trace plot of minimally processed magnetometer data; AAA1 East



<p>TYPE OF ANOMALY</p> <ul style="list-style-type: none"> ● dipolar isolated ● magnetic disturbance — linear trend — linear trend — linear trend — linear trend — magnetic enhancement 	<p>INTERPRETATION</p> <ul style="list-style-type: none"> ferrous material ferrous material ridge and furrow agricultural geological variation geology 	<p>TYPE OF ANOMALY</p> <ul style="list-style-type: none"> — magnetic enhancement — magnetic enhancement 	<p>INTERPRETATION</p> <ul style="list-style-type: none"> archaeology? archaeology 	<p>ABBREVIATIONS</p> <ul style="list-style-type: none"> E - enclosure TR - trackway 	<p>PROJECT TSFN22 Thoroton Solar Farm Thoroton Nottinghamshire</p> <p>CLIENT Neo Environmental Ltd</p>	<p>HEADLAND ARCHAEOLOGY</p> <p>Headland Archaeology Yorkshire & North Units 23-25 Acorn Business Centre Balme Road Cleckheaton BD19 4EZ t 0127 493 8019 www.headlandarchaeology.com</p>
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ILLUS 29 Interpretation of magnetometer data; AAA1 East



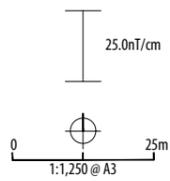
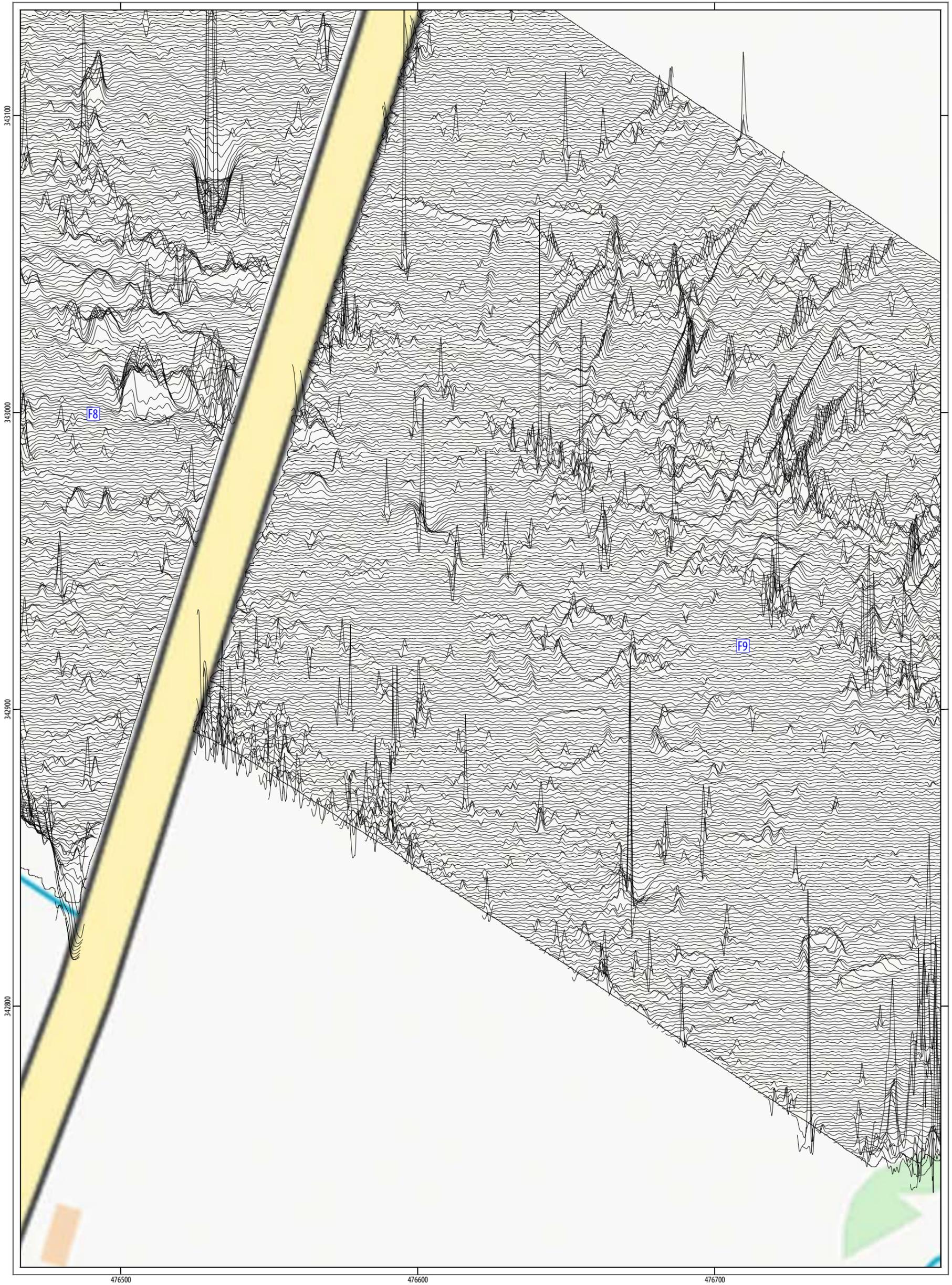


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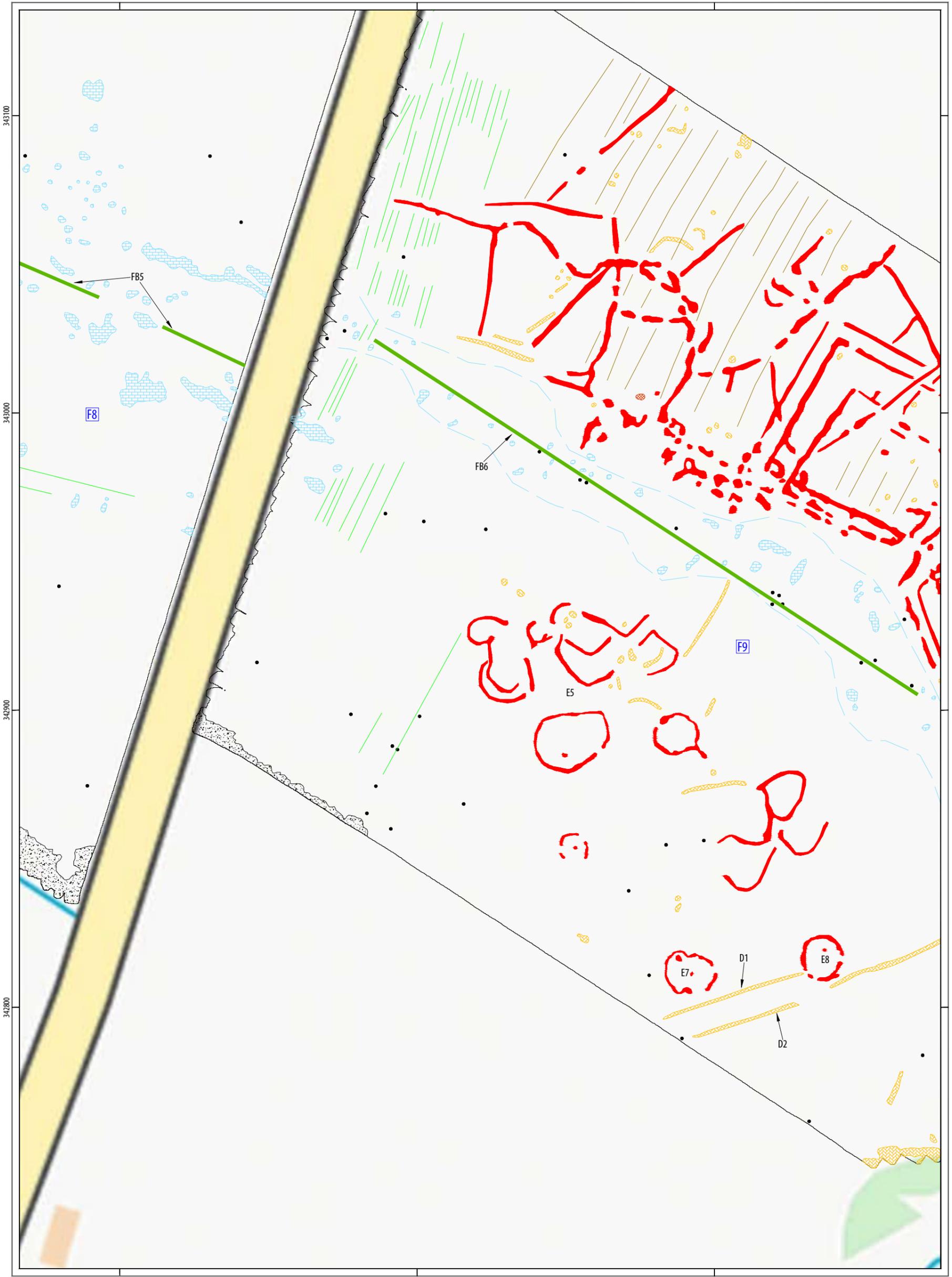
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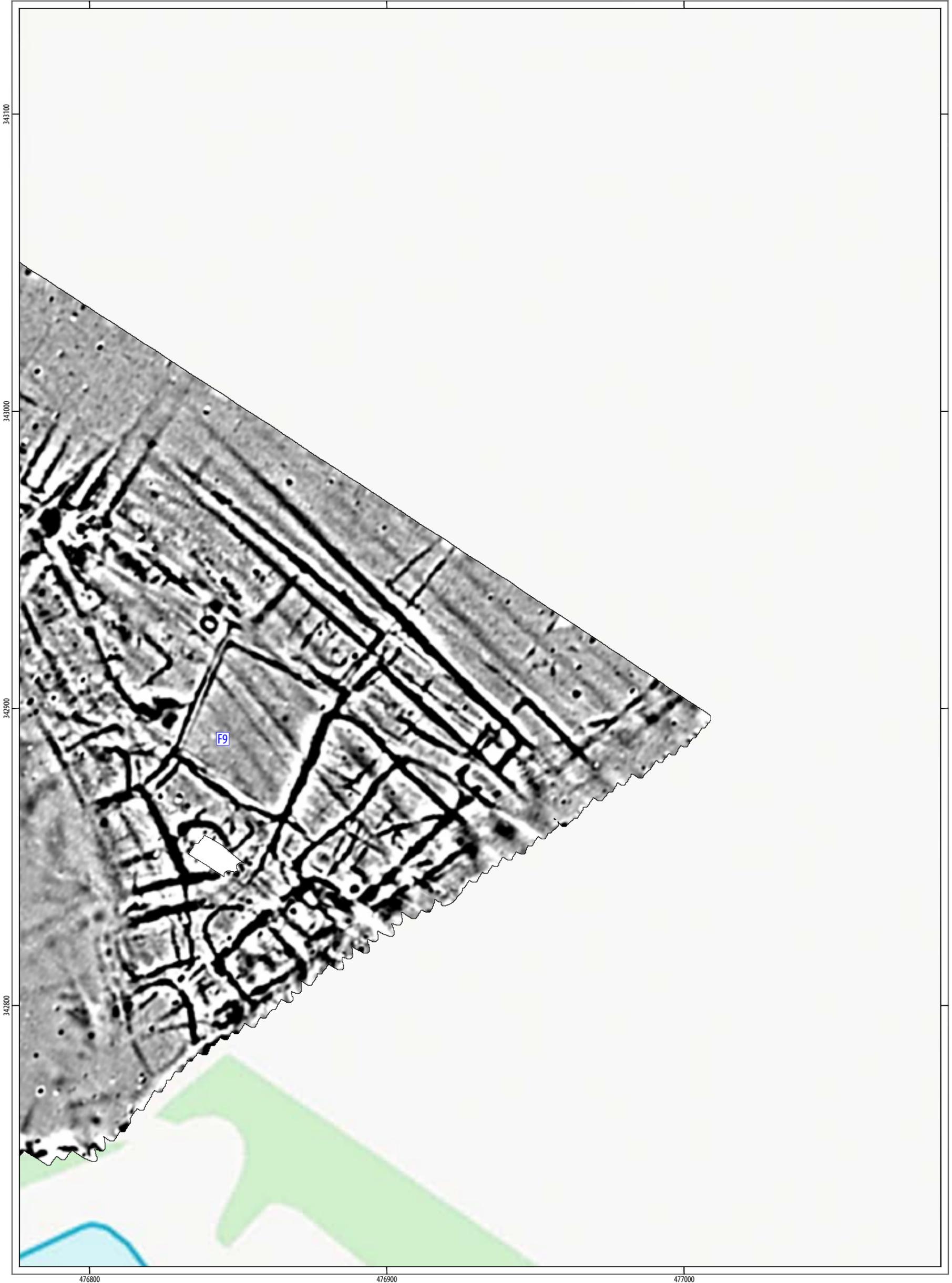
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ILLUS 31 XY trace plot of minimally processed magnetometer data; AAA2 West

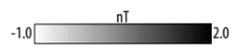


<p>TYPE OF ANOMALY</p> <ul style="list-style-type: none"> ● dipolar isolated ● magnetic disturbance — linear trend — linear trend — linear — linear trend 	<p>INTERPRETATION</p> <ul style="list-style-type: none"> ferrous material ferrous material ridge and furrow agricultural former field boundary geological variation 	<p>TYPE OF ANOMALY</p> <ul style="list-style-type: none"> ● magnetic enhancement ● magnetic enhancement ● magnetic enhancement ● magnetic enhancement 	<p>INTERPRETATION</p> <ul style="list-style-type: none"> geology archaeology? kiln/burning archaeology 	<p>ABBREVIATIONS</p> <ul style="list-style-type: none"> D - ditch E - enclosure FB - former boundary 	<p>PROJECT TSFN22 Thoroton Solar Farm Thoroton Nottinghamshire</p> <p>CLIENT Neo Environmental Ltd</p>	<p>HEADLAND ARCHAEOLOGY</p> <p>Headland Archaeology Yorkshire & North Units 23-25 Acorn Business Centre Balme Road Cleckheaton BD19 4EZ t 0127 493 8019 www.headlandarchaeology.com</p>
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ILLUS 32 Interpretation of magnetometer data; AAA2 West



ILLUS 33 Processed greyscale magnetometer data; AAA2 East

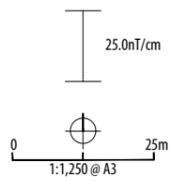
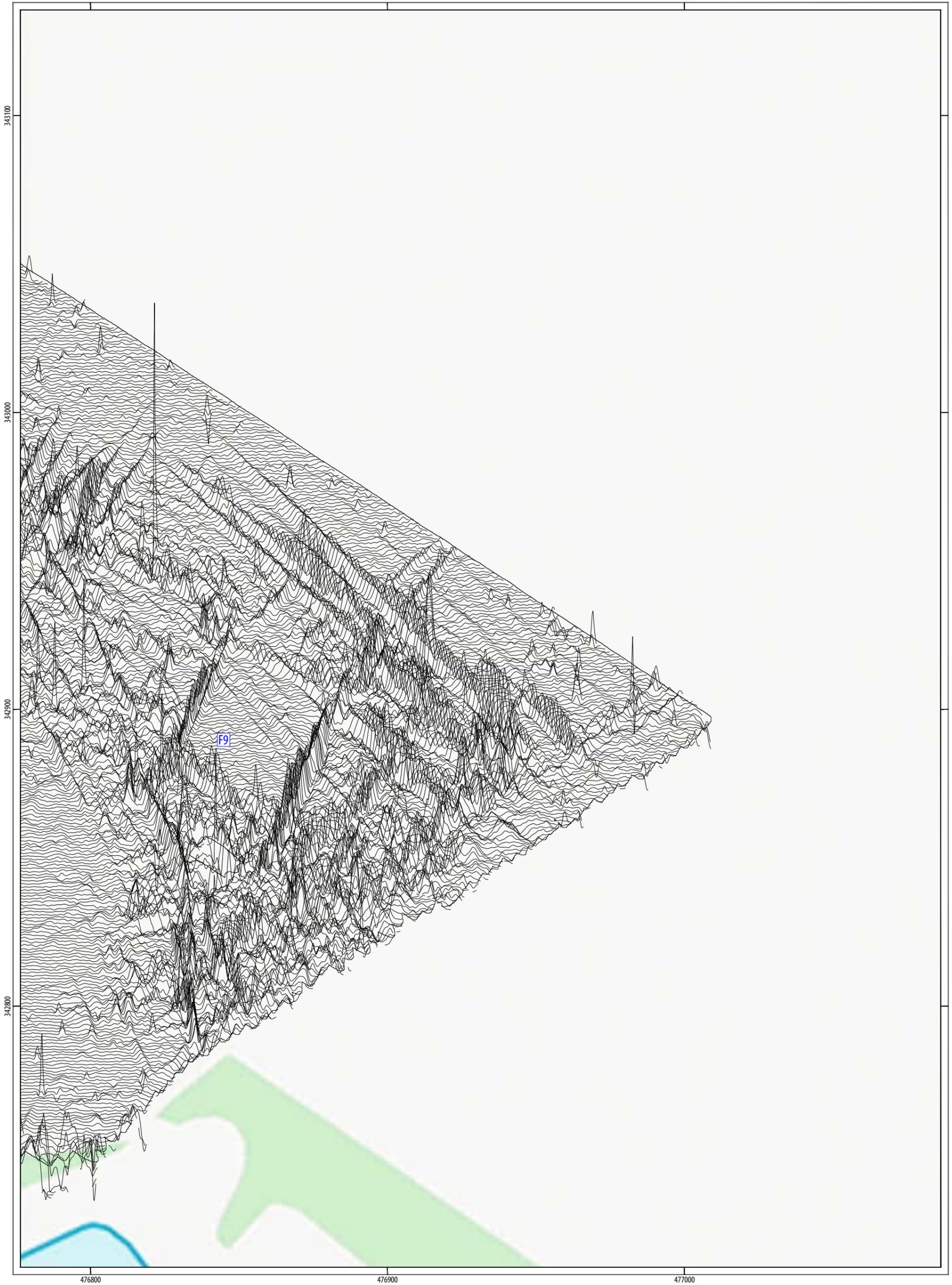


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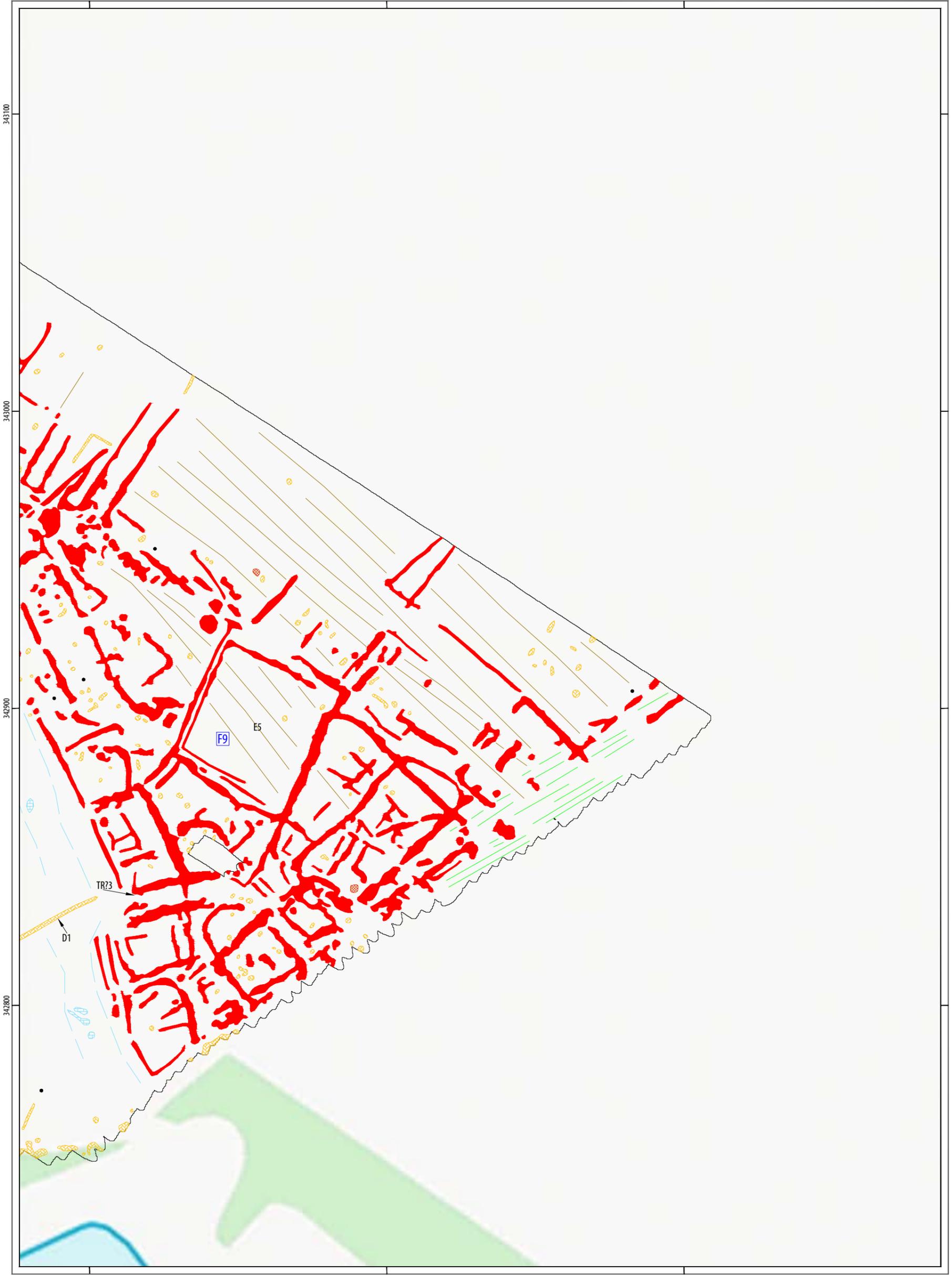
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ILLUS 34 XY trace plot of minimally processed magnetometer data; AAA2 East



TYPE OF ANOMALY	INTERPRETATION	TYPE OF ANOMALY	INTERPRETATION	ABBREVIATIONS
● dipolar isolated	ferrous material	⊗ magnetic enhancement	archaeology?	D - ditch
● magnetic disturbance	ferrous material	⊙ magnetic enhancement	kiln/burning	E - enclosure
— linear trend	ridge and furrow	● magnetic enhancement	archaeology	TR? - trackway?
— linear trend	agricultural			
— linear trend	geological variation			
⊗ magnetic enhancement	geology			

ILLUS 35 Interpretation of magnetometer data; AAA2 East

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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 the topsoil, subsoil and rock, 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 most 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 introduced into the topsoil during 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 and buried pipes can also cause the same disturbed response. A modern origin is usually assumed unless there is other supporting information.

Lightning-induced remnant magnetisation (LIRM)

LIRM anomalies are thought to be caused in the near surface soil horizons by the flow of an electrical current associated with lightning strikes. These observed anomalies have a strong bipolar signal which decreases with distance from the spike point and often appear as linear or radial in shape.

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 was 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 associate 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) 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 ARCHIVE