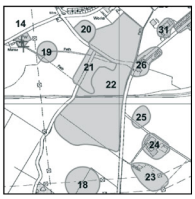
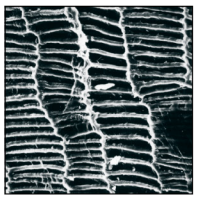
PHMN18










LAND AT PLEASLEY HILL, MANSFIELD, NOTTINGHAMSHIRE

GEOPHYSICAL SURVEY

commissioned by Orion Heritage
on behalf of Helier Limited

November 2018

HEADLAND ARCHAEOLOGY

REGISTERED ORGANISATION CIfA

LAND AT PLEASLEY HILL, MANSFIELD, NOTTINGHAMSHIRE

GEOPHYSICAL SURVEY

commissioned by Orion Heritage
on behalf of Helier Limited

November 2018

This report adheres to the quality standard of ISO 9001:2015

PROJECT INFO:

HA Project Code **PHMN18** / NGR **SK 5122 6308** / Parish **Mansfield** / Local Authority **Nottinghamshire** / OASIS Ref. **headland5-334609**

PROJECT TEAM:

Project Manager **David Harrison** / Author **Alistair Webb** / Fieldwork **Bethany Shenton, Mark Evans, Phoebe Utting, Ross Bishop** / Graphics **Eleanor Winter, Nick Hannon, Rafael Maya Torcelly**

Approved by **David Harrison** D Harrison.....

Headland Archaeology North
Unit 16 | Hillside | Beeston Rd | Leeds LS11 8ND
t 0113 387 6430
e north@headlandarchaeology.com
w www.headlandarchaeology.com

HEADLAND ARCHAEOLOGY

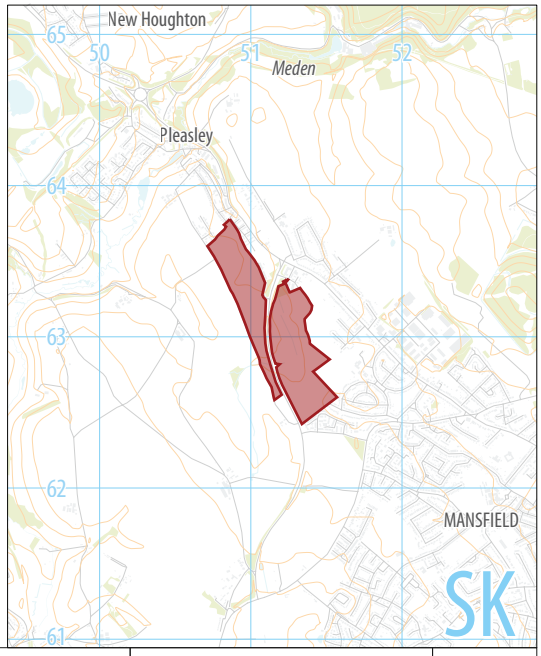
PROJECT SUMMARY

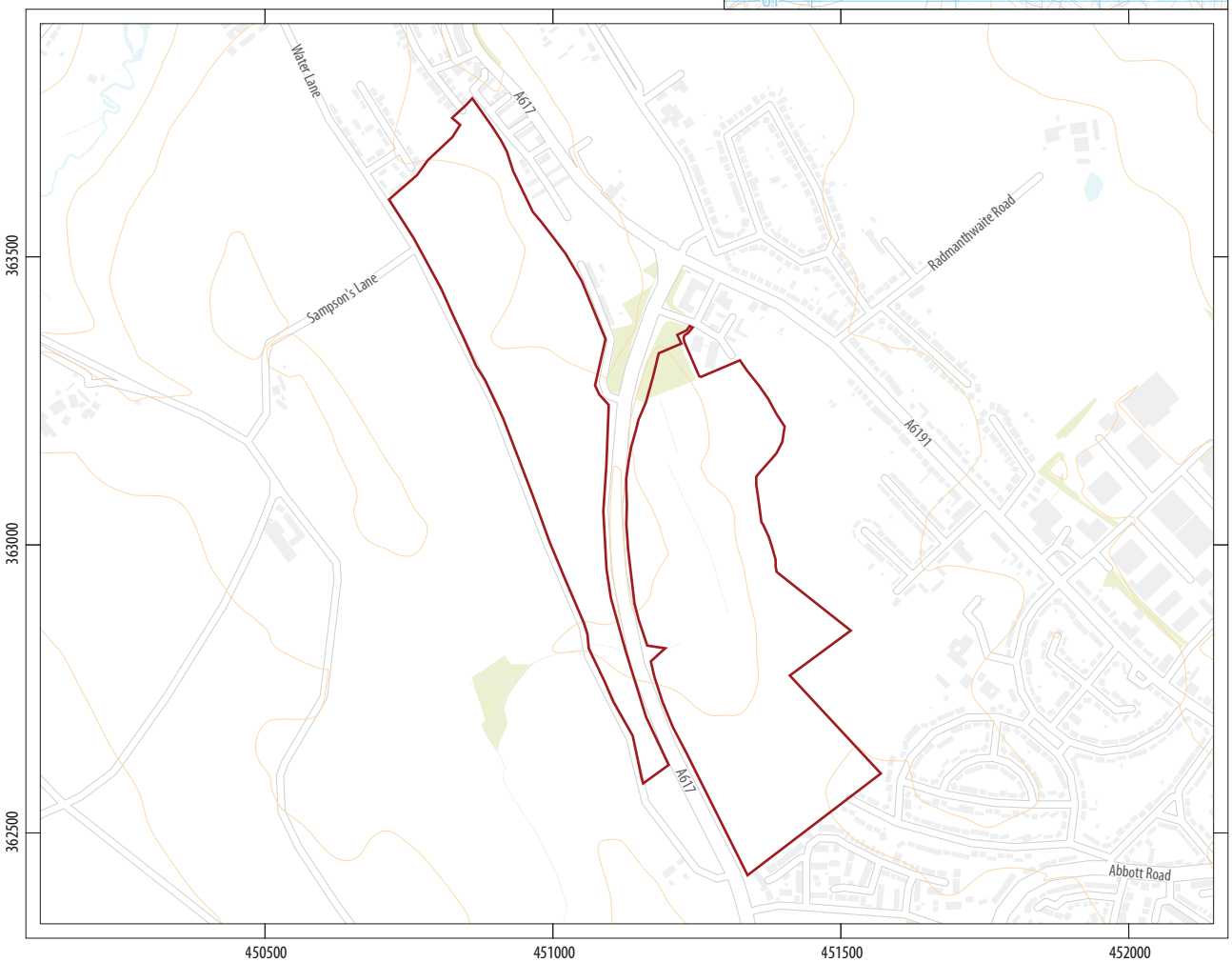
Headland Archaeology (UK) Ltd undertook a geophysical (magnetometer) survey of a 40-hectare site at Pleasley Hill, near Mansfield, Nottinghamshire, to provide information on the archaeological potential of the site in advance of its possible development. The survey has identified anomalies indicative of archaeological activity across the whole of the site including an extensive former field system and trackway, an enclosure (which may or may not be contemporary) and a ring ditch (the remains of a prehistoric burial mound). All these features were previously unknown. Other anomalies are due to recent and post-medieval ploughing and modern activity. Overall the survey has confirmed the conclusions of the earlier desk-based appraisal which assessed the site to have moderate to high archaeological potential for remains of the Roman to post-medieval and prehistoric periods respectively although there are clearly large parts of the site containing no archaeological anomalies.

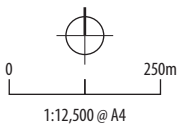
CONTENTS

LIST OF ILLUSTRATIONS

Land at Pleasley Hill
Mansfield
Nottinghamshire







proposed development area

HEADLAND ARCHAEOLOGY
Headland Archaeology North
Unit 16 | Hillside | Beeston Rd | Leeds LS11 8ND
t 0113 387 6430
e north@headlandarchaeology.com
w www.headlandarchaeology.com

ILLUS 1 Site location

LAND AT PLEASLEY HILL, MANSFIELD, NOTTINGHAMSHIRE

GEOPHYSICAL SURVEY

1 INTRODUCTION

Headland Archaeology was commissioned by Orion Heritage on behalf of Helier Ltd (the Client), to undertake a geophysical (magnetometer) survey on land adjacent at Pleasley Hill, Mansfield which is being proposed for development. The survey was undertaken in order to support any future planning proposal by assessing the heritage potential of the application site and, therefore the impact of any proposed development on the historic environment.

The work was undertaken in accordance with Written Scheme of Investigation (Hannon 2018), 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 between the 11th and 18th September 2018.

1.1 SITE LOCATION, TOPOGRAPHY AND LAND-USE

The proposed development area (PDA) comprises two irregularly shaped areas on the southern periphery of the village of Pleasley Hill, Nottinghamshire, split either side of the A617, and centred on SK 5122 6308 (Illus 1). The western area is bounded to the south and west by Water Lane, and by the A617 and the A6191 on the north and east. The eastern area is bounded by the A6191 to the north and east, Water Lane to the west and Bull Farm to the south.

The site was in agricultural use at the time of survey (see Illus 2 – 5 inclusive) and comprised thirteen different fields or parcels of land (see Illus 6) which had recently been harvested and were under stubble and/or sown with a fodder crop. One field was overgrown (F7) and unsuitable for survey (see Illus 4).

The eastern half of the site is relatively flat at 130m Above Ordnance Datum (AOD) rising to 140m AOD in the north of the western half of the site.

1.2 GEOLOGY AND SOILS

The bedrock geology comprises Cadeby Formation – Dolostone. No superficial deposits are recorded (NERC 2018).

The soils are classified in the Soilscape 5 Association, characterised as freely draining lime-rich loamy soils (Cranfield University 2018).

2 ARCHAEOLOGICAL BACKGROUND

Trent and Peak Archaeology carried out a rapid desk-based appraisal of the proposed allocation site in response to comments from Historic England. The appraisal concluded that 'the site is located within an area of considerable archaeological interest and has a high potential to contain archaeological remains dating to the Mesolithic, Neolithic and Bronze Age periods'. This assessment is based primarily on the number of prehistoric artefacts recovered both from within the PDA and the immediate environs. The potential for archaeological remains of Romano-British, medieval and post-medieval date was assessed as moderate; a cropmark interpreted as an enclosure of uncertain date has been identified 0.7km west of the PDA. There is also evidence of post-medieval agricultural activity.

ILLUS 2 F2, looking north

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 PDA. This will, therefore, enable an assessment to be made of the impact of any 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 1m intervals (1m 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. 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 1:10,000. Illus 2 – 5 respectively are site condition photographs. Illus 6 is a 1:5,000 survey location plan showing the direction of survey as GPS swaths. Illus 7 and Illus 8 present the overall greyscale and interpretative plot at a scale of 1:4,000. Large-scale, fully processed (greyscale) data, minimally processed data (XY traceplot) and accompanying interpretative plot are presented at a scale of 1:2,500 in Illus 9 – 14 inclusive. Larger scale (1:1,000) plots of two areas of archaeological potential are presented in Illus 15 – 20 inclusive.

ILLUS 3 F8 (south), looking east

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 (Hannon 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

The ground conditions were very good (see Illus 2 – 5 inclusive) and contributed to a high standard of data throughout.

The magnetic background is fairly variable across the PDA being relatively homogenous in F1 but with a lot more variation across the remainder of the site. Against this background, numerous 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 high magnitude dipolar linear anomaly (SP1; see Illus 9 – 14) aligned north-west/south-east along the length of Water Lane is caused by a buried service pipe. A second pipe is identified north-east/south-west across F13 (SP2; See Illus 12 – 14).

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

ILLUS 4 F7, looking north

4.2 AGRICULTURAL ANOMALIES

Analysis of historical Ordnance Survey (OS) mapping indicates that the division and layout of land within the PDA has undergone considerable alterations since the publication of the first edition OS map in 1881, most obviously with the construction of the A6191 which bisects the site, but also with the removal of a number of field boundaries to create larger fields. Three of these former boundaries have been detected by the survey as fragmented linear anomalies (FB1 – FB3). The anomalies are caused by the contrast between soil-filled ditches and the surrounding soil.

Parallel linear trend anomalies are identified throughout the PDA on differing alignments but mostly parallel or orthogonal to the current field boundaries. The tightly spaced, very straight, linear trends reflect the direction of recent ploughing. The more widely spaced, slightly curving, trends are more likely caused by the medieval and post-medieval practice of ridge and furrow cultivation. The anomalies are caused by the magnetic contrast between the soil-filled furrows and the surrounding soil.

4.3 GEOLOGICAL ANOMALIES

Broad sinuous and curvilinear low magnitude anomalies are identified in several locations across the PDA. These anomalies are interpreted as of geological origin being due to variation and composition of the dolostone bedrock and the soils.

A series of broadly parallel linear anomalies aligned broadly north/south in F1, which are oblique to both the current field boundaries and the earlier field system (described below). These anomalies are also interpreted as geological and are thought to be due to soil-filled fissures in the bedrock geology.

4.4 ARCHAEOLOGICAL ANOMALIES

A series of conjoining linear anomalies have been identified in all the fields within the PDA, extending from F1 in the north to F13 at the southern end (see Illus 8). These anomalies are aligned oblique to the orientation of the current pattern of field division and are interpreted as soil-filled ditches forming a system of field division and enclosure which pre-dates the current layout. At the northern end of the PDA, in F1, parallel linear anomalies (TR1) aligned broadly north-west/south-east probably locates a trackway (defined by ditches to either side), with rectangular enclosures extending west and east of this trackway. The anomalies fade within the south of F1, reappearing across the north of F6. The field system becomes less well defined through the central part of the PDA but is clearly defined again at the southern end of the site, in Fields 9 to 13, where the overall pattern is clearly discerned.

Area of Archaeological Potential 1

A single small square enclosure, approximately 40m by 40m, located within the field system described above, is identified in the north-western corner of F3 (E1, Illus 15 – 17). Only the southern and eastern sides manifest as magnetic anomalies; the response from the western side is masked by magnetic noise from SP1 along the edge of the field and the northern side likely falls beneath the extant boundary. Several discrete anomalies are identified within the enclosure which may be due to pits. However, these discrete anomalies might also just be due to variations within the plough-

ILLUS 5 F11, looking north-east

soil. It is not clear whether this enclosure forms part of the field system described above or is of more recent origin as it respects the current field boundaries.

Area of Archaeological Potential 2

Also identified within the former field system is a small circular anomaly in F10 (RD1, Illus 18–20) about 10m to 12m in diameter. This is interpreted as a ring ditch, likely locating the ploughed down remains of a round barrow.

5 CONCLUSION

The survey has successfully evaluated the site and has clearly identified linear anomalies which define a system of field division and enclosure which pre-dates the current field pattern. Evidence of possible settlement activity is limited to one much smaller enclosure, but it is not clear whether this feature is contemporary with the earlier or current system of division. In addition, a circular anomaly locates the ploughed down remains of a round barrow of likely Bronze Age date. Overall the survey has corroborated the conclusions of the desk-based appraisal in assessing the archaeological potential of the site to of moderate to high potential.

6 REFERENCES

Natural Environment Research Council (NERC) (2018) ***British Geological Survey*** http://www.bgs.ac.uk/ accessed 27 September 2018

Cranfield University (2018) ***Cranfield Soil and Agrifood Institute Soilscapes*** http://www.landis.org.uk/soilscapes/ accessed 27 September 2018

Europae Archaeologia Consilium (2016) ***EAC Guidelines for the use of Geophysics in Archaeology*** Archaeolingua 2016

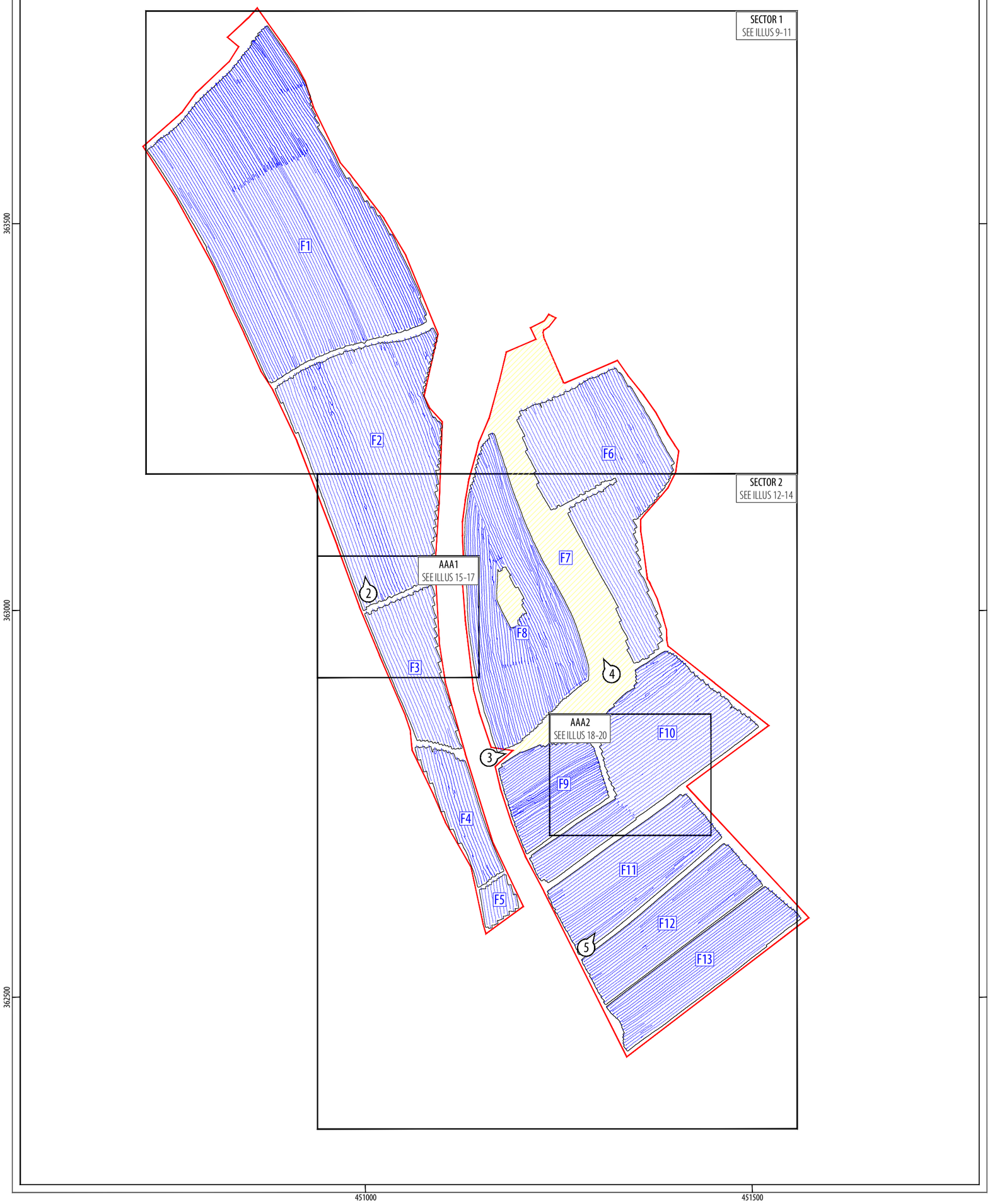
Hannon N (2018) ***Land at Pleasley Hill, Mansfield, Nottinghamshire; Written Scheme of Investigation for Geophysical Survey*** [unpublished client document] Headland Archaeology Ref PHMN18

Department of Communities and Local Government (DCLG) (2012) ***National Planning Policy Framework*** https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/6077/2116950.pdf accessed 27 September 2018

Ministry of Housing, Communities and Local Government (MHCLG) (2018) ***National Planning Policy Framework*** https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/740441/National_Planning_Policy_Framework_web_accessible_version.pdf accessed 27 September 2018

Gaffney C & Gater J (2003) ***Revealing the Buried Past: Geophysics for Archaeologists*** Stroud

Chartered Institute for Archaeologists (ClfA) (2016) ***Standard and guidance for archaeological geophysical survey*** Reading http://www.archaeologists.net/sites/default/files/ClfAS%26GGeophysics_2.pdf accessed 27 September 2018



proposed development area
GPS swaths
area unsuitable for survey
location and direction of ILLUS 2-5

0 100m
1:5,000 @ A3

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Land at Pleasley Hill
Mansfield
Nottinghamshire

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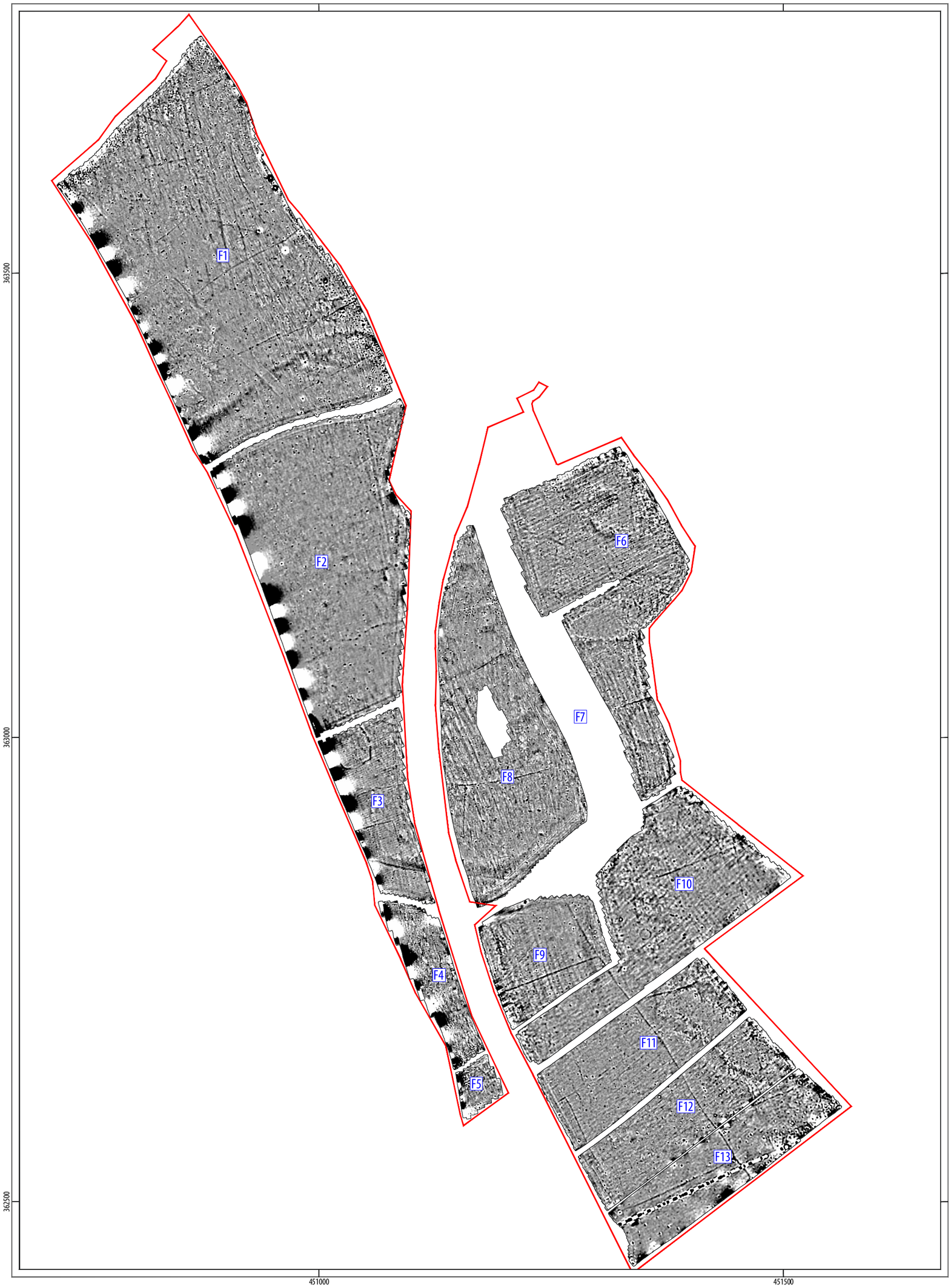
NORTH Unit 16, Hillside, Beeston Road
Leeds LS11 8ND
0113 387 6430
www.headlandarchaeology.com

ILLUS 6 Survey location showing GPS swaths (1:5,000)



nT
-2.0 3.0

0 100m
1:4,000 @ A3

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ILLUS 7 Processed greyscale magnetometer data (1:4,000)

TYPE OF ANOMALY	INTERPRETATION
dipolar isolated	ferrous material
magnetic disturbance	ferrous material
dipolar linear	service pipe
linear trend	ridge and furrow
linear trend	agricultural
linear	former field boundary

TYPE OF ANOMALY	INTERPRETATION
linear trend	geological variation
magnetic enhancement	geology
magnetic enhancement	archaeology?
magnetic enhancement	archaeology

ABBREVIATIONS

- **E** Enclosure
- **FB** Former Boundary
- **SP** Service Pipe
- **RD** Ring-ditch
- **TR** Trackway

0 100m
1:4,000 @ A3

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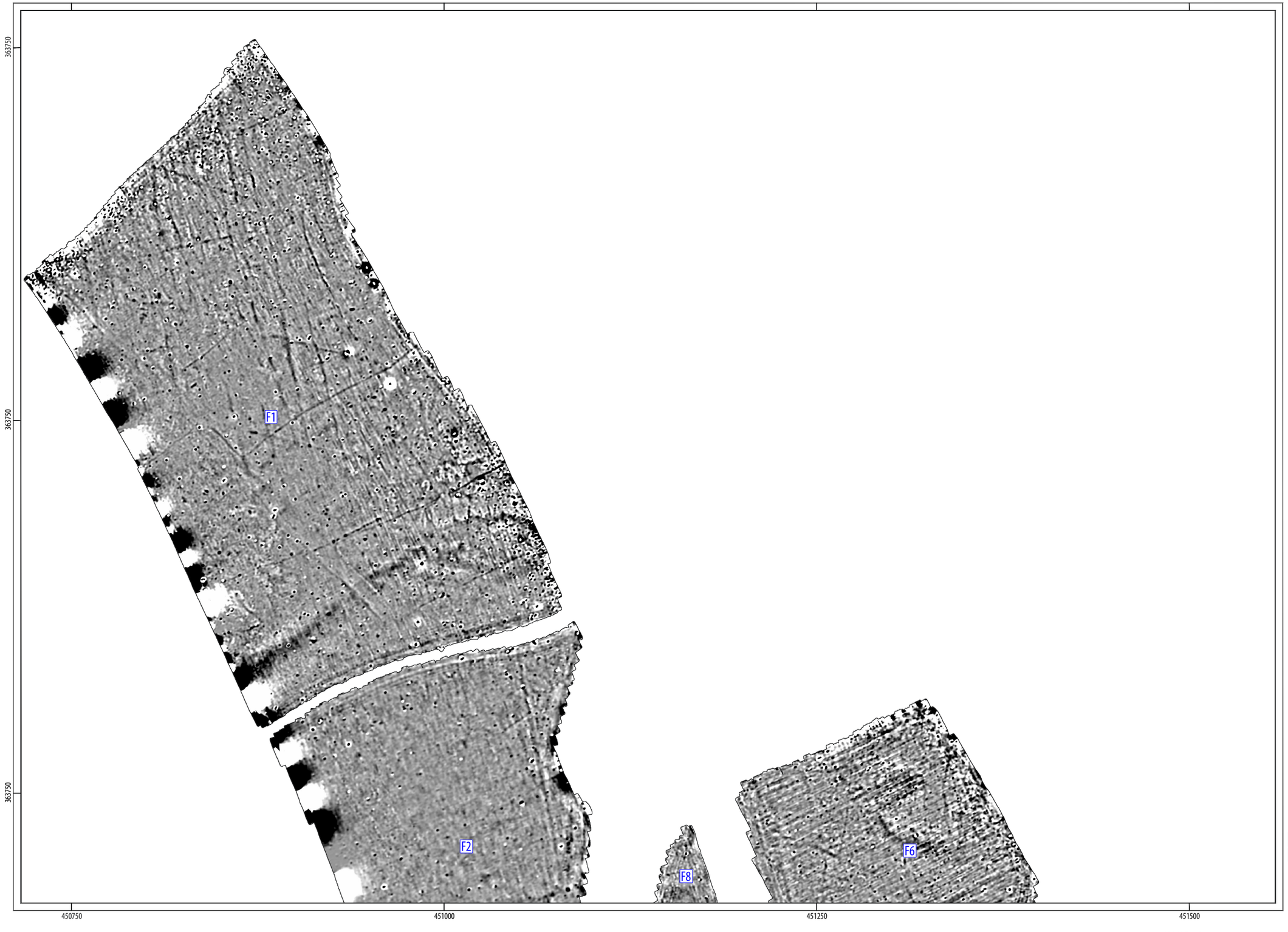
ILLUS 8 Interpretation of magnetometer data (1:4,000)



nT
-2.0 3.0

0 50m
1:2,500 @ A3

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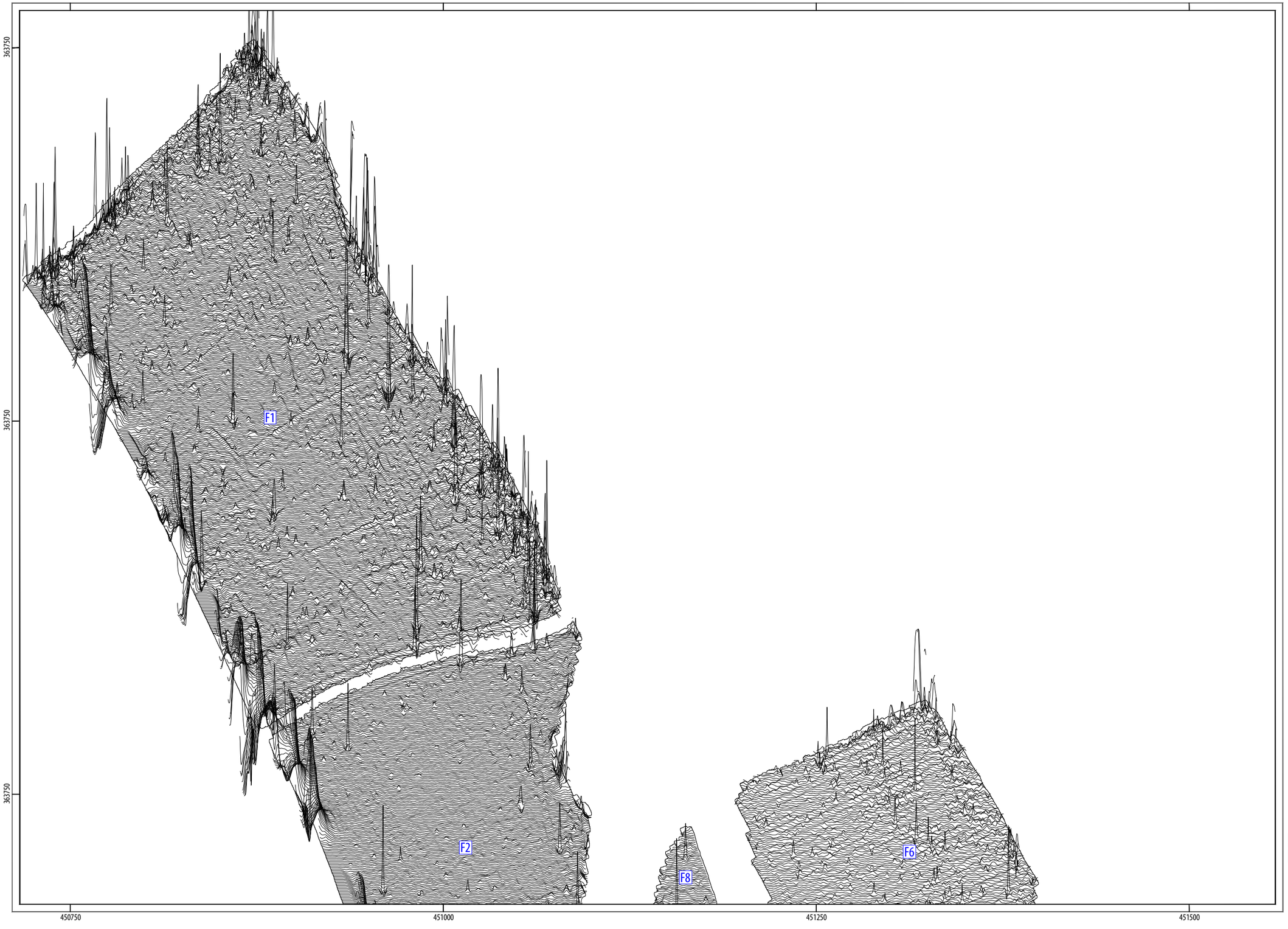
ILLUS 9 Processed greyscale magnetometer data; Sector 1 (1:2,500)



50.0nT/cm

0 50m

1:2,500 @ A3

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ILLUS 10 XY trace plot of minimally processed magnetometer data; Sector 1 (1:2,500)

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

ABBREVIATIONS

FB Former Boundary
SP Service Pipe
TR Trackway

0 50m
1:2,500 @ A3

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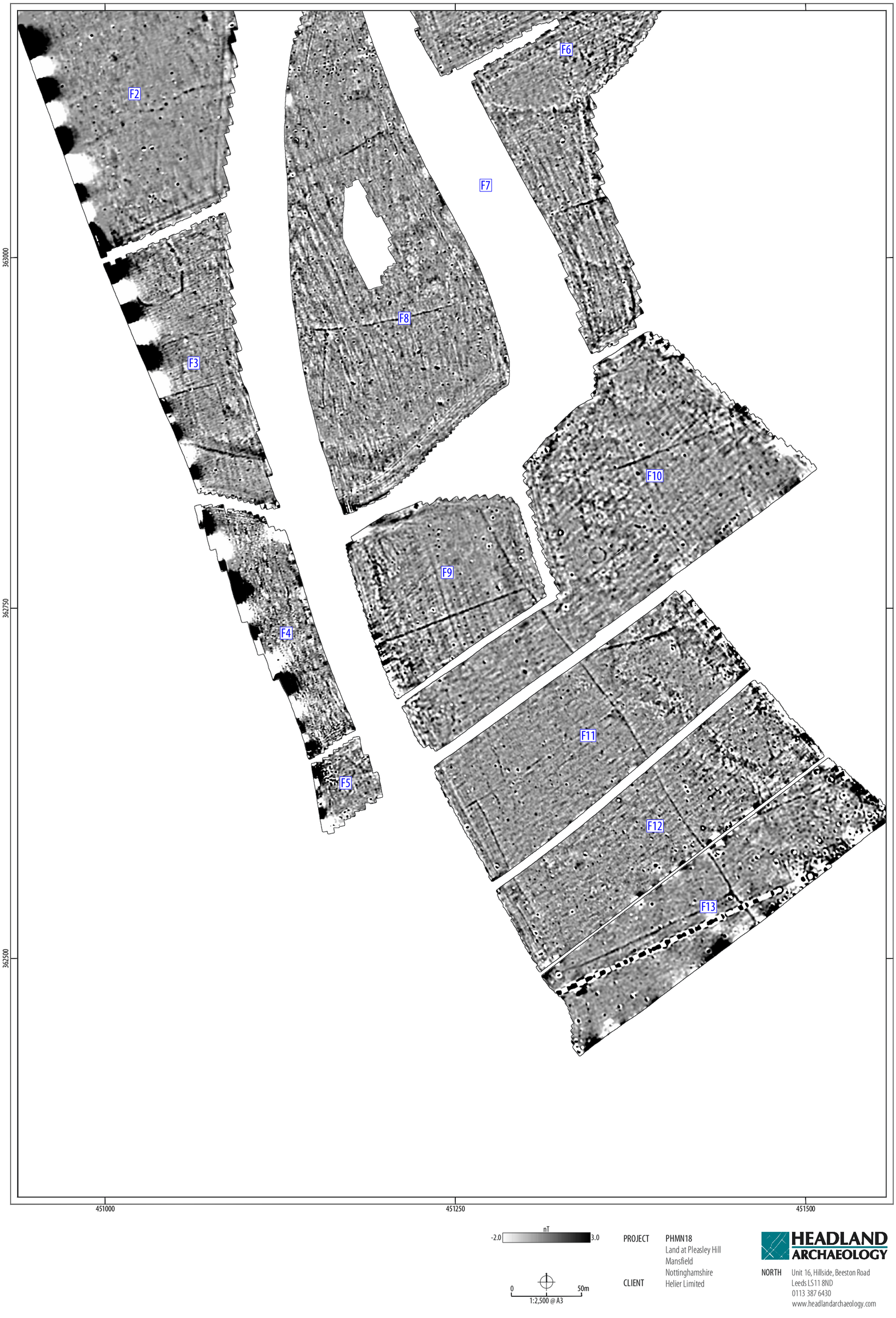
ILLUS 11 Interpretation of magnetometer data; Sector 1 (1:2,500)



nT
-2.0
3.0

0
50m
1:2,500 @ A3

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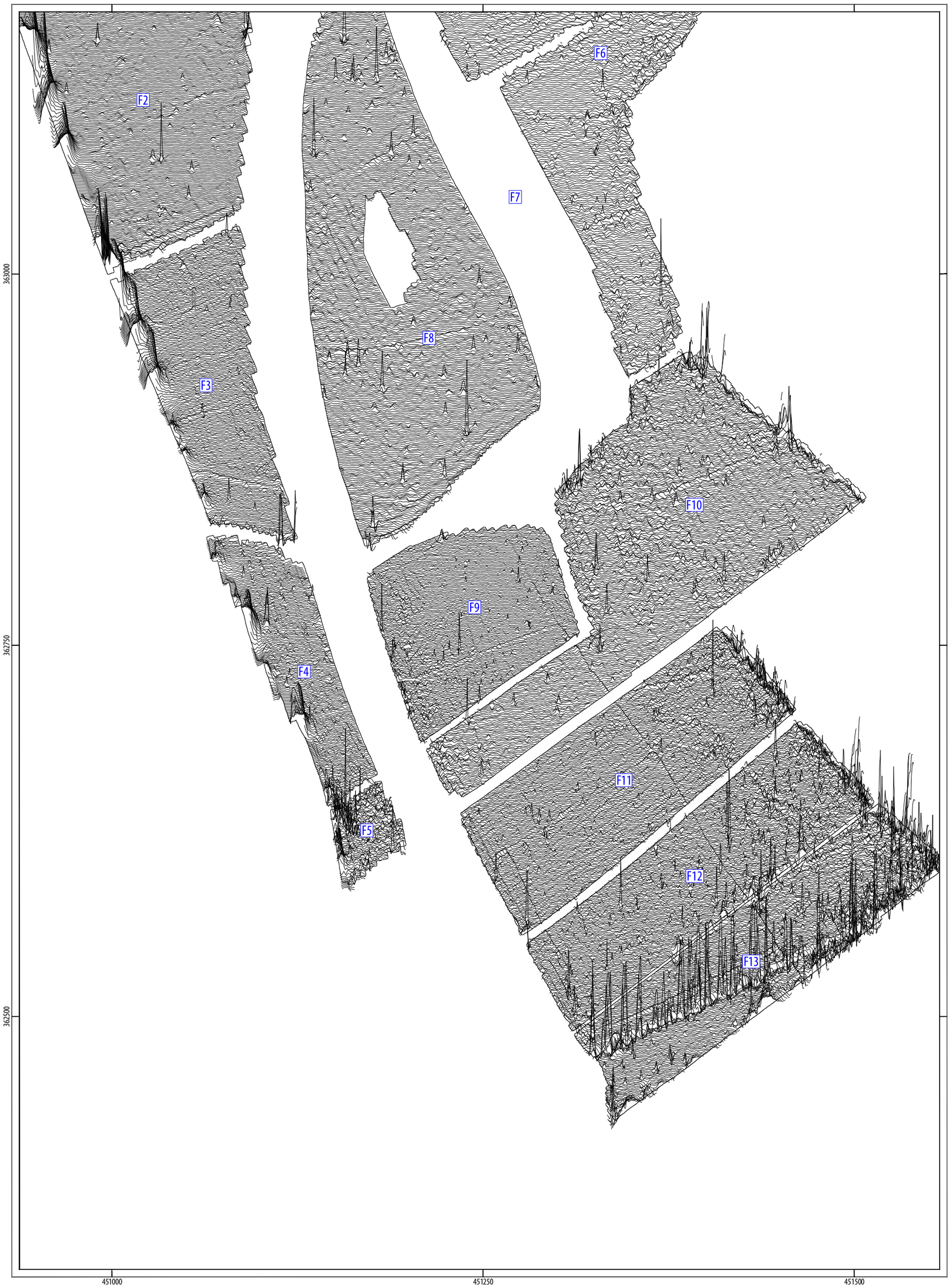
ILLUS 12 Processed greyscale magnetometer data; Sector 2 (1:2,500)



50.0nT/cm

0 50m

1:2,500 @ A3

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Leeds LS11 8ND
0113 387 6430
www.headlandarchaeology.com

ILLUS 13 XY trace plot of minimally processed magnetometer data; Sector 2 (1:2,500)

TYPE OF ANOMALY	INTERPRETATION
dipolar isolated	ferrous material
magnetic disturbance	ferrous material
dipolar linear	service pipe
linear trend	ridge and furrow
linear trend	agricultural
linear	former field boundary

TYPE OF ANOMALY	INTERPRETATION
linear trend	geological variation
magnetic enhancement	geology
magnetic enhancement	archaeology?
magnetic enhancement	archaeology

ABBREVIATIONS	
E	Enclosure
FB	Former Boundary
SP	Service Pipe
RD	Ring-ditch
TR	Trackway

0 50m
1:2,500 @ A3

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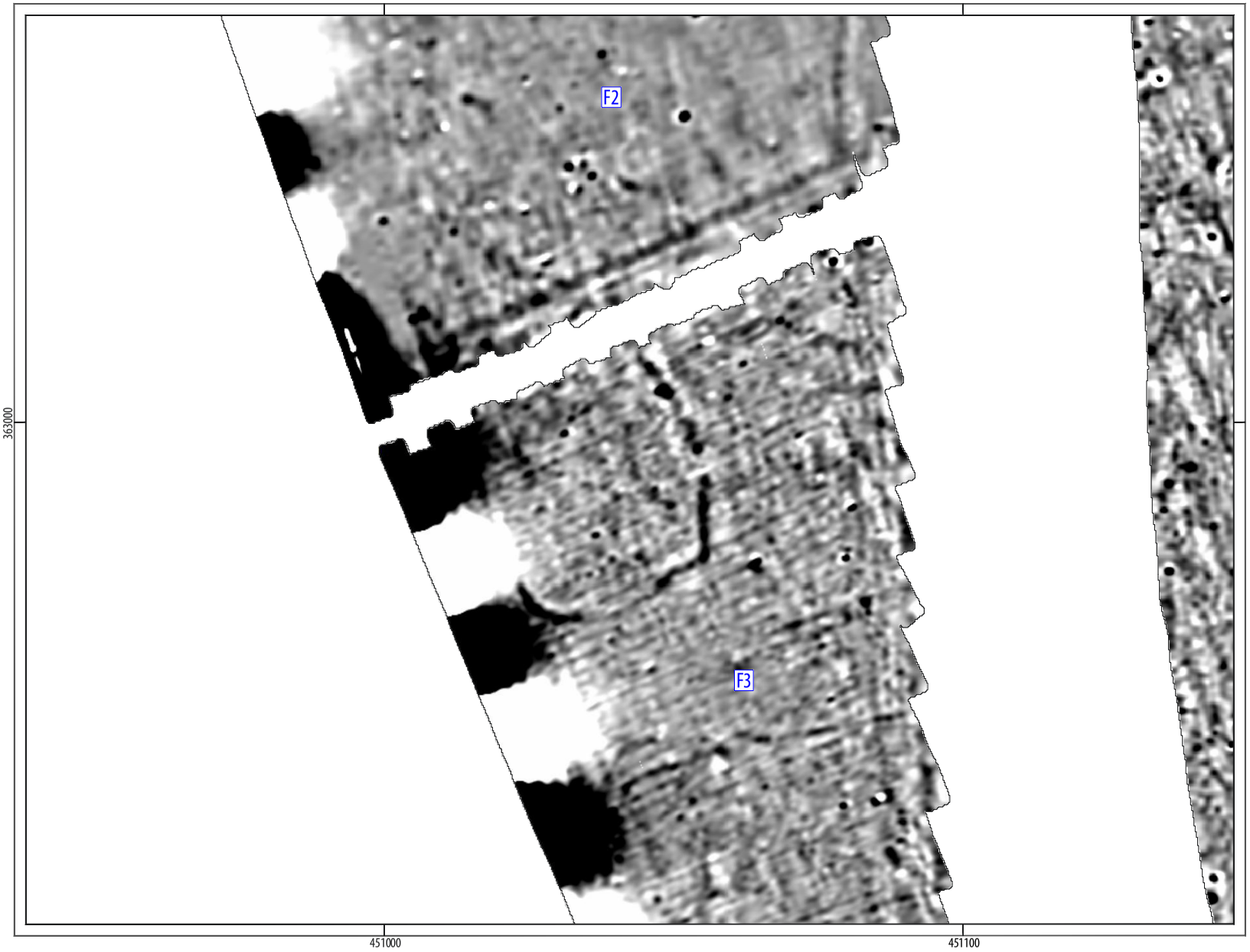
ILLUS 14 Interpretation of magnetometer data; Sector 2 (1:2,500)



nT
-2.0
3.0

0
25m
1:1,000 @ A4

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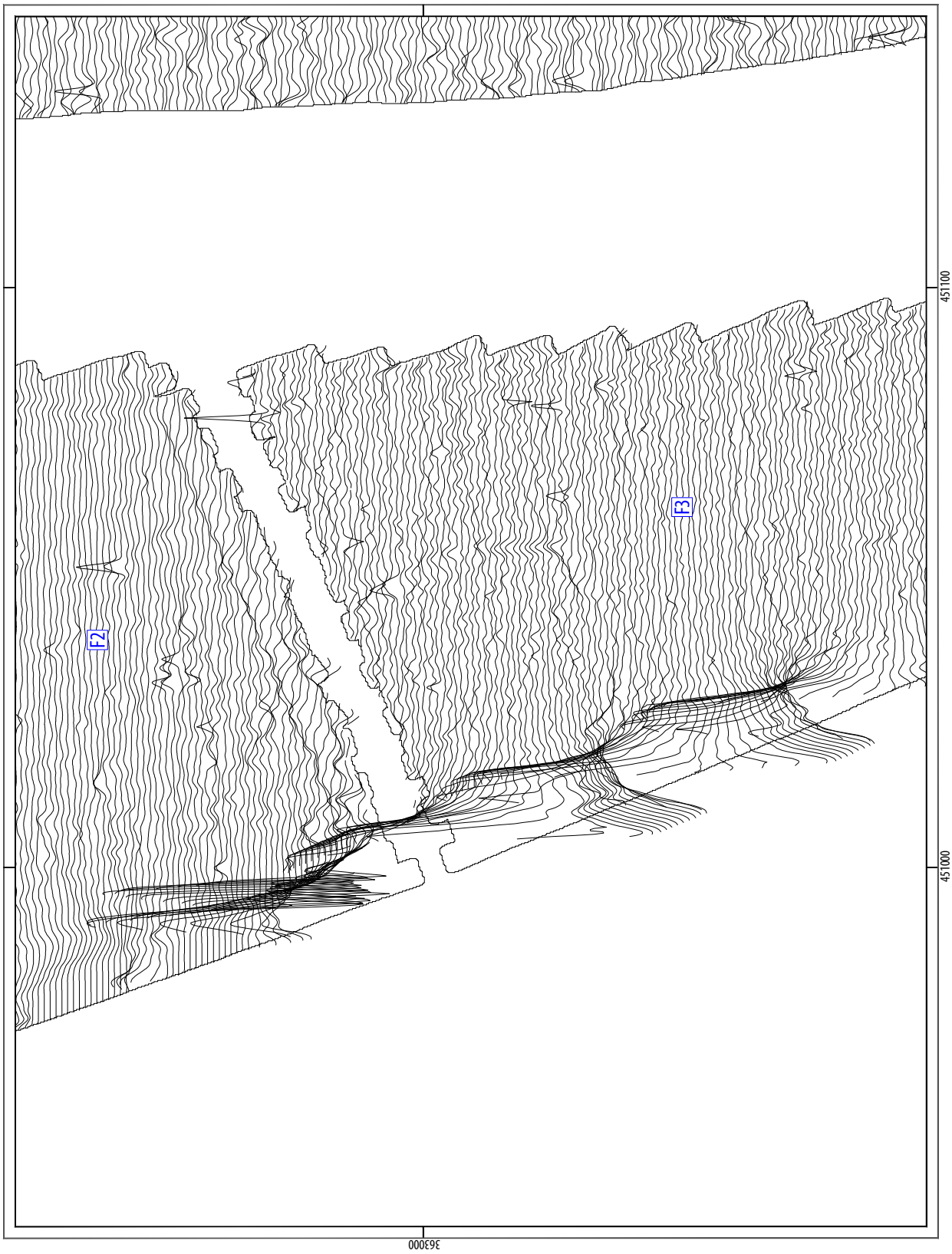
ILLUS 15 Processed greyscale magnetometer data; AAA1 (1:1,000)



ILLUS 16 XY trace plot of minimally processed magnetometer data; AAA1 (1:1,000)

TYPE OF ANOMALY | INTERPRETATION

- dipolar isolated — ferrous material
- dipolar linear — service pipe
- linear trend — ridge and furrow
- linear trend — agricultural
- magnetic enhancement — geology
- magnetic enhancement — archaeology?
- magnetic enhancement — archaeology

ABBREVIATIONS

E Enclosure

SP Service Pipe

0 25m

1:1,000 @ A4

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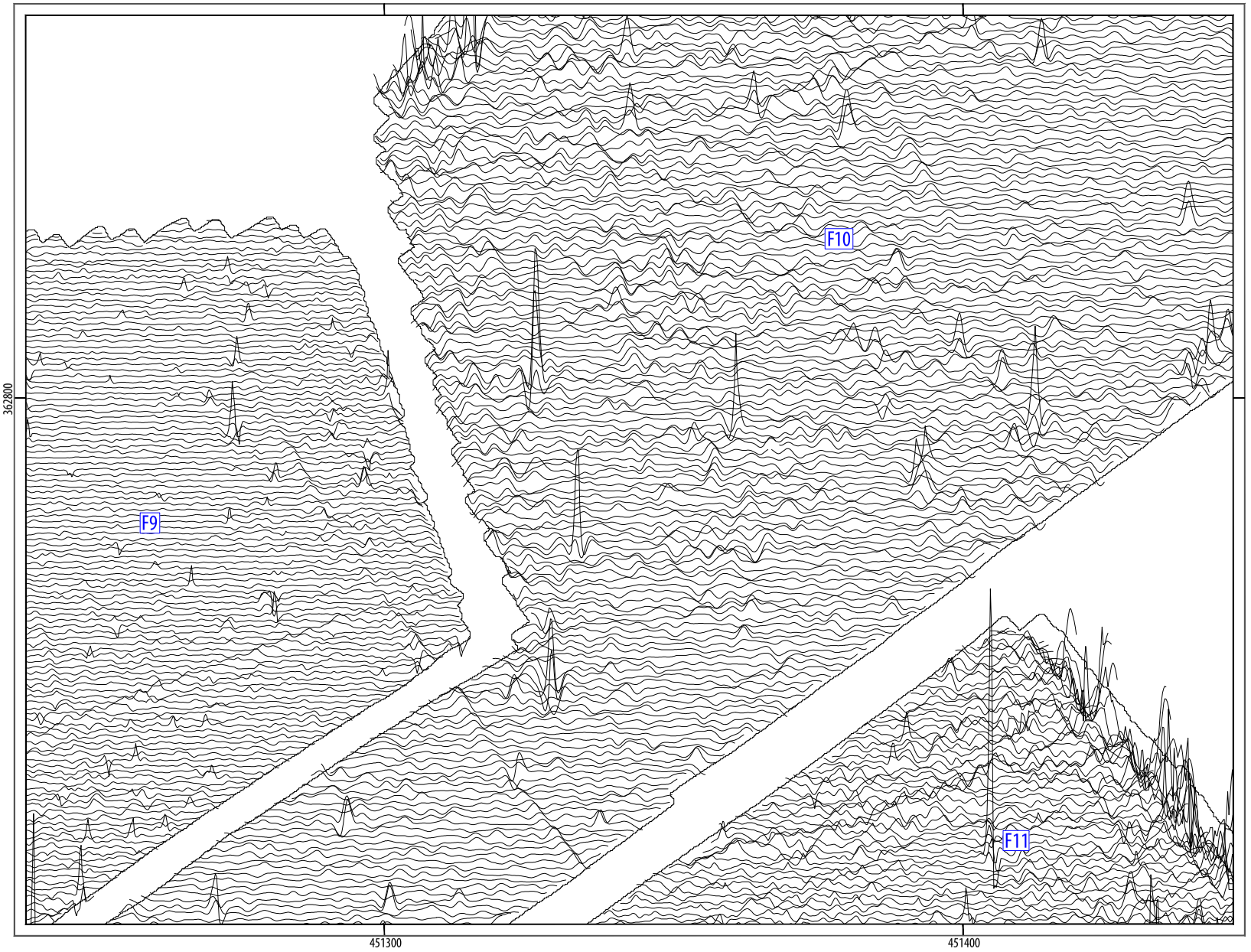
ILLUS 17 Interpretation of magnetometer data; AAA1 (1:1,000)

ILLUS 18 Processed greyscale magnetometer data; AAA2 (1:1,000)



20.0nT/cm

0 25m

1:1,000 @ A4

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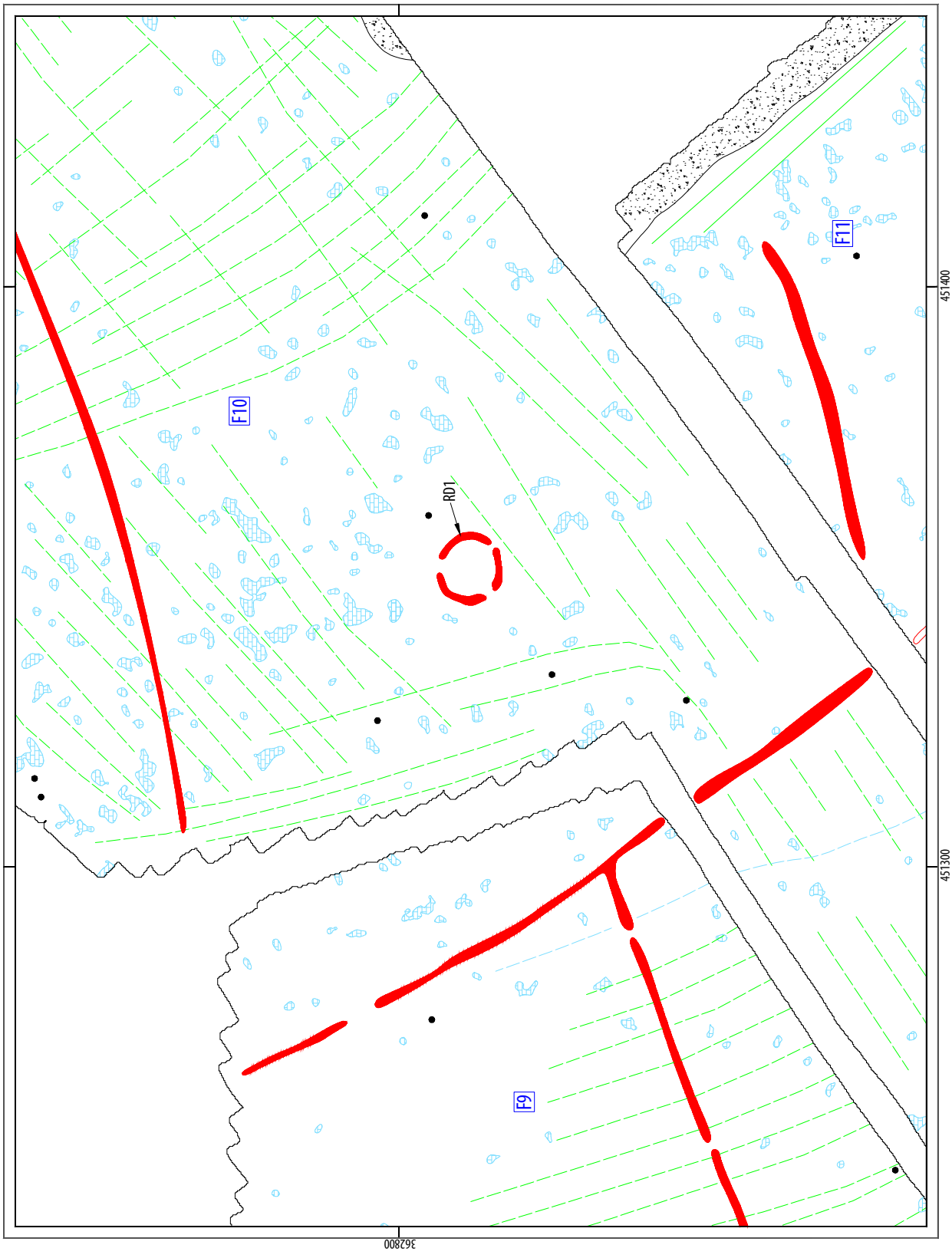
ILLUS 19 XY trace plot of minimally processed magnetometer data; AAA2 (1:1,000)



ILLUS 20 Interpretation of magnetometer data; AAA2 (1:1,000)

7 APPENDICES

APPENDIX 1 MAGNETOMETER SURVEY

Appendix 1.1 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.

Appendix 1.2 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 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) 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

OASIS ID: headland5-334609

Project details	
Project name	Land at Pleasley Hill, Mansfield, Nottinghamshire
Short description of the project	Headland Archaeology (UK) Ltd undertook a geophysical (magnetometer) survey of a 40 hectare site at Pleasley Hill, near Mansfield, Nottinghamshire, to provide information on the archaeological potential of the site in advance of its possible development. The survey has identified anomalies indicative of archaeological activity across the whole of the site including an extensive former field system and trackway, an enclosure (which may or may not be contemporary) and a ring ditch (the remains of a prehistoric burial mound). All these features were previously unknown. Other anomalies are due to recent and post-medieval ploughing and modern activity. Overall the survey has confirmed the conclusions of the earlier desk-based appraisal which assessed the site to have moderate to high archaeological potential for remains of the Roman to post-medieval and prehistoric periods respectively although there are clearly large parts of the site containing no archaeological anomalies.
Project dates	Start: 11-09-2018 End: 18-09-2018
Previous/future work	No / Not known
Any associated project reference codes	PHMN18 - Contracting Unit No.
Type of project	Field evaluation
Site status	None
Current Land use	Cultivated Land 4 - Character Undetermined
Monument type	N/A None
Monument type	N/A None
Significant Finds	N/A None
Significant Finds	N/A None
Methods & techniques	"Geophysical Survey"
Development type	Housing estate
Prompt	National Planning Policy Framework - NPPF
Position in the planning process	Pre-application
Solid geology (other)	Cadeby Formation - Dolostone
Drift geology (other)	None
Techniques	Magnetometry
Project location	
Country	England
Site location	NOTTINGHAMSHIRE MANSFIELD MANSFIELD Land at Pleasley Hill, Mansfield
Study area	40 Hectares
Site coordinates	SK 5122 6308 53.162087101152 -1.233827310069 53 09 43 N 001 14 01 W Point
Project creators	
Name of Organisation	Headland Archaeology
Project brief originator	Orion Heritage
Project design originator	Headland Archaeology
Project director/manager	Harrison, D
Project supervisor	Evans, M
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	Land at Pleasley Hill, Mansfield, Nottinghamshire; Geophysical Survey
Author(s)/Editor(s)	Webb, A.
Date	2018
Issuer or publisher	Headland Archaeology
Place of issue or publication	Leeds
Description	PDF[A]
Entered by	David Harrison (david.harrison@headlandarchaeology.com)
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Headland Archaeology South & East
Building 68C | Wrest Park | Silsoe | Bedfordshire MK45 4HS
t 01525 861 578
e southandeast@headlandarchaeology.com

Headland Archaeology Midlands & West
Unit 1 | Clearview Court | Twyford Rd | Hereford HR2 6JR
t 01432 364 901
e midlandsandwest@headlandarchaeology.com

Headland Archaeology North
Unit 16 | Hillside | Beeston Rd | Leeds LS11 8ND
t 0113 387 6430
e north@headlandarchaeology.com

Headland Archaeology Scotland
13 Jane Street | Edinburgh EH6 5HE
t 0131 467 7705
e scotland@headlandarchaeology.com

www.headlandarchaeology.com