TPUG18

TRANS-PENNINE UPGRADE

GEOPHYSICAL SURVEY

commissioned by Arcadis Consulting (UK) Ltd
on behalf of Highways England

September 2018

HEADLAND ARCHAEOLOGY

REGISTERED ORGANISATION CIfA

TRANS-PENNINE UPGRADE

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

PROJECT INFO:

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PROJECT TEAM:

Project Manager **Sam Harrison** / Author **Ross Bishop** / Fieldwork **Krasimir Dylgerski, Olivier Vansassenbrouck, Richard McGregor Edwards** / Graphics **Beata Wieczorek-Oleksy, Caroline Norrman, Ross Bishop**

Approved by **Sam Harrison**

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

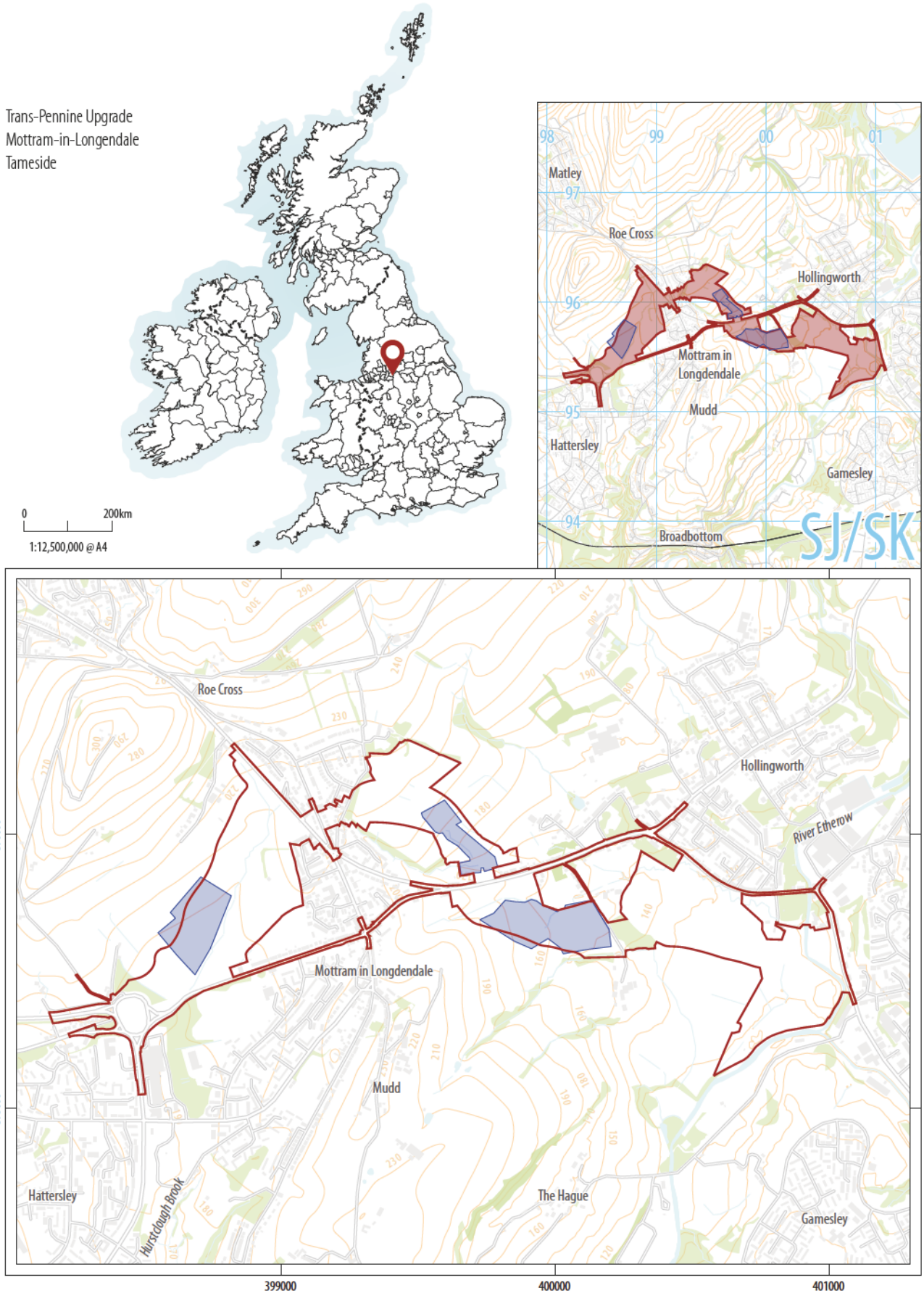
HEADLAND ARCHAEOLOGY

PROJECT SUMMARY

Headland Archaeology (UK) Ltd undertook a geophysical (magnetometer) survey covering approximately 12.5 hectares at three locations around the town of Mottram in Longdendale, Tameside, in support of the Trans-Pennine Upgrade. No anomalies of probable archaeological activity have been identified by the survey supporting the conclusions of the Arcadis Cultural Heritage Desk-based Assessment. Although numerous linear anomalies have been identified the majority reflect recent agricultural activity such as ploughing, drainage or hedgerow removal. Areas of magnetic disturbance locate infilled small-scale quarry pits or ponds. A large rectilinear anomaly locates a former building not recorded on historic mapping but likely to be of post-medieval or modern date based on its orientation. Parallel high magnitude linear responses locate the route of the Mottram Tunnel, part of the Longdendale Aqueduct, which was built in the mid-19th century to carry water to Manchester. On the basis of the geophysical survey the archaeological potential of Areas 3, 4 and 5 is assessed as low.

CONTENTS

LIST OF ILLUSTRATIONS



HEADLAND ARCHAEOLOGY
Headland Archaeology North
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t 0113 387 6430
e north@headlandarchaeology.com
w www.headlandarchaeology.com

ILLUS 1 Site location

TRANS-PENNINE UPGRADE

GEOPHYSICAL SURVEY

1 INTRODUCTION

Headland Archaeology (UK) Ltd was commissioned by Arcadis Consulting (UK) Ltd (The Client) on behalf of Highways England, to undertake a geophysical (magnetometer) survey of land centred around the town of Mottram in Longdendale, Tameside (see Illus 1), in support of the Trans-Pennine Upgrade.

All work was undertaken in line with current best practice (Chartered Institute for Archaeologists 2014, English Heritage 2008).

The survey was carried out in two mobilisations; 17th–19th July 2018, and the 2nd August 2018

1.1 SITE LOCATION, LAND-USE AND TOPOGRAPHY

The geophysical survey area (GSA) comprises six fields in three blocks (Areas 3, 4, and 5), centred around the town of Mottram in Longdendale. Each area comprises two (or parts of two) fields. Area 3 is located approximately 300 metres east of Mottram (centred at 440800,262475), and is bound to the north, east, and west by arable fields, and to the south by residential dwellings along the Mottram Moor road. Area 4, centred at SK 00000 95700, is located 400 metres south-east of Mottram and is bound to the east by Carrhouse Lane, and to the north, west and south by arable fields and Area 5 (centred at SJ 98700 95700) is located 400 metres to the west of Mottram and is bound on all sides by arable fields.

All of the survey areas were under permanent pasture (see Illus 2–3), with the exception of the southern part of Area 3, which was overgrown and unsuitable for survey (see Illus 4).

The topography of Area 3 moderately slopes from the north, at 204m Above Ordnance Datum (AOD), to the south of the area at 166 AOD. Area 4 moderately slopes from the west at 181m AOD to the east of the area at 148m AOD. Area 5 gently slopes from the north at 110m AOD to the south of the area at 93m AOD.

1.2 GEOLOGY AND SOILS

The bedrock geology underlying Area 3 and Area 5 comprises Fletcher Bank Grit- Sandstone. In Area 4, the bedrock is recorded in the north of the area as Huddersfield White Rock- Sandstone, and over the south and majority of the area as Marsden Formation- Mudstone and Siltstone. The bedrock throughout is overlain by superficial deposits of Devensian till – diamicton (NERC 2018).

The soils are classified in the Soilscape 19 association being characterised as slowly permeable, very wet loams and peats (Cranfield University 2018).

2 ARCHAEOLOGICAL BACKGROUND

The Cultural Heritage Desk Based Assessment (DBA), produced by Arcadis Consulting (UK Ltd (Document Reference TR010034/APP/6.7.1) on behalf of Highways England, looked at non-designated assets within 500m of the Scheme, as well as designated assets within 1km of the Scheme and concluded that 'overall there is a low to moderate potential for unknown archaeological remains within the Site'.

Within the GSA, there is little evidence of archaeological potential and there are no non-designated assets within the three survey areas. However, it is known that the broader landscape was occupied and exploited from the prehistoric period, through to Roman, medieval and present times, hence the low to moderate assessment of potential.

ILLUS 2 Area 4, eastern field, looking north-east **ILLUS 3** Area 5, southern field, looking south **ILLUS 4** Area 3, southern field, unsuitable for survey

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 GSA. 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 and 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 1:20,000. Illus 2, Illus 3 and Illus 4 are site condition photographs. Illus 5 is a 1:7,500 scale survey location plan showing the GPS swath data. The processed greyscale data and an overall interpretation plot are also presented at 1:7,500 on Illus 6 and Illus 7. Detailed data plots of the fully processed data (greyscale), the minimally processed data (XY traceplot) and an accompanying interpretative plot of the three areas into which the GSA is divided, are presented at a scale of 1:1,500 in Illus 8 to Illus 16 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 guidelines outlined by Historic England (English Heritage 2008) and by the Chartered Institute for Archaeologists (CIfA 2014). 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 across the GSA were good, except in part of Area 3 which was overgrown, and the overall quality of the data collected was good throughout. There is a variation in magnetic background across the three areas with numerous discrete anomalies caused by variations within the diamicton and upper soil horizons. Against this background, numerous anomalies have been identified. Those anomalies with modern, agricultural or geological origins are discussed first followed by those anomalies with a possible archaeological cause. All are discussed below and cross-referenced to specific anomalies on the interpretative drawings, where appropriate.

4.1 FERROUS AND MODERN 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.

Two high magnitude dipolar linear anomalies (SP1 and SP2; see Illus 7 and 11–13) aligned south-west/north-east across Area 4 locate buried service pipes.

The parallel linear dipolar anomalies in Area 5 (SP3 and SP4; see Illus 7 and Illus 14–16), aligned south-west/north-east in Area 5, locate the Mottram Tunnel, part of the Langdendale Aqueduct constructed in the mid-19th century to carry water to Manchester.

Three highly magnetic irregularly shaped anomalies in Area 4 (Q1–Q3; Illus 7 and Illus 11–13) probably locate former quarry pits or ponds which have subsequently been backfilled with strongly magnetic material. These anomalies can also be identified as small depressions in the LiDAR data and correlate with Heritage Assets 3024, 3026 and 175 respectively.

A rectangular anomaly of very high magnetic response, also in Area 4, (FS1; Illus 7 and Illus 11–13) is interpreted as being caused by the sub-surface remains of a structure. Whilst no structure is recorded on the historic Ordnance Survey (OS) maps or the earlier tithe map it is considered likely that this building is probably post-medieval or modern in date based on the fact that the anomaly clearly aligns with and respects the current field boundaries; it may be associated with the nearby small-scale quarrying. This feature was also identified in the LiDAR data and recorded as Heritage Asset 3013.

Other areas of magnetic disturbance around the field edges are due to ferrous material within or close to the adjacent field boundaries and are of no archaeological interest.

4.2 AGRICULTURAL ANOMALIES

Analysis of historic OS mapping indicates that the division and layout of land within the GSA has changed over the last 150 years with the removal of six former boundaries. All are identified in the magnetic data as incomplete or discontinuous linear anomalies. Three are present in Area 4 (FB1–3; Illus 7 and Illus 11–13) and three in Area 5 (FB4–6; Illus 7 and Illus 14–16).

Elsewhere and ubiquitous across the three areas are other linear anomalies on varying alignments which are interpreted as of agricultural origin being either indicative of ploughing or caused by field drains.

4.3 GEOLOGICAL ANOMALIES

Generally, a low level of magnetic background variation has been identified across the PDA with numerous low magnitude discrete anomalies being due to localised variations in the composition of the topsoil.

4.4 ARCHAEOLOGICAL ANOMALIES

No anomalies of definite archaeological origin have been identified. However, the date of the rectangular structure in Area 4 (see Section 4.1, para. 5) is uncertain and could be of archaeological interest. However, on balance it is considered more likely to be of relatively recent date and therefore is likely to be of historical or local interest only.

5 CONCLUSION

The survey has successfully evaluated the site identifying a number of anomalies due to recent agricultural activity. Evidence for small scale mineral extraction and 19th century engineering (the Mottram Tunnel) has also been confirmed. A single anomaly indicative of a structure of an unknown date or function is the only feature of possible archaeological interest. There is no known reason not to assume that the survey has given anything other than an accurate assessment of the archaeological potential of the three survey areas. This potential is assessed as low corroborating the conclusions of the Cultural Heritage Desk-based Assessment (Document Ref. TR010034/APP6.7.1).

6 REFERENCES

Arcadis Consulting (UK) Ltd 2018 ***Trans Pennine Upgrade TR010034 6.7.1 Appendix 1 Cultural Heritage Desk-based Assessment*** (Draft) [unpublished client document] Ref TR010034/APP/6.7.1

Chartered Institute for Archaeologists (CIfA) 2014 ***Standard and guidance for archaeological geophysical survey*** http://www.archaeologists.net/sites/default/files/CIfAS&GGeophysics_1.pdf accessed 23 August 2018

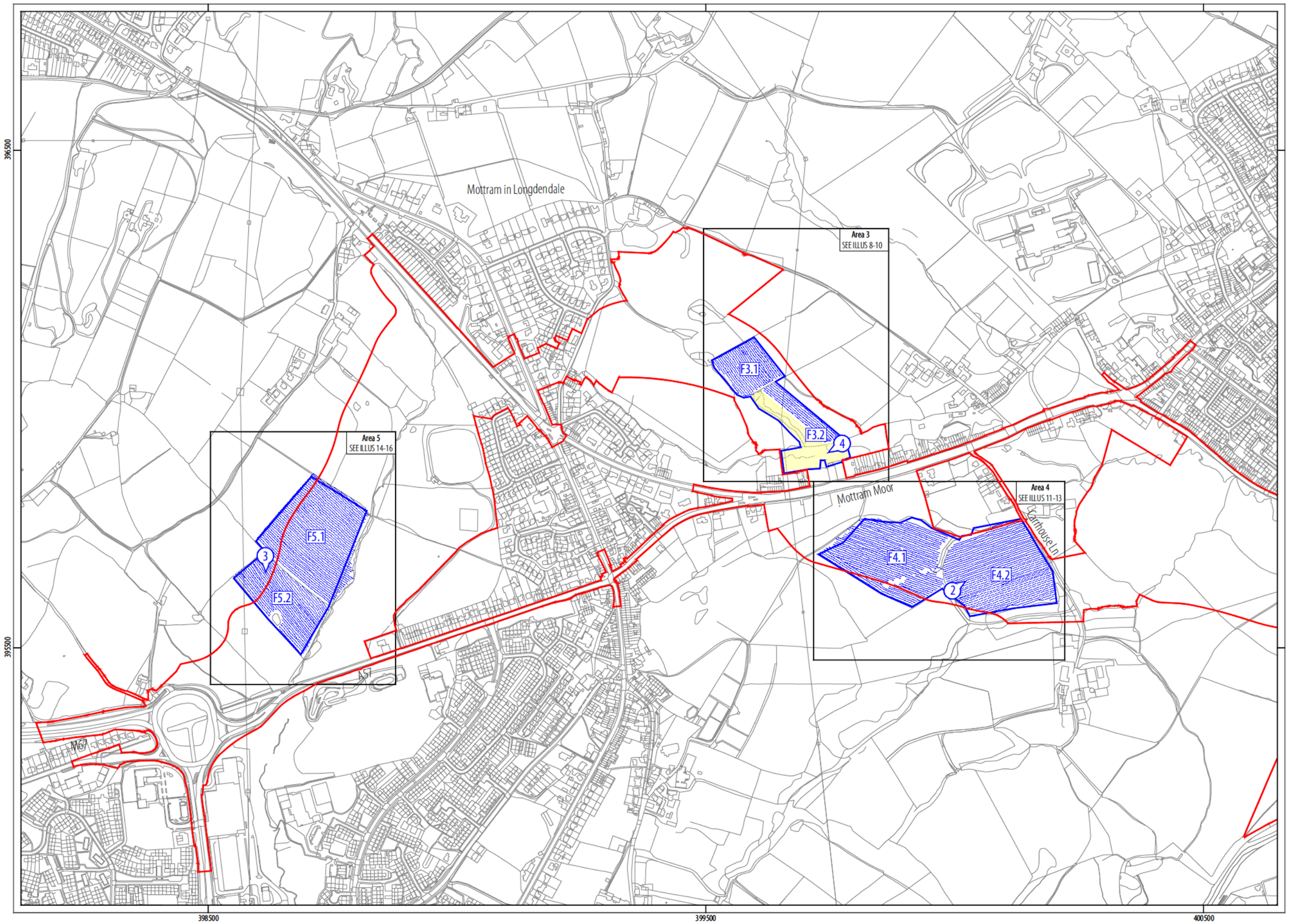
Cranfield University 2018 ***Cranfield Soil and Agrifood Institute Soilscapes*** http://www.landis.org.uk/soilscapes/ accessed 23 August 2018

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 23 August 2018

English Heritage 2008 ***Geophysical Survey in Archaeological Field Evaluation: Research and Professional Services Guidelines*** (2nd edition) http://content.historicengland.org.uk/images-books/publications/geophysical-survey-in-archaeological-field-evaluation/geophysics-guidelines.pdf accessed 23 August 2018

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

Natural Environment Research Council (NERC) 2018 ***British Geological Survey*** http://www.bgs.ac.uk/ accessed 23 August 2018



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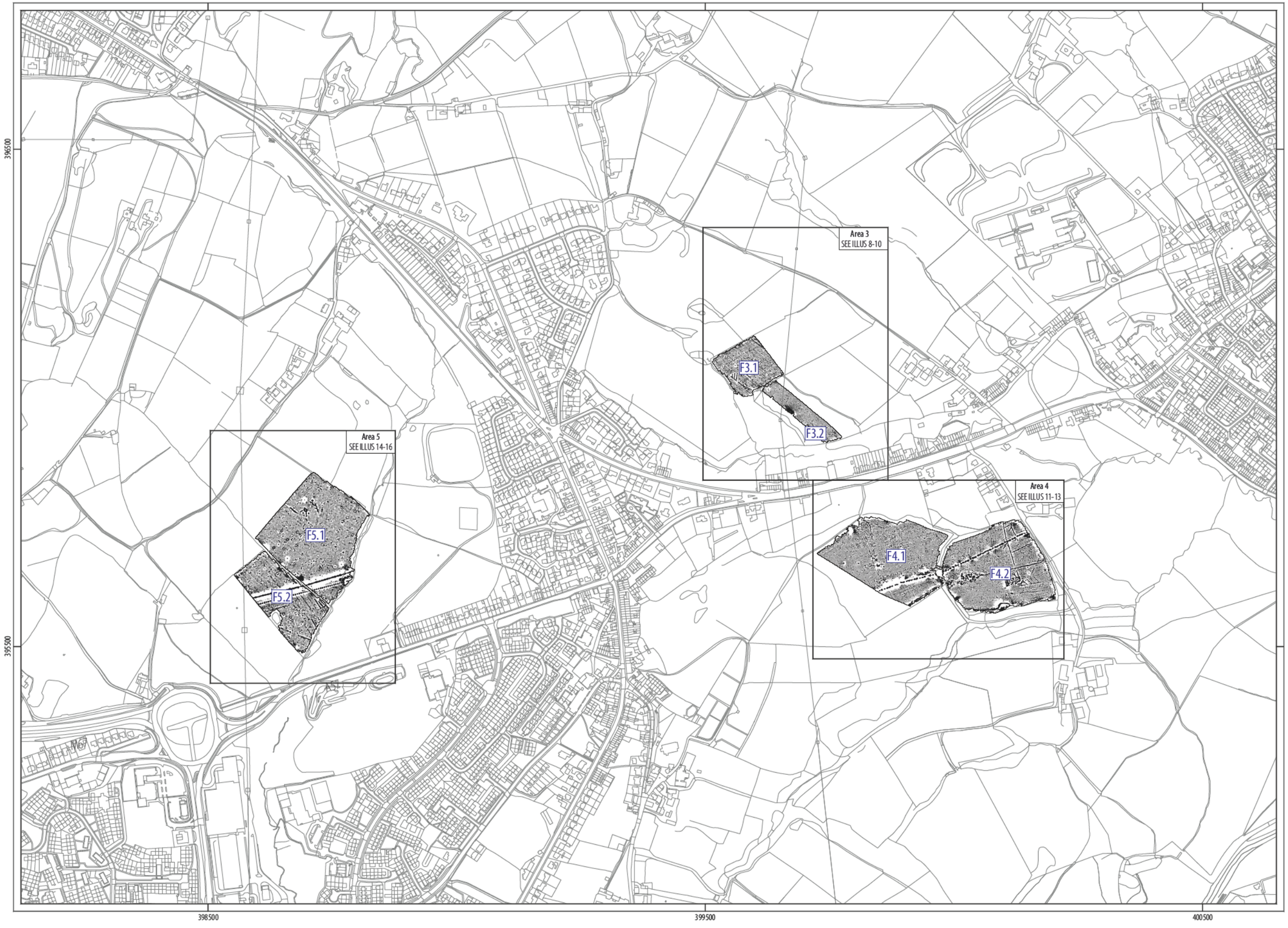
Mottram in Longdendale

CLIENT Arcadis

HEADLAND ARCHAEOLOGY

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

ILLUS 5 Survey location showing GPS swaths and photo locations (1:7,500)



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

ILLUS 6 Processed greyscale magnetometer data (1:7,500)

TYPE OF ANOMALY	INTERPRETATION
dipolar isolated	ferrous material
magnetic disturbance	ferrous material
dipolar linear	service pipe
magnetic disturbance	modern
linear trend	agricultural
linear trend	field drain
linear	former field boundary
linear trend	footpath
linear trend	geology
magnetic enhancement	geology
magnetic enhancement	archaeology?

ABBREVIATIONS

FS	former structure
M	modern
FB	former boundary
SP	service pipe
FP	footpath
Q	quarry

0 200m
1:7,500 @ A3

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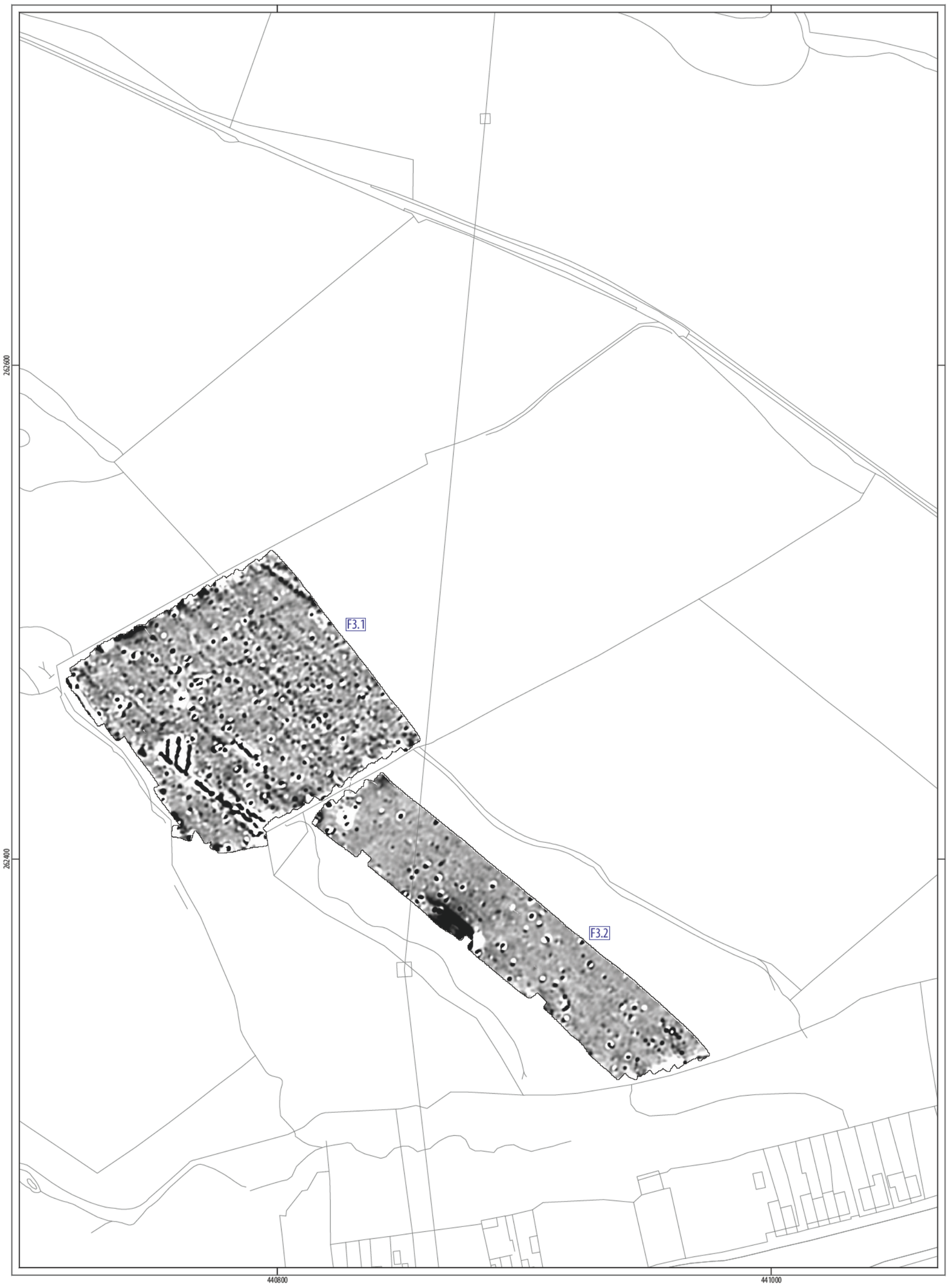
ILLUS 7 Interpretation of magnetometer data (1:7,500)



nT
-1.0 2.0

0 50m
1:1,500 @ A3

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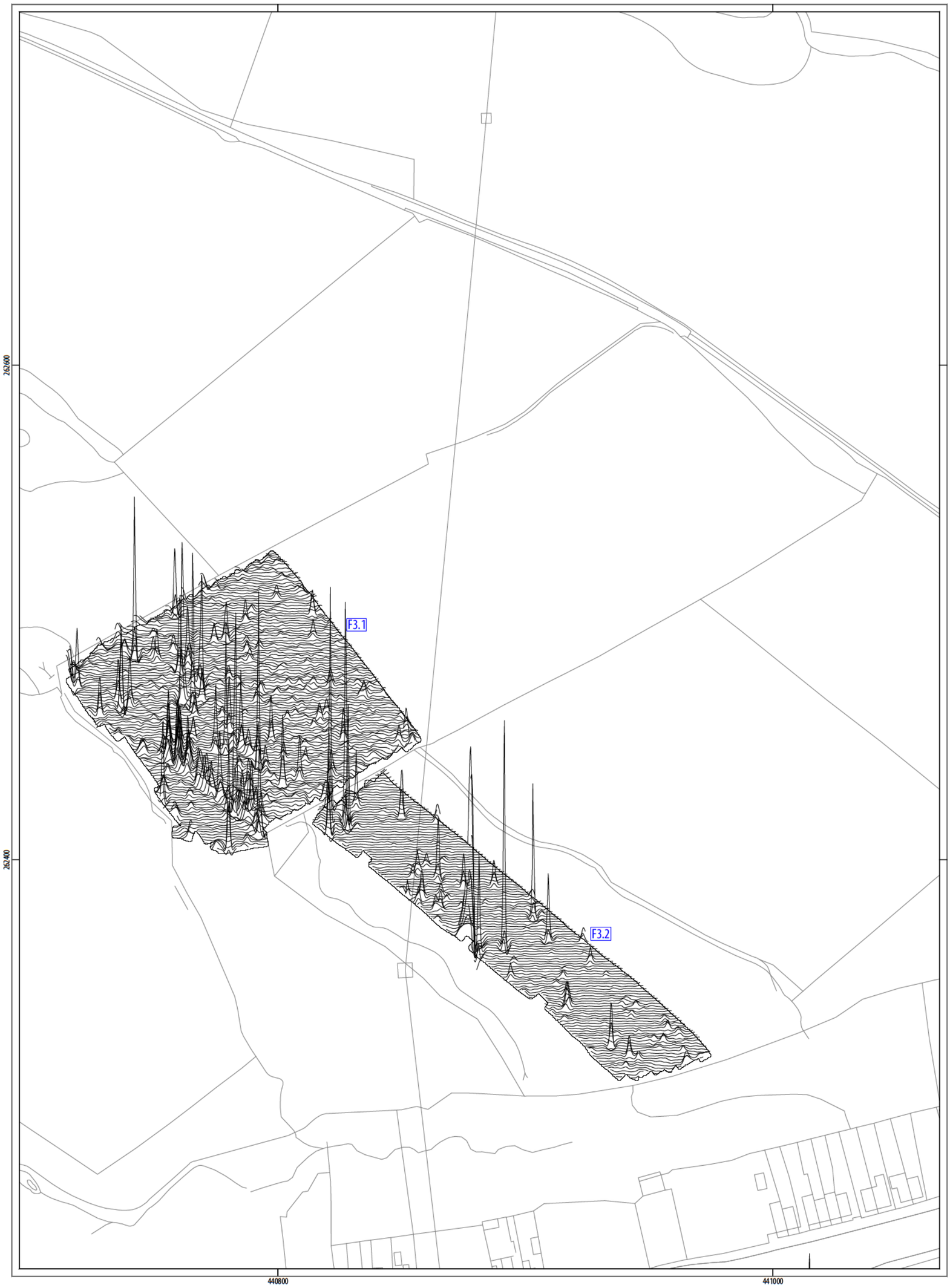
ILLUS 8 Processed greyscale magnetometer data; Area 3 (1:1,500)



22.0nT/cm

0 50m

1:1,500 @ A3

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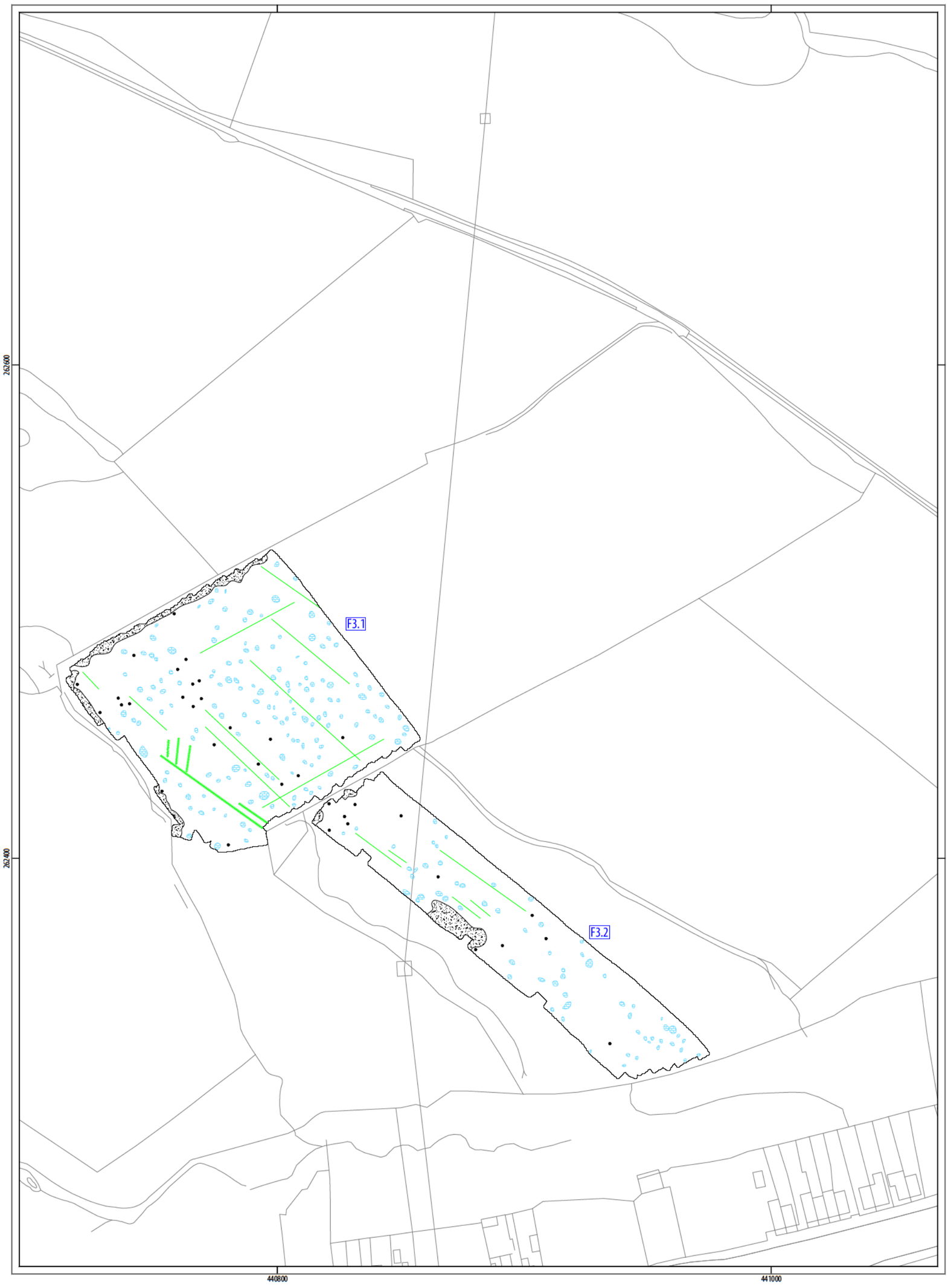
ILLUS 9 XY trace plot of minimally processed magnetometer data; Area 3 (1:1,500)



TYPE OF ANOMALY	INTERPRETATION
dipolar isolated	ferrous material
magnetic disturbance	ferrous material
linear trend	agricultural
linear trend	field drain
magnetic enhancement	geology

0 50m
1:1,500 @A3

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HEADLAND ARCHAEOLOGY
NORTH Unit 16, Hillside, Beeston Road
Leeds LS11 8ND
0113 387 6430
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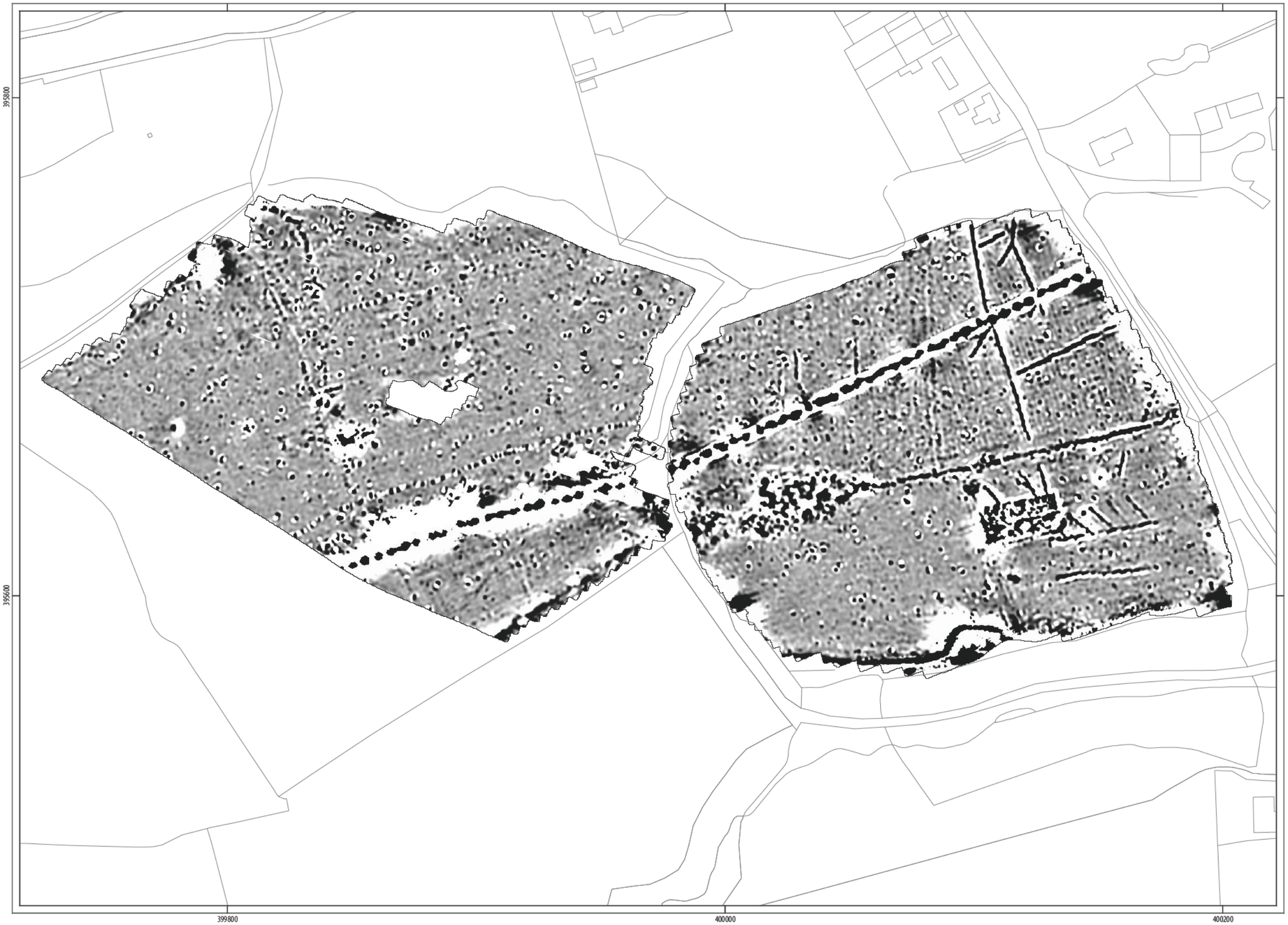
ILLUS 10 Interpretation of magnetometer data; Area 3 (1:1,500)



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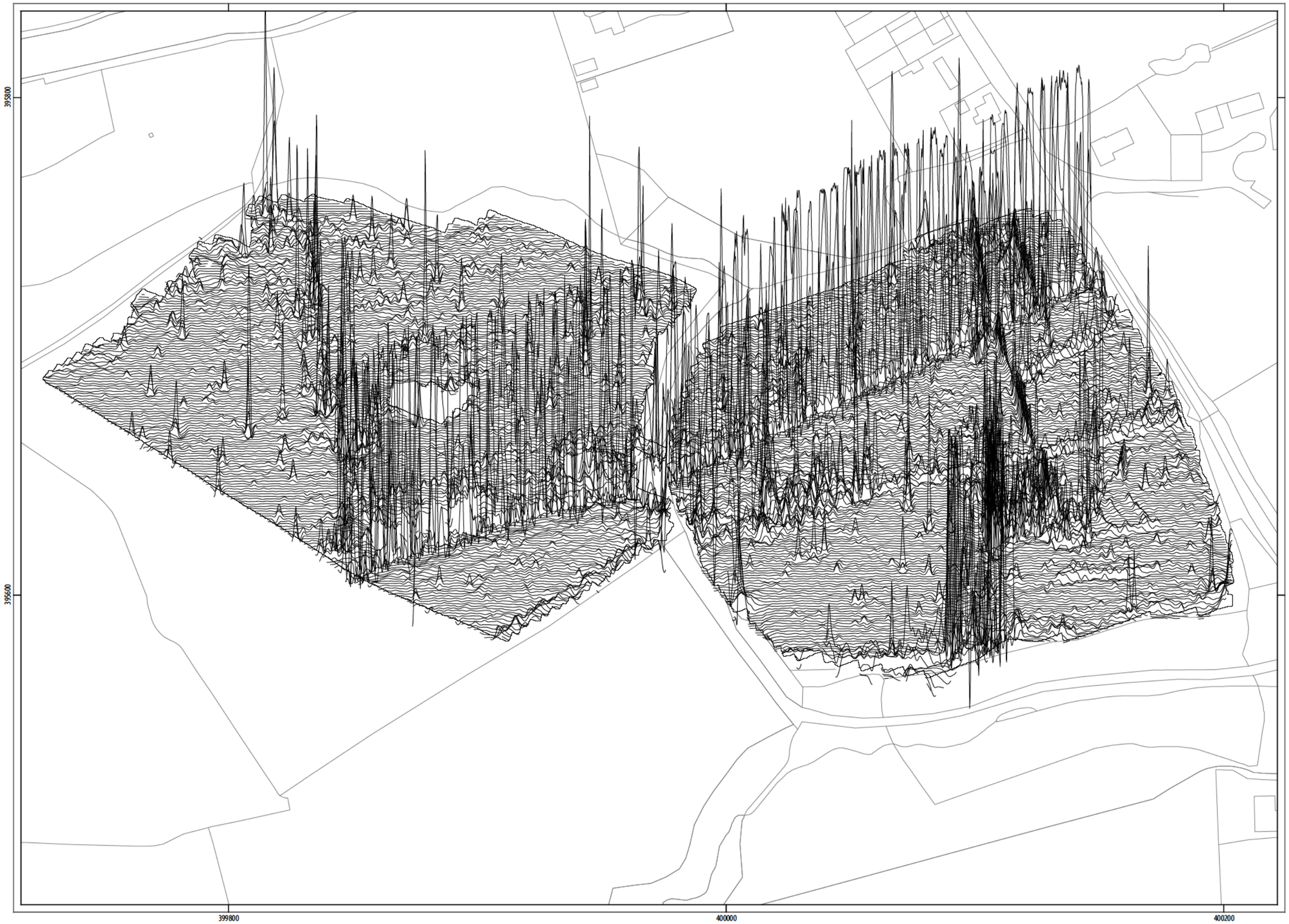
HEADLAND ARCHAEOLOGY
NORTH Unit 16, Hillside, Beeston Road
Leeds LS11 8ND
0113 387 6430
www.headlandarchaeology.com

ILLUS 11 Processed greyscale magnetometer data; Area 4 (1:1,500)



22.0nT/cm

0 50m

1:1,500 @ A3

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Leeds LS11 8ND
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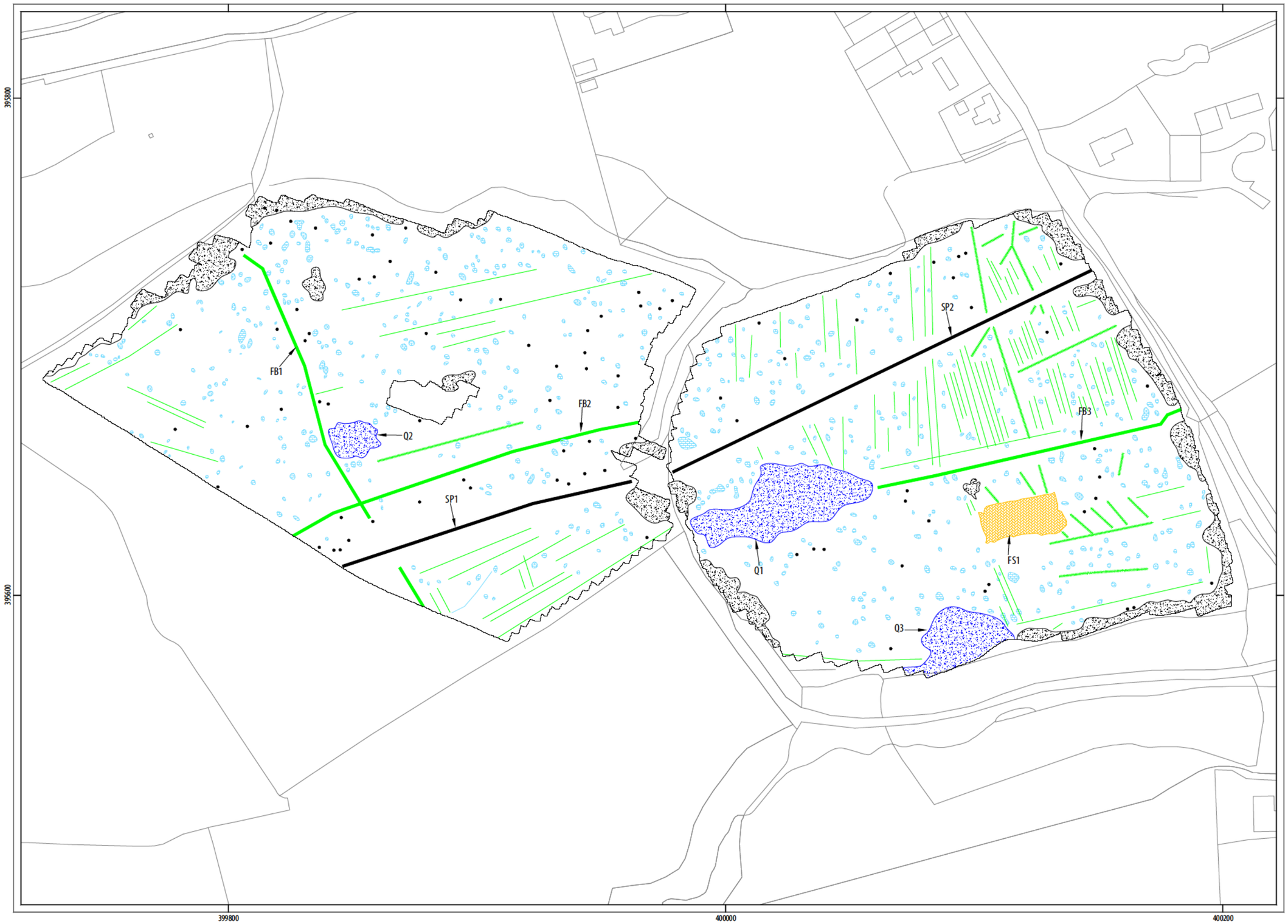
ILLUS 12 XY trace plot of minimally processed magnetometer data; Area 4 (1:1,500)



TYPE OF ANOMALY	INTERPRETATION
dipolar isolated	ferrous material
magnetic disturbance	ferrous material
dipolar linear	service pipe
magnetic disturbance	modern
linear trend	agricultural
linear trend	field drain
linear	former field boundary
linear trend	geology
magnetic enhancement	geology
magnetic enhancement	archaeology?

ABBREVIATIONS

FS	former structure
Q	quarry
FB	former boundary
SP	service pipe

0 50m
1:1,500 @ A3

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0113 387 6430
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ILLUS 13 Interpretation of magnetometer data; Area 4 (1:1,500)

nT
-1.0 2.0

0 50m
1:1,500 @ A3

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0113 387 6430
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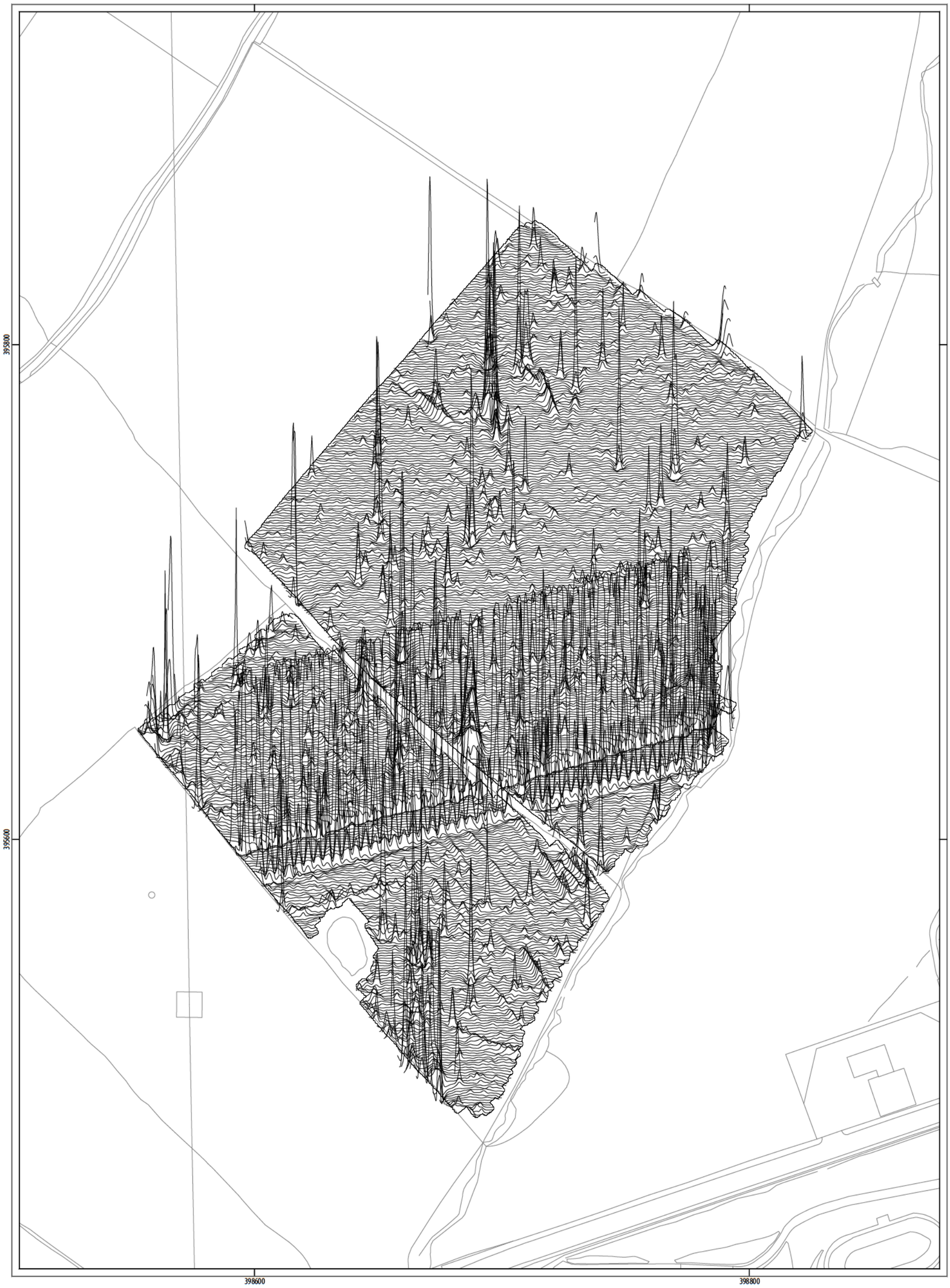
ILLUS 14 Processed greyscale magnetometer data; Area 5 (1:1,500)



22.0nT/cm

0 50m

1:1,500 @ A3

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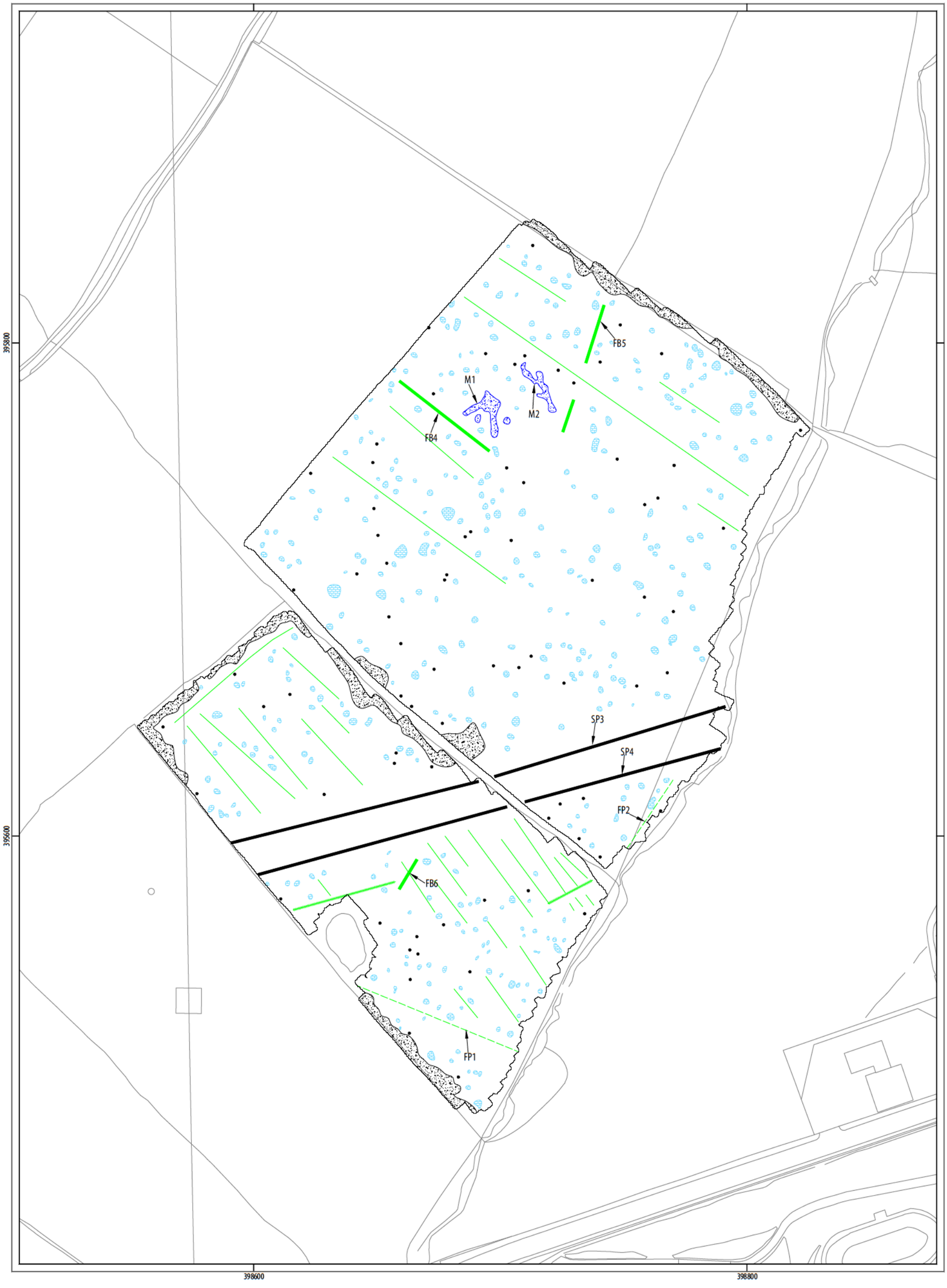
ILLUS 15 XY trace plot of minimally processed magnetometer data; Area 5 (1:1,500)



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

TYPE OF ANOMALY	INTERPRETATION
linear trend	footpath
magnetic enhancement	geology

ABBREVIATIONS	
M	modern
FB	former boundary
SP	service pipe
FP	footpath

0 50m
1:1,500 @A3

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

ILLUS 16 Interpretation of magnetometer data; Area 5 (1:1,500)

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 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. In addition, the raw data will be deposited with the Archaeology Data Service (ADS) in accordance with Devon County Council's Specification for Geophysical Survey.

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: headland5-327823

Project details	
Project name	Trans-Pennine Upgrade
Short description of the project	Headland Archaeology (UK) Ltd undertook a geophysical (magnetometer) survey covering approximately 12.5 hectares at three locations around the town of Mottram in Longdendale, Tameside, in support of the Trans-Pennine Upgrade. No anomalies of probable archaeological activity have been identified by the survey supporting the conclusions of the Arcadis Cultural Heritage Desk-based Assessment. Although numerous linear anomalies have been identified the majority reflect recent agricultural activity such as ploughing, drainage or hedgerow removal. Areas of magnetic disturbance locate infilled small-scale quarry pits or ponds. A large rectilinear anomaly locates a former building not recorded on historic mapping but likely to be of post-medieval or modern date based on its orientation. Parallel high magnitude linear responses locate the route of the Mottram Tunnel, part of the Longdendale Aqueduct, which was built in the mid-19th century to carry water to Manchester. On the basis of the geophysical survey the archaeological potential of Areas 3, 4 and 5 is assessed as low.
Project dates	Start: 19-07-2018 End: 02-10-2018
Previous/future work	Not known / Not known
Any associated project reference codes	TPUG18 - Contracting Unit No.
Type of project	Field evaluation
Site status	None
Current Land use	Grassland Heathland 4 - Regularly improved
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	Road scheme (new and widening)
Prompt	Environmental (unspecified schedule)
Position in the planning process	Not known / Not recorded
Solid geology (other)	Fletcher Bank Grit- Sandstone and Huddersfield White Rock- Sandstone
Drift geology (other)	Devensian till - diamicton
Techniques	Magnetometry
Project location	
Country	England
Site location	GREATER MANCHESTER TAMESIDE LONGDENDALE Trans-Pennine Upgrade
Study area	12.5 Hectares
Site coordinates	SJ 9970 9590 53.459594959196 -2.004518810011 53 27 34 N 002 00 16 W Point
Site coordinates	SK 0000 9570 53.457797139856 -2 53 27 28 N 002 00 00 W Point
Site coordinates	SJ 9870 9550 53.455997630291 -2.01957985524 53 27 21 N 002 01 10 W Point
Project creators	
Name of Organisation	Headland Archaeology
Project brief originator	Arcadis
Project design originator	Headland Archaeology
Project director/manager	Harrison, S
Project supervisor	Vansassenbrouck, O.

Type of sponsor/funding body	Highways Agency
Project archives	
Physical Archive Exists?	No
Digital Archive recipient	In house
Digital Contents	"other"
Digital Media available	"Geophysics"
Paper Archive Exists?	No
Project bibliography 1	
Publication type	Grey literature (unpublished document/manuscript)
Title	Trans-Pennine Upgrade: Geophysical Survey
Author(s)/Editor(s)	Bishop, R.
Other bibliographic details	TPUG18
Date	2018
Issuer or publisher	Headland Archaeology
Place of issue or publication	Edinburgh
Description	A4 Glue bound report. and PDF/A
Entered by	Sam Harrison (sam.harrison@headlandarchaeology.com)
Entered on	7 September 2018

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