ARCHAEOLOGICAL SERVICES WYAS

High Eastfield and Middle Deepdale
Scarborough
North Yorkshire

Geophysical Survey

October 2009

Report No. 1960

CLIENT

Scarborough Borough Council and Kebbell Development Ltd

High Eastfield and Middle Deepdale
Scarborough
North Yorkshire

Geophysical Survey

Summary

A geophysical (magnetometer) survey covering approximately 67 hectares was carried out at a site approximately 3km south of Scarborough, immediately north of Eastfield. The site extends more than 2km from the A64 and High Eastfield Farm in the west to the Eastway Link Road and Osgodby in the east and for 0.5km from north to south. In the western part of the site a 'ladder settlement' extending virtually from south to north across the full width of the site has been located. To the west and south of the farm anomalies due to the ploughed out remains of at least four square barrows and a pit alignment as well as other possible fields/enclosures have also been identified. In the eastern half of the site a single linear ditch extends from north-west to south-east. Appended to the southern side of this ditch are a series of enclosures of differing size and shape. The truncated remains of other enclosures and fields are identified to the south of this 'washing line' settlement. At the eastern end of the site the level of archaeological activity appears to decrease although there is evidence for the continuation of the abandoned medieval village with possibly earlier activity to the south-east corner where the site adjoins an area excavated in advance of the construction of the Eastway Link Road. On the basis of the geophysical survey the archaeological potential of the site is assessed as being high, locally very high, with features indicative of multi-period activity having been identified.

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Report Information

Client:	Scarborough Borough Council/Kebbell Development Ltd
Report Type:	Geophysical survey
Location:	Eastfield, near Scarborough
County:	North Yorkshire
Grid Reference:	TA 041 846
Period(s) of activity represented:	Multi-period
Report Number:	1960
Project Number:	3419
Site Code:	OSG09
Planning Application No.:	Pre-determination (Outline)
Museum Accession No.:	n/a
Date of fieldwork:	April-October 2009
Date of report:	November 2009
Project Management:	Alistair Webb BA MIfA
Fieldwork:	Alex Harrison BSc Sam Harrison BSc MSc AIfA Ian Wilkins BSc MSc
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Authorisation for distribution:	----------

ISOQAR ISO 9001:2000
Certificate No. 125/93

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1 Introduction

Archaeological Services WYAS was commissioned by Peter Cardwell, Archaeology and Heritage Consultant, and undertaken for P + HS Architects, on behalf of their clients Scarborough Borough Council and Kebbell Developments Limited to carry out a programme of non-intrusive geophysical (magnetometer) survey over a large block of land about 3km to the south of Scarborough (see Fig. 1) which is the subject of development proposals. The survey was undertaken in stages between April and October 2009 to take account of the differing land use and cropping regimes and as dictated by changes to the extent of the required survey. The final stage of survey included blocks of land beyond the proposed development boundary.

Site location, topography and land use (see Figs 1 and 2)

The overall application area covers an area in excess of 75 hectares and is bounded to the south by housing on the northern edge of Eastfield with the village of Osgodby and the new link road to the east. Open fields extend to the north with the A64 to the west. The site is split into two either side of Deepdale, a natural valley that extends north/south through the centre of the site. Area A and Area C are to the west of the valley, centred at TA 037 846, with Area B and Area D to the east, centred at TA 047 847 (see Fig. 2).

Area A was surveyed in April and early May whilst the fields were under a maturing bean crop. With the exception of a small area to the east of High East Field Farm which was set-aside/fallow Areas B, C and D were under either oil seed rape or wheat and were surveyed post-harvest.

The western half of the site is generally lower than the east with the land sloping down towards the A64 and Eastfield to the south and west. To the east the general trend is the same with the highest part of the site to the north-east. Heights range from the northern site edge at a height of approximately 75m aOD to about 55m aOD on the southern boundary.

Geology and soils (see Fig. 3)

The solid geology comprises Calcareous Grit to the north of the site with a band of Oolitic limestone and sandstone to the south. Superficial deposits of glacial till overlie the solid geology across the majority of the site except to the north-western corner.

The soils are classified in the Burlingham 2 association comprising deep, fine loams with slowly permeable subsoils that are prone to slight seasonal waterlogging.

2 Archaeological background

A cultural heritage assessment completed as part of the environmental impact statement for the site identified two areas of archaeological potential. At the western end of the site Area A

encompasses a number of cropmarks (see Fig. 2 and Fig. 3), identified from air photographs, interpreted as probable enclosures and trackways. These features are dispersed over a wide area and are assumed to be Iron Age or Roman in date based on their location and morphology.

At the eastern end of the development Area B is located immediately west of the site of an Iron Age or Romano-British settlement site that was excavated in advance of the construction of the Eastway Link Road from the A165 diversion. The number of potential structures and their distribution suggest either an extensive settlement or several phases of occupation and it seems likely that the settlement extends westwards into Area B.

Very few cropmarks were identified in Area C and Area D.

3 Aims, Methodology and Presentation

The general aim of the survey was to obtain information that would evaluate the archaeological potential of the site. This information would then enable further evaluation and/or mitigation measures to be designed in advance of the finalisation of the development proposals and/or commencement of any groundworks.

Specifically the aims were:

- To determine the presence or absence of buried archaeological remains
- To clarify the extent and layout of archaeological remains
- To clarify the extent and layout of previously unknown buried remains
- To interpret any magnetic anomalies identified by the survey.

These aims were to be achieved by undertaking detailed (recorded) magnetometer survey initially in Area A and Area B. However, following analysis and interpretation of the initial data it was determined that it would be useful to also survey in full Area C and Area D which had initially been assessed as of relatively low archaeological potential following analysis of the air photographs.

Magnetometer survey

Bartington Grad601 magnetic gradiometers were used during the survey taking readings at 0.25m intervals on zig-zag traverses 1m apart within 30m by 30m grids so that 3600 readings were recorded in each grid. These readings were stored in the memory of the instrument and later downloaded to computer for processing and interpretation. Geoplot 3 (Geoscan Research) software was used to process and present the data. Further details are given in Appendix 1.

Reporting

A general site location plan, incorporating the 1:50000 Ordnance Survey mapping is shown in Figure 1. Figures 2 and 3 show the survey area in relation to cropmarks, first edition mapping detail and geology. Large scale plots of the processed data with archaeological and non-archaeological interpretations are presented in Figures 5, 6 and 7. The data are presented in greyscale and X-Y trace plot formats with accompanying interpretation graphics in Figures 8 to 43 inclusive at a scale of 1:1000.

Further technical information on the equipment used, data processing and survey methodologies are given in Appendix 1 and Appendix 2. Appendix 3 describes the composition and location of the site archive.

The survey methodology, report and any recommendations comply with the Brief (Cardwell 2009) and guidelines outlined by English Heritage (David *et al* 2008) and by the IfA (Gaffney, Gater and Ovenden 2002). All figures reproduced from Ordnance Survey mapping are with the permission of the controller of Her Majesty's Stationery Office (© Crown copyright).

The figures 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 figures are presented to most suitably display and interpret the data from this site based on the experience and knowledge of Archaeological Services staff.

4 Results and Discussion

Due to the ultimate size of the survey it has been decided to report and discuss the anomalies by type in the case of the non-archaeological anomalies but by area in the case of the archaeological anomalies.

Non-archaeological anomalies

Ferrous responses/Magnetic disturbance

These anomalies are typically caused by ferrous (magnetic) material, either on the ground surface or in the topsoil, which causes rapid variations in the magnetic readings giving a characteristic 'spiky' XY trace. Unless there is supporting evidence for an archaeological interpretation, little importance is normally given to such anomalies, as modern ferrous objects are common on rural sites, often being present as a consequence of manuring or tipping/infilling. There is no obvious clustering to these anomalies and they are consequently not considered to be archaeologically significant.

Linear trends

Numerous parallel linear anomalies have been identified across all parts of the site on varying alignments. These anomalies are caused by either recent ploughing regimes or by earlier ridge and furrow ploughing. Recent ploughing results in much straighter more closely separated linear anomalies whilst the less regular, sometimes slightly curving, anomalies are characteristic of ridge and furrow ploughing. The broader ridge and furrow anomalies are due to the magnetic contrast between the infilled furrows and former ridges.

Broad areas of magnetic enhancement

Numerous sinuous anomalies and other broader areas of magnetic enhancement can be seen across all parts of the site. From Figure 5 it can be seen that the general trend of these anomalies is south-west/north-east. The orientation and location of these anomalies correlates with slight depressions in the topography. These anomalies are therefore interpreted as natural in origin being caused by the accumulation of topsoil in these depressions.

Archaeological anomalies

West of Deepdale - Area A and Area C (see Figs 8 - 28 inclusive)

The main focus of activity is to the western centre of the area where a large and complex arrangement of enclosures covering more than 5 hectares is clearly identifiable. The basic alignment of the complex is north/south. A linear anomaly locating a field boundary shown on the first edition Ordnance Survey mapping bisects the complex. The complex extends at least 250m from east to west and at least 350m from north to south.

At the northern end of the complex are two large enclosures (**E1** and **E2**). To the immediate north another enclosure (**E3** – outside the proposed development area) possibly locates the northern extent of the complex. Appended to the south-western corner of **E2** is **E4** which appears to mark the western extent of the complex. These four enclosures are the largest and the most well defined. South of these are several other conjoining rectangular enclosures, many of which have been subdivided. The discontinuous nature of many of the anomalies describing these enclosures suggests possible truncation from ploughing. This apparent truncation seems to increase towards the southern and eastern ends of the complex.

Within all these enclosures numerous discrete anomalies have been identified which strongly suggests that the majority of these enclosures were used for more than just stock containment. These anomalies are likely to be caused by features indicative of settlement activity such as pits, larger post-holes, areas of burning, hearths and possibly kilns, two of which, **K1** and **K2**, have tentatively been interpreted. It should be noted however that some of these anomalies may not be caused by archaeological features but by infilled natural features such as solution hollows, frost cracks or fissures in the limestone bedrock. It is impossible to interpret from the magnetic responses between discrete (as opposed to linear) anomalies that may be archaeological in origin and those that are likely to be due to infilled

natural features or to modern activity. The rationale used for the interpretations made in this survey are that those anomalies located inside clearly defined and coherent enclosures (eg **E1**) are interpreted as probably archaeological in origin whilst those outside, or in partially defined enclosures, (eg **E11** and **E13**) are only considered as of possible archaeological potential. It is likely that some of the discrete anomalies interpreted as archaeological will be natural or modern in origin and vice versa. It is also to be expected that there will be a large number of smaller discrete archaeological features, such as post-holes, that have not been identified by the survey either because they are too small (less than 0.25m in diameter) or because there is insufficient magnetic contrast.

Also starting at the south-western corner of **E2** is trackway, **TR1**, which is defined by linear ditches, between 8m and 9m apart, which extend the full length of the complex. Some of the enclosures to the east of the trackway appear to 'overlap' the trackway, perhaps suggesting different phases of activity. A second possible trackway, **TR2**, has been interpreted to the eastern side of the complex. Here though the anomalies defining the feature are intermittent and perhaps less convincing.

To the east of the main body of the complex are three slightly smaller enclosures (**E5**, **E6** and **E7**), none of which are directly linked to the main complex but which do respect the basic alignment. **E5** is a reverse D-shape, morphologically distinct from any of the other identified enclosures, located just to the east of **E1** and to the south of **D1**, a ditch feature that extends right the way to the eastern edge of Area A at Deepdale. To the north of **D1** is **E6** while **E7** is located approximately 150m south of **E5**. It is not clear whether these enclosures are contemporary with the main complex.

A second linear ditch feature, **D2**, can be traced intermittently across much of the southern half of Area A. It is considered possible that **D1** and **D2** may have defined the northern and southern limits of the complex when it was first established. It is worth noting that **D2** appears to cut across **E8** although no phasing should be implied from this observation.

To the south-east corner of Area A and south of **D2** is another, seemingly isolated, morphologically distinct enclosure, **E12**.

In the eastern half of Area A and appended to the north of **D2** is a probable series of enclosures collectively labelled **E13**. The linear anomalies defining the extent of this 'enclosure' are weak and discontinuous and it is considered likely that plough damage has truncated what would have been another smaller complex of enclosures which may have been linked to the main body of the ladder complex to the immediate west.

Other possible enclosures are interpreted from the truncated linear anomalies describing **E9** at the western end of the new road link in Area C, **E10** and **E11** at the south-eastern corner of Area C and **E14** in the north-eastern corner of Area A.

As well as the main enclosure complex ('ladder settlement') and isolated enclosures described above a number of other archaeological features have been interpreted from the magnetic data.

Seven possible square barrows have been identified. **SB1** is in isolation being located in the new road link corridor in Area C. **SB2** to **SB5** inclusive occur as two pairs of features approximately 100m apart in the southern part of Area C. Of potential significance is the distinct magnetic response in the centre of **SB3**. Two less well defined sub-circular anomalies to the south of D1 at the eastern edge of Area A may also be the ploughed out remains of barrows, identified as **SB6** and **SB7**.

Two circular anomalies, **RB1** and **RB2**, are interpreted as possible round barrows. **RB1**, located towards the southern end of Area C, is the smaller of the two features with a radius of 12m. Interestingly another linear ditch type feature, **D3**, aligned north/south just to the west of the possible barrow appears to deviate slightly to avoid the barrow.

On the same basic north/south alignment and right on the western development boundary is a line of fifteen discrete anomalies. These anomalies are indicative of large pits and given the archaeological potential of the surrounding landscape have been interpreted as a pit alignment, **PA1**.

East of Deepdale – Area B and Area D (see Figs 29 - 43 inclusive)

The alignment of the archaeological features east of Deepdale differs from that to the west. Here the main alignment is from north-west to south-east as exhibited by the discontinuous linear ditch type anomaly, **D4**, which extends from the north-western corner of the survey for approximately 600m. Appended to the southern side of **D4** are at least six enclosures, **E15** to **E20** inclusive. **E15** and **E16** are the most well defined with **E15** appearing to be un-enclosed to its eastern side. The other four enclosures are less coherent, again probably as a consequence of differential plough damage. Within all of the enclosures are numerous discrete anomalies indicative of occupational activity.

To the south of this first row of enclosures in this 'washing line' are the further truncated remains of several other enclosures. The size and shape of only two of these, **E21** and **E22**, can be fully discerned from the discontinuous anomalies that define them. The anomalies become less coherent to the south and east. Of note is one very small enclosure, **E23**, that is clearly defined.

Towards the south-western corner of Area D are two vague, possibly circular, anomalies. These have tentatively been identified as **RB3?** and **RB4?**

To the north-east of linear feature **D4** the number of anomalies of probable archaeological potential declines significantly. No clearly defined enclosures or barrows are noted although there are still linear anomalies present that in all probability form part of other enclosures or

field boundaries, particularly those closest to **D4**. Indeed, two linear anomalies parallel with and 10m north of **D4** could define the northern side of a third trackway, **TR3?**

Area B covers an area of approximately 3.5 hectares and is at the extreme eastern end of the site bordering a new section of road. The magnetic background from this part of the site is extremely 'flat' with nowhere near the level of anomalies identified as were present in the area surveyed in advance of the road scheme (Eastway Link Road). However, anomalies have been identified adjacent to the site boundary and because of the nature of the archaeology encountered during the subsequent excavations these have been interpreted as archaeological although a more detailed interpretation is not possible.

To the south-east corner two strong anomalies, **B2?** and **B3?** may locate structures as may another sub-rectangular anomaly, **B1?**, 100 metres to the north. This latter anomaly seems to be the sole indication of the continuation of the activity uncovered in the adjacent excavations. Numerous linear anomalies indicative of ridge and furrow ploughing can also be seen in this area.

A line of discrete anomalies aligned north/south to the west of the area locates a former field boundary shown on the first edition Ordnance Survey mapping.

5 Conclusions

The geophysical survey has clearly demonstrated the presence of anomalies indicative of human activity across virtually the whole of the proposed development area and in the immediate vicinity. This level of activity is much more extensive than had been indicated by the cropmark evidence and this discrepancy between the cropmark and geophysical evidence is particularly apparent to the east of Deepdale where only a single cropmark had previously been recorded. However, this disparity is probably explained by the very weak and intermittent nature of the anomalies which strongly suggests that the underlying features may have been greatly degraded by modern ploughing and therefore not visible as cropmarks.

The site naturally and physically divides into two distinct areas and possible phases of activity either side of Deepdale. To the west of Deepdale and east of High Eastfield Farm a complex of enclosures aligned north/south, bounded by trackways to the east and west, is prominent extending from virtually the northern extent of the survey area to just south of High Eastfield Farm, a distance of in excess of 500m north/south and 250m east/west. Morphologically this 'ladder settlement' is presumed to be of Iron Age or Roman date. Beyond the obvious extent of the settlement to the south and west are a series of isolated features including round barrows and square barrows, a pit alignment as well as a few linear ditch features and possible remnants of enclosures.

To the east of Deepdale a single linear ditch type anomaly extends approximately 500m north-west/south-east from the north-western corner of the development boundary. The anomaly becomes increasingly weak and intermittent as it extends to the south-east and apparently terminates about 150m from the southern edge of the site. It is considered probable that the 'gaps' in the anomaly towards the south-eastern terminal are due to the truncation of the feature by ploughing. Appended to the southern side of this 'washing line' are a series of enclosures of varying size and shape with other more truncated enclosures further to the south. North of the linear ditch the survey suggests that the archaeology may peter out. However, it is not clear whether this is an actual reflection of the underlying archaeology.

In the south-east corner of the site in Area B there are a few anomalies to suggest that the archaeology encountered during the excavations undertaken prior to the construction of the Eastway Link Road does extend but for only a limited distance into the current site. However, as in the 2004 geophysical survey it is difficult to ascribe a specific function to the anomalies that have been identified but three of the larger rectilinear anomalies could be structures.

In conclusion anomalies interpreted as archaeological or potentially archaeological have been identified throughout the site. Based on the morphology, location, alignment and type of feature suggested by the anomalies the archaeological activity on this site may be considered to be multi-phase. On this basis the site overall can be said to have a high, locally very high, archaeological potential.

The results and subsequent interpretation of data from geophysical surveys should not be treated as an absolute representation of the underlying archaeological and non-archaeological remains. Confirmation of the presence or absence of archaeological remains can only be achieved by direct investigation of sub-surface deposits.

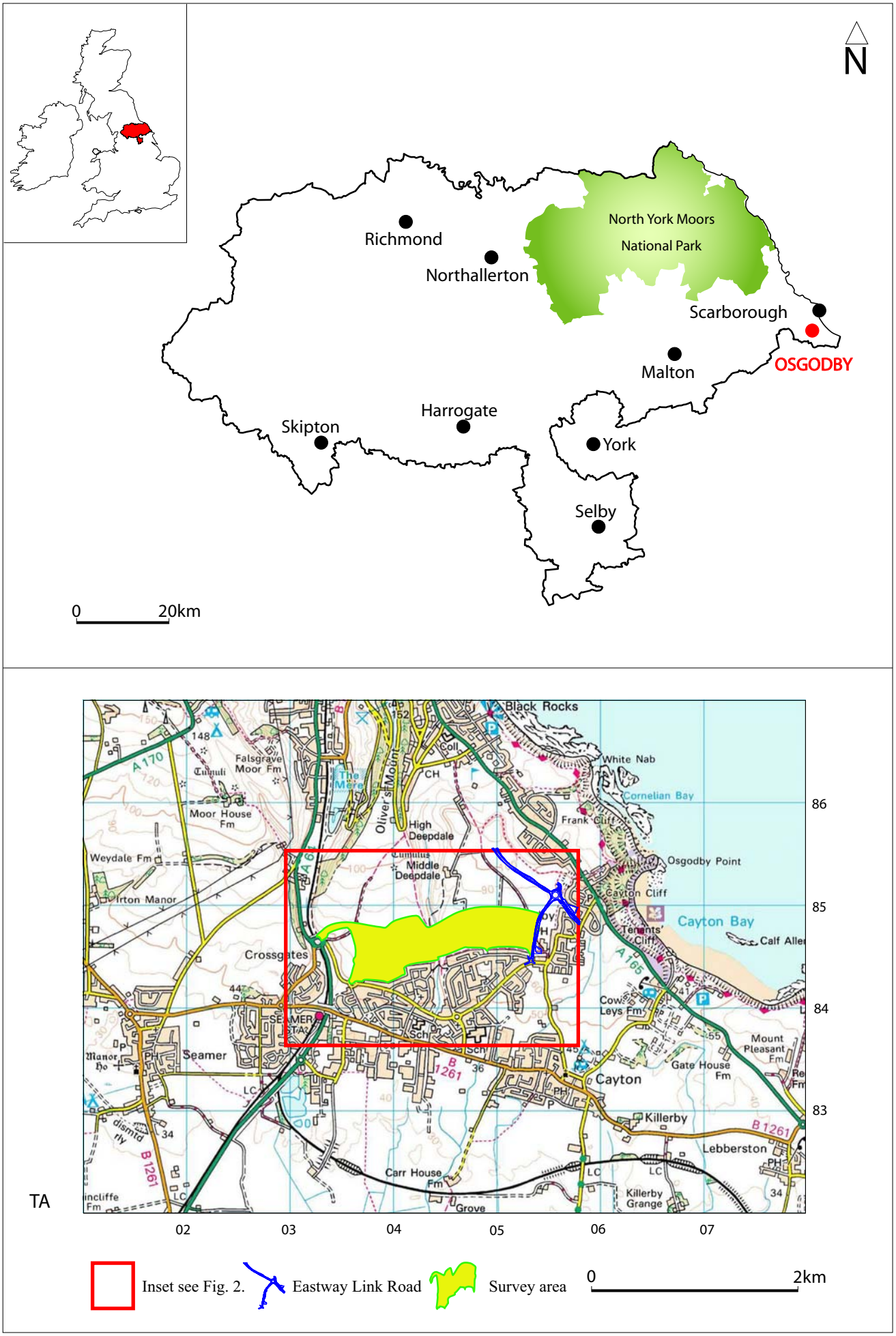
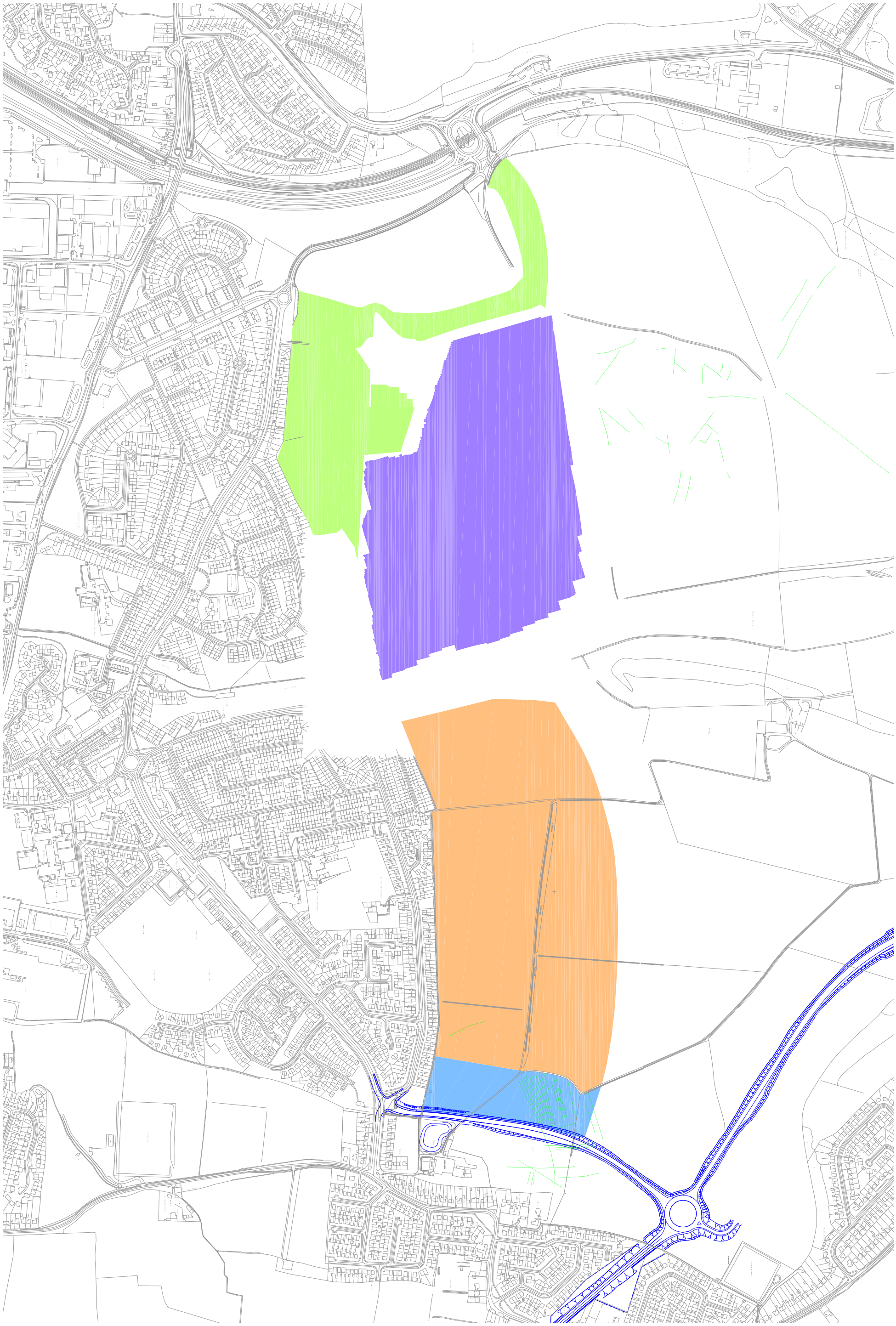


Fig. 1. Site location



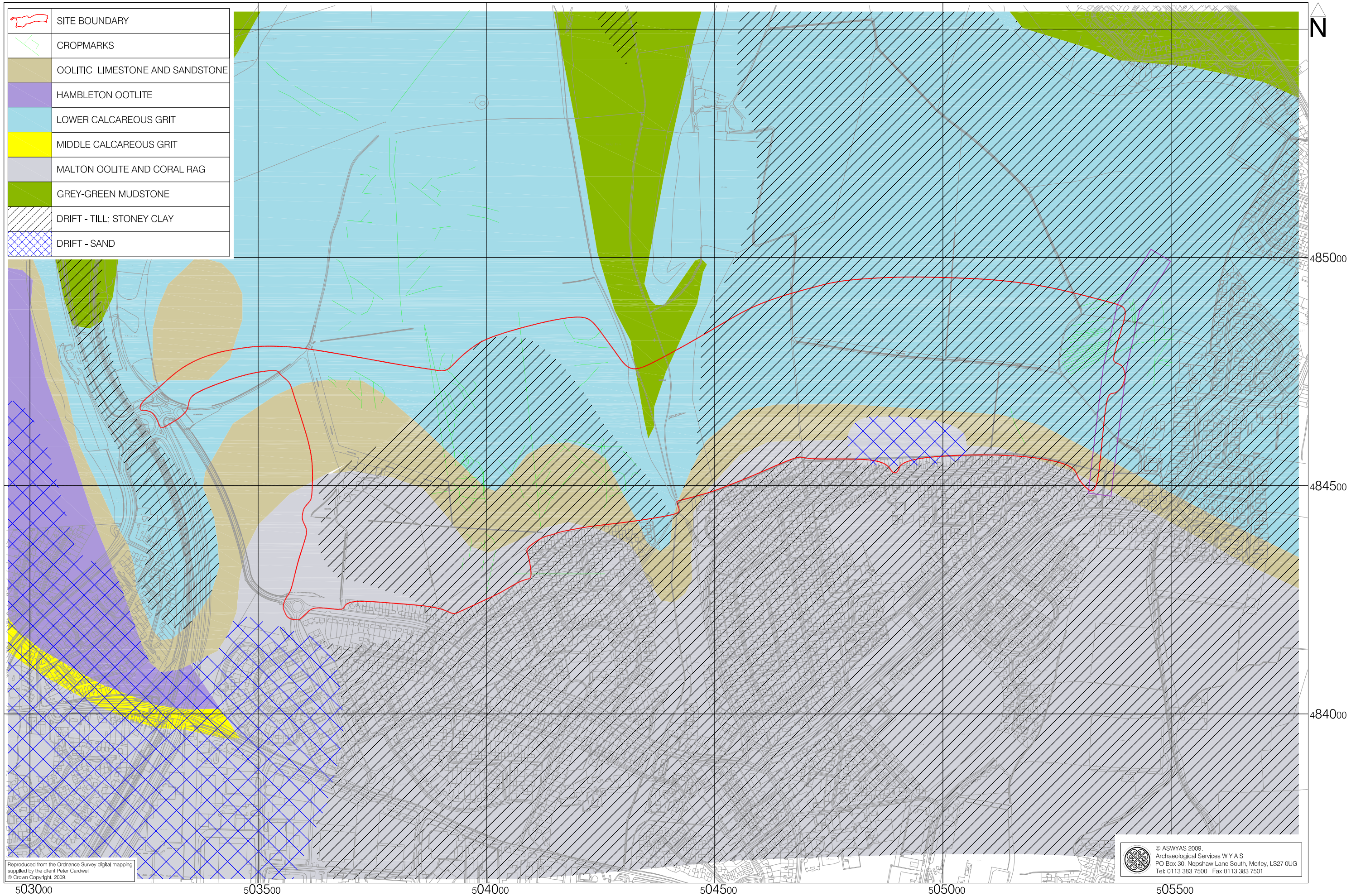


Fig. 3. Site location showing geology and cropmark detail (1:7500 @ A3)

SITE BOUNDARY

PREVIOUS ASWYAS GEOPHYSICAL SURVEY 2004

EASTWAY LINK ROAD

SECTOR DIVISION

N

AREA C, SECTOR 1
SEE FIGS 8 - 10

AREA A, SECTOR 1
SEE FIGS 26 - 28

AREA A, SECTOR 2
SEE FIGS 23 - 25

AREA D, SECTOR 1
SEE FIGS 29 - 31

AREA D, SECTOR 4
SEE FIGS 41 - 43

AREA B
SEE FIGS 38 - 40

AREA C, SECTOR 2
SEE FIGS 11 - 13

AREA A & C, SECTOR 4
SEE FIGS 17 - 19

AREA A, SECTOR 3
SEE FIGS 20 - 22

AREA D, SECTOR 2
SEE FIGS 32 - 34

AREA D, SECTOR 3
SEE FIGS 35 - 37

AREA C, SECTOR 3
SEE FIGS 14 - 16

4850$_{00}$

4845$_{00}$

4840$_{00}$

5030$_{00}$ 5035$_{00}$ 5040$_{00}$ 5045$_{00}$ 5050$_{00}$ 5055$_{00}$

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0 250m

Fig. 4. Site location showing magnetometer data (1:7500 @ A3)

	SITE BOUNDARY
	EASTWAY LINK ROAD

TYPE OF ANOMALY		INTERPRETATION
•	DIPOLAR ISOLATED	FERROUS MATERIAL
	MAGNETIC DISTURBANCE	FERROUS MATERIAL
	DIPOLAR LINEAR	SERVICE PIPE
	LINEAR TREND	AGRICULTURAL
	MAGNETIC ENHANCEMENT	GEOLOGY
	MAGNETIC VARIATION	GEOLOGY/ARCHAEOLOGY?
	MAGNETIC ENHANCEMENT	ARCHAEOLOGY?/GEOLOGY
•	MAGNETIC ENHANCEMENT	HEARTH/KILN ?
	MAGNETIC ENHANCEMENT	ARCHAEOLOGY

N

4855 00

4850 00

4845 00

4840 00

5030 00 5035 00 5040 00 5045 00 5050 00 5055 00

0 250m

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Fig. 5. Site location showing overall interpretation (1:7500 @ A3)

	SITE BOUNDARY

TYPE OF ANOMALY		INTERPRETATION
	MAGNETIC VARIATION	GEOLOGY/ARCHAEOLOGY?
	MAGNETIC ENHANCEMENT	ARCHAEOLOGY/GEOLOGY?
	MAGNETIC ENHANCEMENT	HEARTH/KILN ?
	MAGNETIC ENHANCEMENT	ARCHAEOLOGY

N

4848 00

4844 00

5035 00

5039 00

5043 00

SB1
E9
E3
E6
E14
E2
K2
E1
D1
E5
E4
SB6
TR1
TR2
SB7
K1
RB2
E7
D2
TR1
D2
D2
E13
D3
E8
D2
E12
PA1
RB1
SB5
E11
SB4
SB2
SB3
E10
D3
D4
E15
E16
E22
E23
RB3?
RB?4

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0 100m

Fig. 6. Site location showing archeaological interpretation of magnetometer data; west of Deepdale (1:4000 @ A3)

	SITE BOUNDARY
	EASTWAY LINK ROAD

TYPE OF ANOMALY		INTERPRETATION
	MAGNETIC VARIATION	GEOLOGY/ARCHAEOLOGY?
	MAGNETIC ENHANCEMENT	ARCHAEOLOGY/GEOLOGY?
	MAGNETIC ENHANCEMENT	HEARTH/KILN ?
	MAGNETIC ENHANCEMENT	ARCHAEOLOGY

N

4848 00

4844 00

5043 00

5047 00

5051 00

E6 E1 D1 E5 TR2 E14 SB6 SB7 TR2 E7 D2 E13 E8 D2 E12 SB2 SB3 D4 E15 E16 E21 E22 E23 RB3? RB?4 TR3 E17 E18 E19 TR3 D4 E20 B1? B2? B3?

0 100m

Fig. 7. Site location showing archeaological interpretation of magnetometer data; east of Deepdale (1:4000 @ A3)

SECTOR DIVISION

N

PLANTATION

PLANTATION

G/MkR

5.0

-5.0

nT

4848^{00}

4846^{00}

5033^{00}

5035^{00}

0 50m

Fig. 8. Processed greyscale magnetometer data; Area C, Sector 1 (1:1000 @ A3)

Fig. 9. XY trace plot of unprocessed magnetometer data; Area C, Sector 1 (1:1000 @ A3)

TYPE OF ANOMALY		INTERPRETATION
•	DIPOLAR ISOLATED	FERROUS MATERIAL
	MAGNETIC ENHANCEMENT	GEOLOGY
	LINEAR TREND	AGRICULTURAL
	MAGNETIC ENHANCEMENT	ARCHAEOLOGY/GEOLOGY?
	MAGNETIC ENHANCEMENT	ARCHAEOLOGY
	MAGNETIC DISTURBANCE	FERROUS MATERIAL

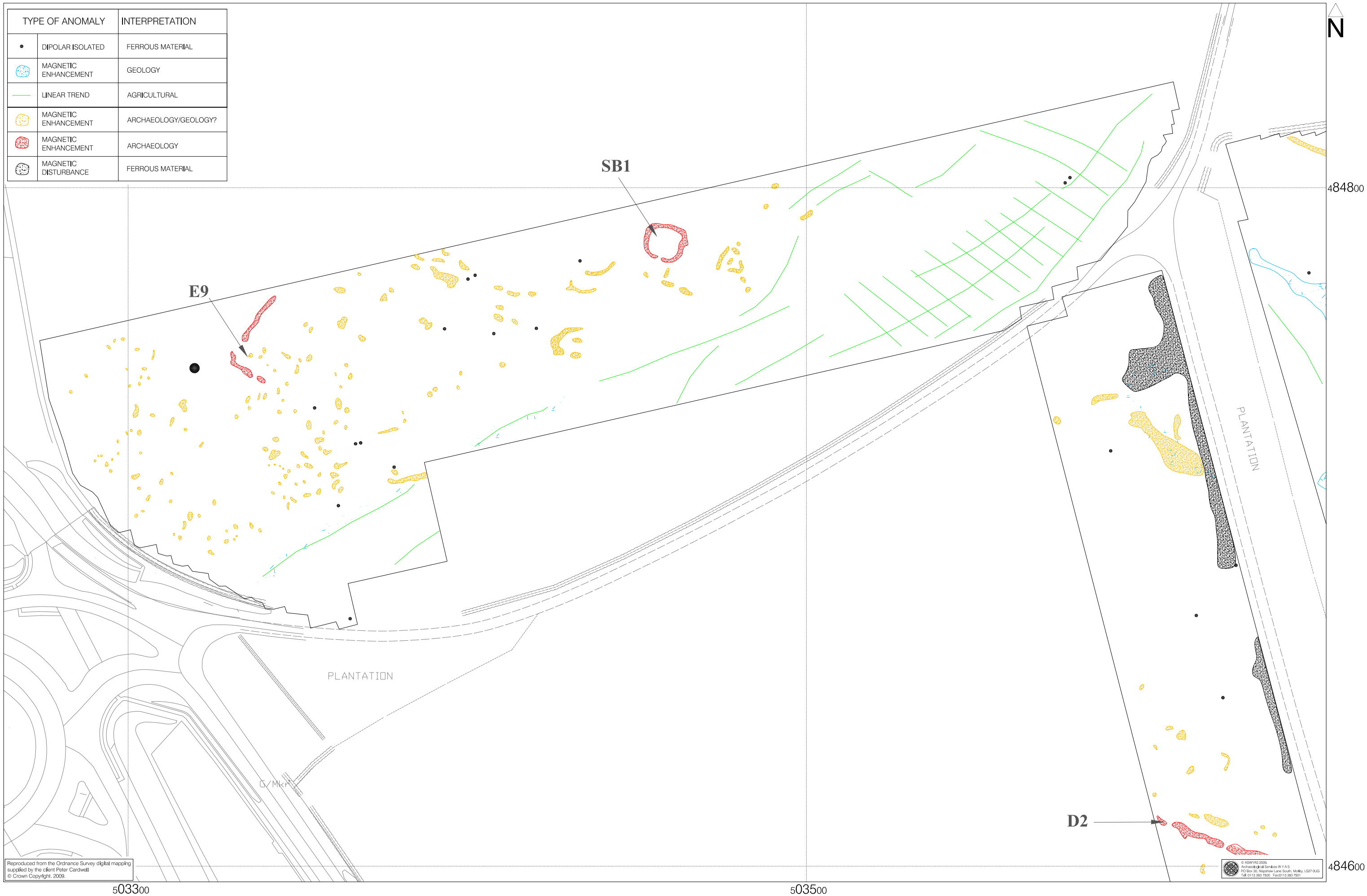

Fig. 10. Interpretation of magnetometer data; Area C, Sector 1 (1:1000 @ A3)

SECTOR DIVISION

1:500 AREA

N

4844 00

PLANTATION

HIGH E

SEE FIGS 44 - 46
FOR 1:500

ORCHARD

5.0

-5.0

nT

4844 00

46.0m

MUSHAM BANK ROAD

47.5m

5035 00

5037 00

0 50m

Fig. 11. Processed greyscale magnetometer data; Area C, Sector 2 (1:1000 @ A3)

SECTOR DIVISION

32.4 nT/cm

N

4844 00

4844 00

PLANTATION

HIGH E

ORCHARD

MUSHAM BANK ROAD

46.0m

47.5m

5035 00

5037 00

0 50m

Fig. 12. XY trace plot of unprocessed magnetometer data; Area C, Sector 2 (1:1000 @ A3)

TYPE OF ANOMALY		INTERPRETATION
•	DIPOLAR ISOLATED	FERROUS MATERIAL
	MAGNETIC DISTURBANCE	FERROUS MATERIAL
	DIPOLAR LINEAR	SERVICE PIPE
	MAGNETIC ENHANCEMENT	GEOLOGY
	LINEAR TREND	AGRICULTURAL
	MAGNETIC ENHANCEMENT	ARCHAEOLOGY/GEOLOGY?
	MAGNETIC ENHANCEMENT	ARCHAEOLOGY

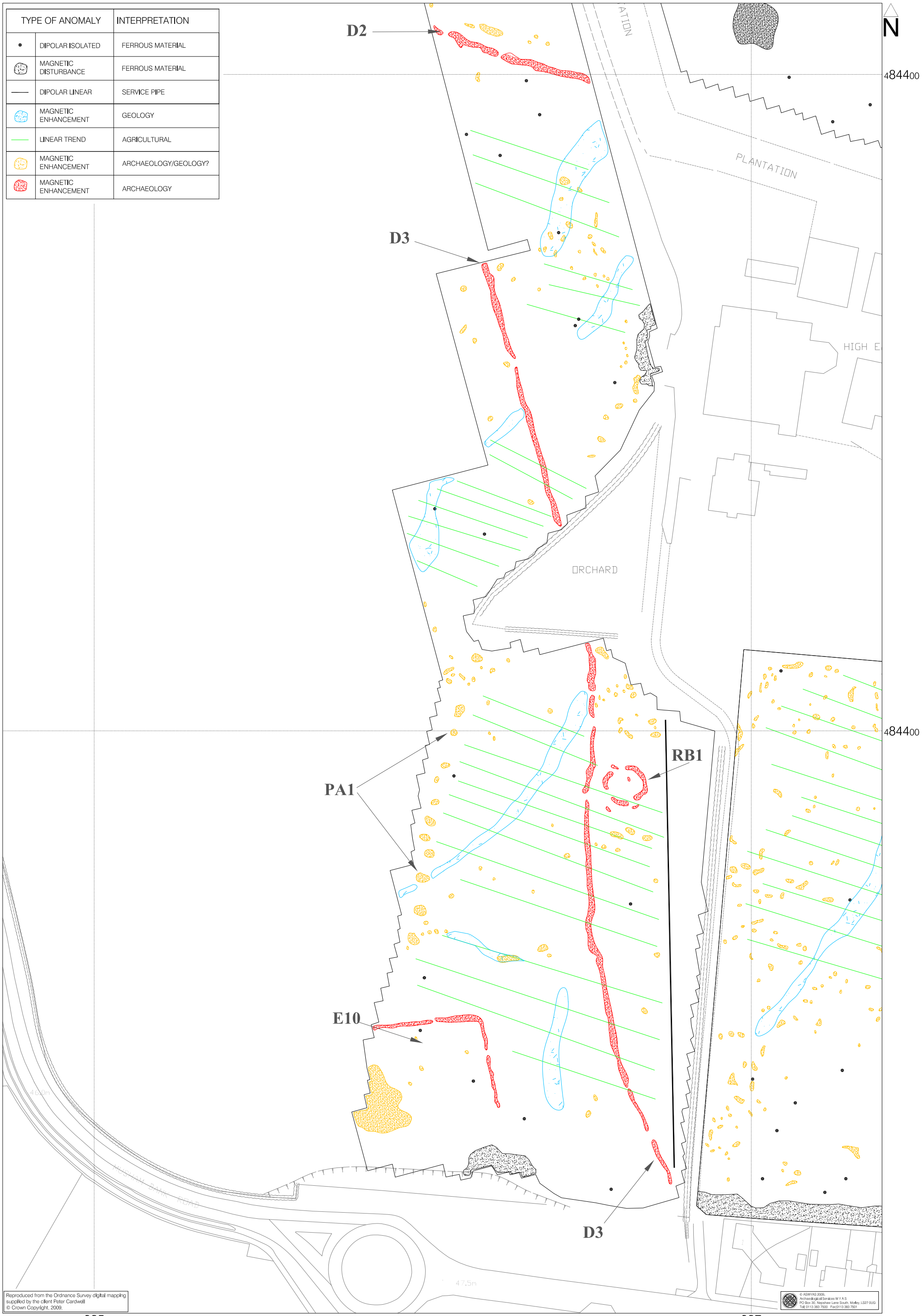

Fig. 13. Interpretation of magnetometer data; Area C, Sector 2 (1:1000 @ A3)

Fig. 14. Processed greyscale magnetometer data; Area C, Sector 3 (1:1000 @ A3)

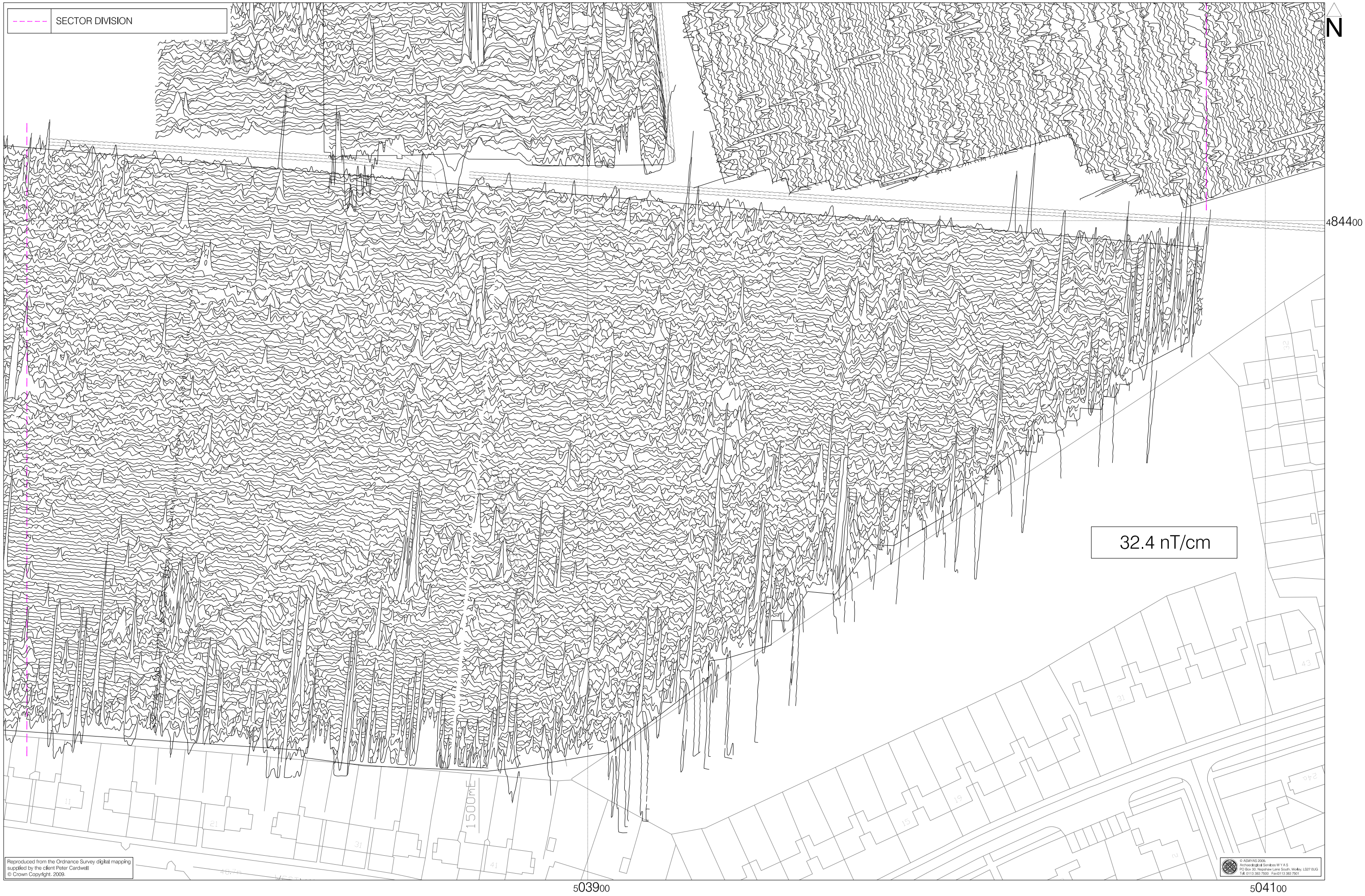

Fig. 15. XY trace plot of unprocessed magnetometer data; Area C, Sector 3 (1:1000 @ A3)

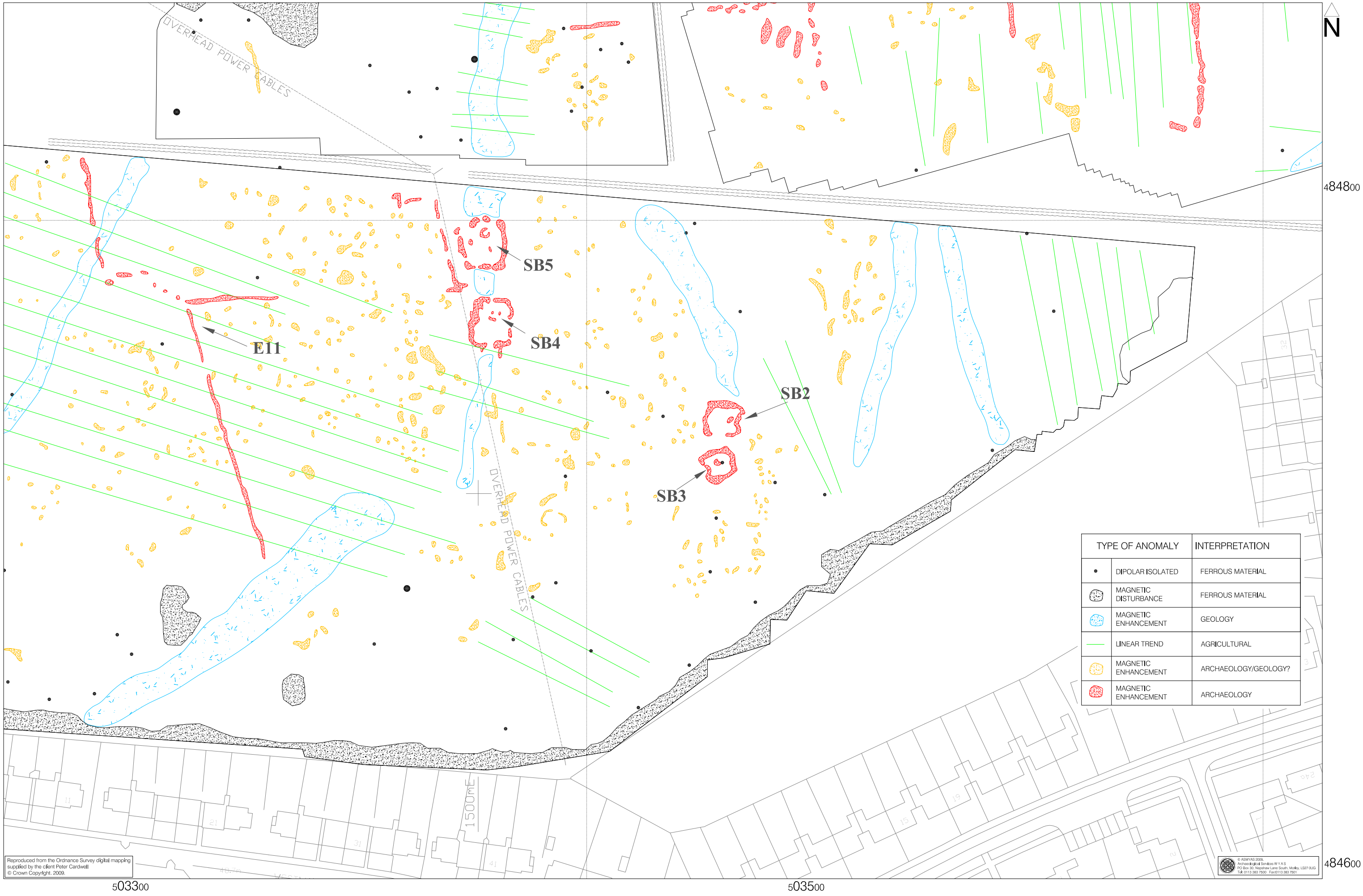

Fig. 16. Interpretation of magnetometer data; Area C, Sector 3 (1:1000 @ A3)

Fig. 17. Processed greyscale magnetometer data; Area A, Sector 4 and Area C, Sector 4 (1:1000 @ A3)

Fig. 18. XY trace plot of unprocessed magnetometer data; Area A & Area C, Sector 4 (1:1000 @ A3)

TYPE OF ANOMALY		INTERPRETATION
•	DIPOLAR ISOLATED	FERROUS MATERIAL
	MAGNETIC ENHANCEMENT	GEOLOGY
	LINEAR TREND	AGRICULTURAL
	LINEAR TREND	ARCHAEOLOGY?/ AGRICULTURAL
	MAGNETIC ENHANCEMENT	ARCHAEOLOGY/GEOLOGY?
	MAGNETIC ENHANCEMENT	ARCHAEOLOGY
	MAGNETIC DISTURBANCE	FERROUS MATERIAL

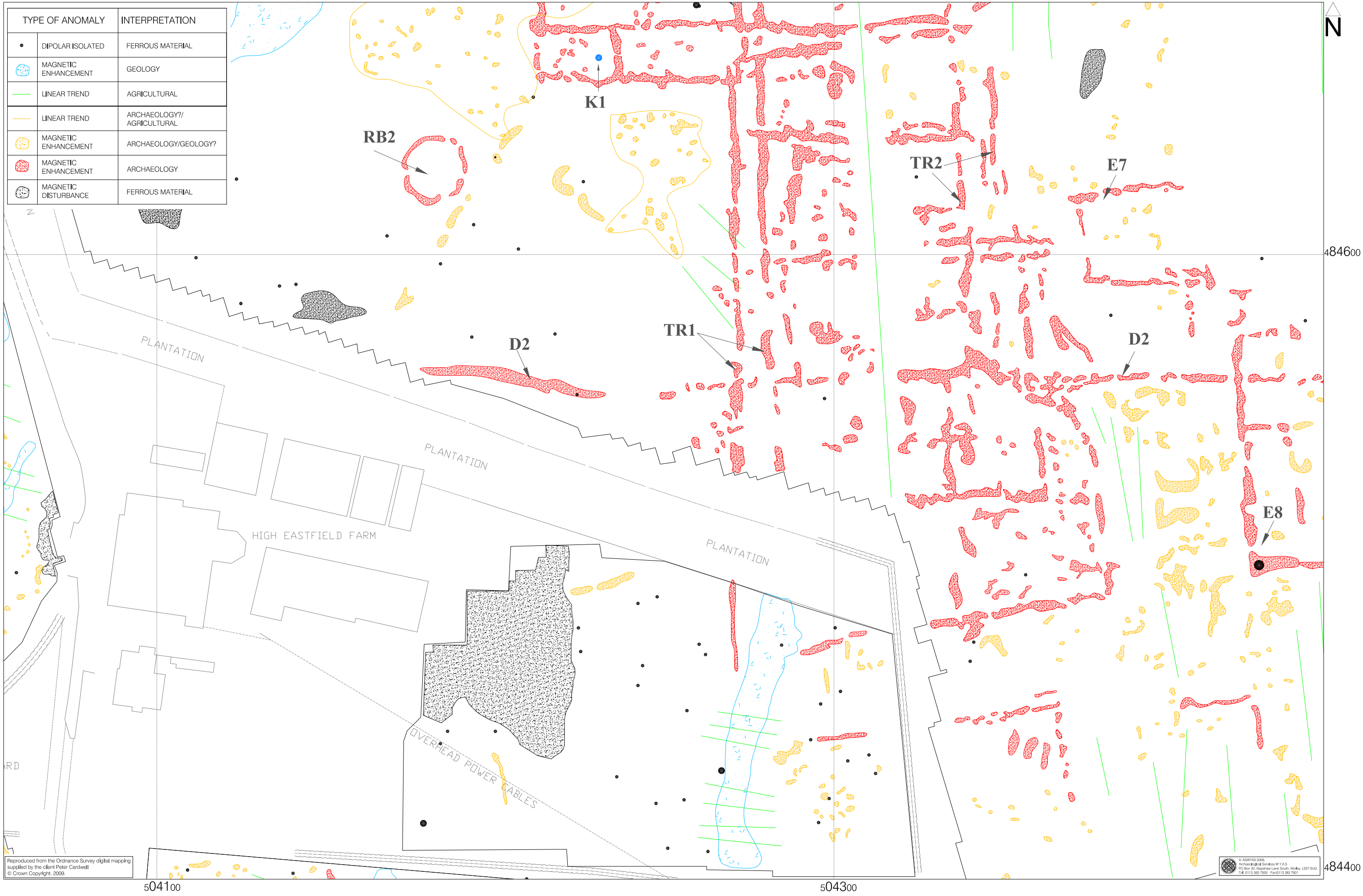

Fig. 19. Interpretation of magnetometer data; Area A, Sector 3 and Area C, Sector 4 (1:1000 @ A3)

SECTOR DIVISION

1:500 AREA

N

SEE FIGS 65 - 67
FOR 1:500

SEE FIGS 71 - 73
FOR 1:500

4846$_{00}$

5.0

-5.0

nT

48.8m

BM 55.93m

27

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5041$_{00}$

5043$_{00}$

4844$_{00}$

0 50m

Fig. 20. Processed greyscale magnetometer data; Area A, Sector 3 (1:1000 @ A3)

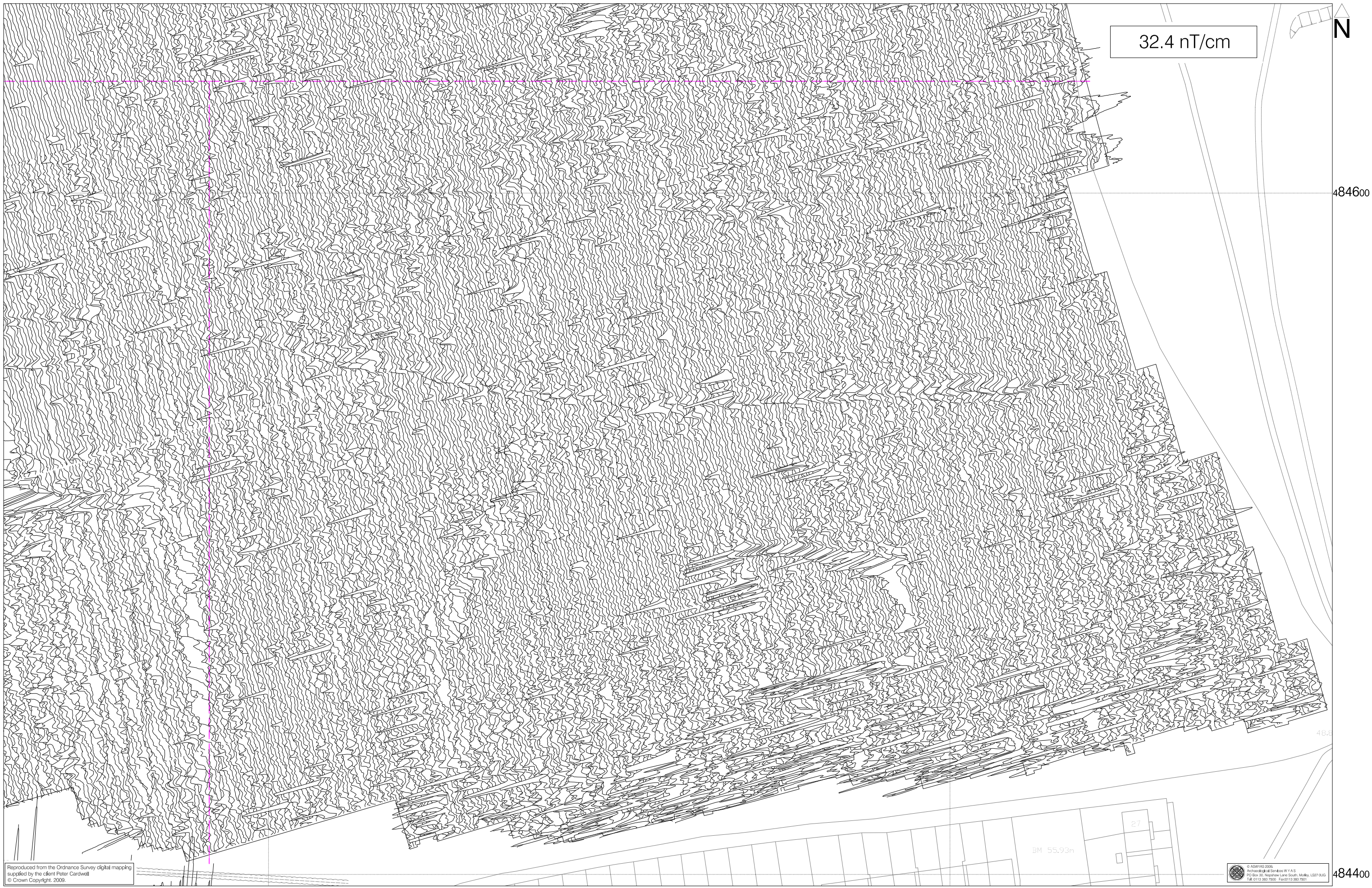

Fig. 21. XY trace plot of unprocessed magnetometer data; Area A, Sector 3 (1:1000 @ A3)

Fig. 22. Interpretation of magnetometer data; Area A, Sector 3 (1:1000 @ A3)

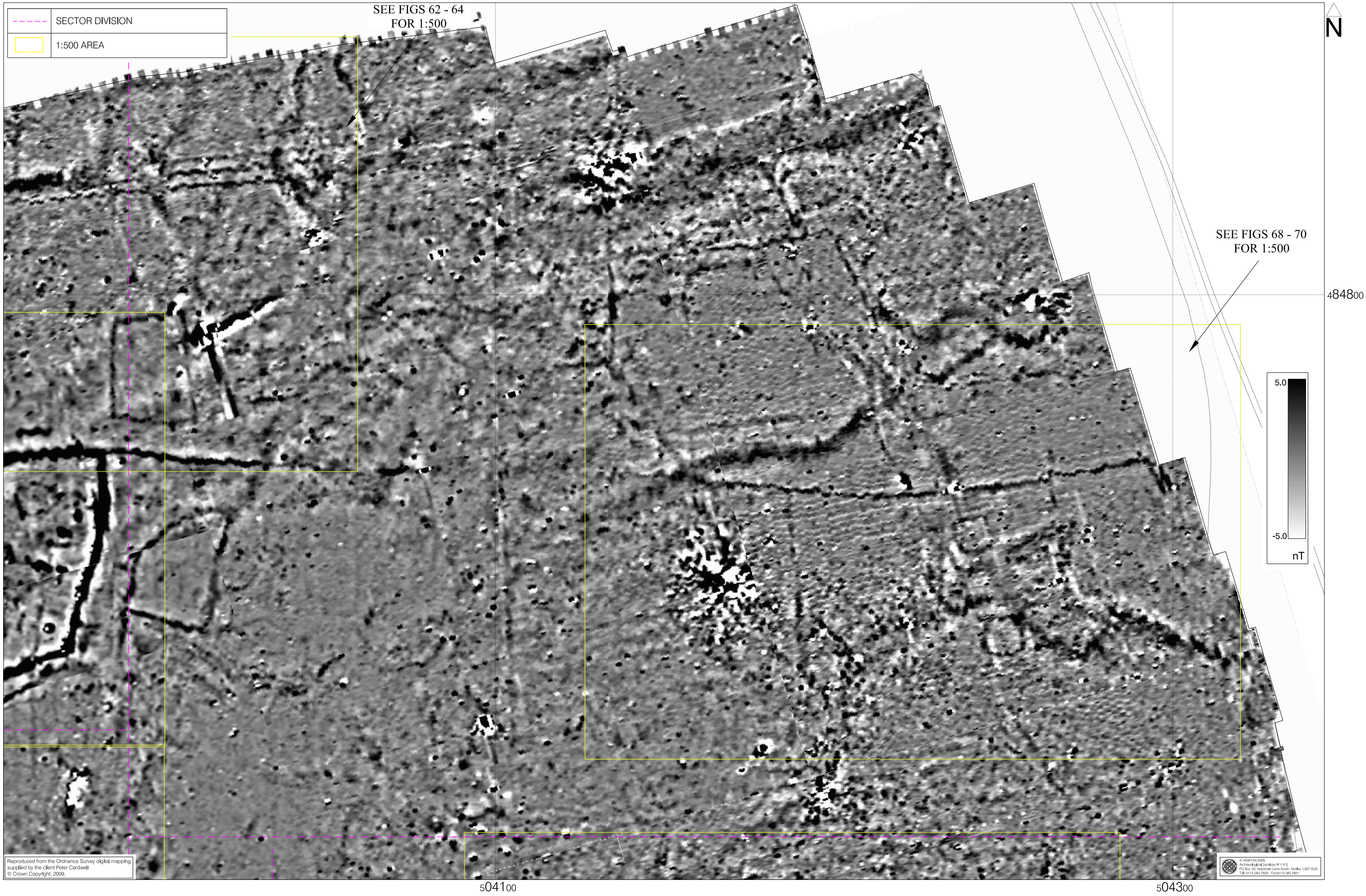

Fig. 23. Processed greyscale magnetometer data; Area A, Sector 2 (1:1000 @ A3)

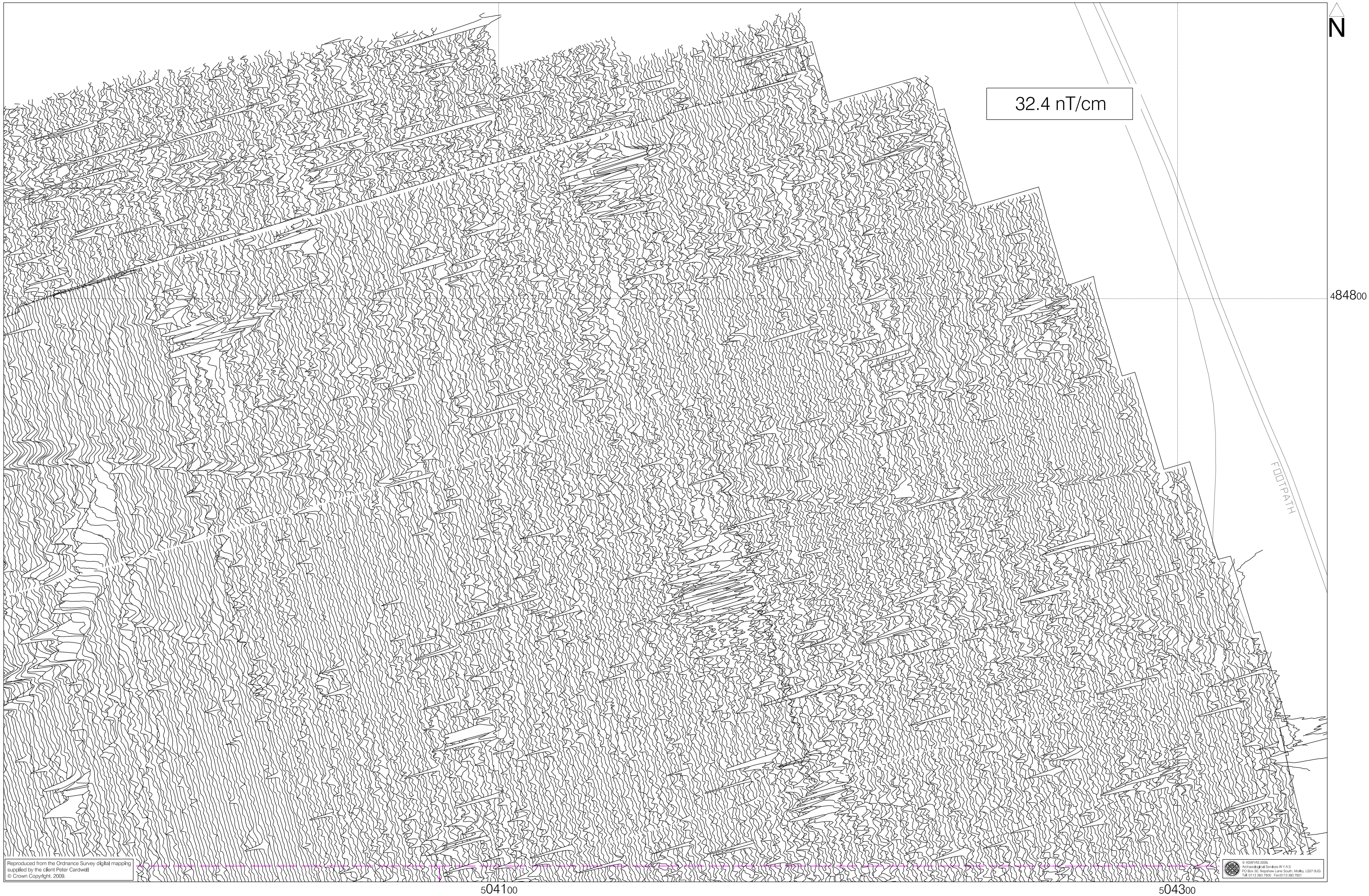

Fig. 24. XY trace plot of unprocessed magnetometer data; Area A, Sector 2 (1:1000 @ A3)

TYPE OF ANOMALY		INTERPRETATION
•	DIPOLAR ISOLATED	FERROUS MATERIAL
	MAGNETIC DISTURBANCE	FERROUS MATERIAL
	MAGNETIC ENHANCEMENT	GEOLOGY
	LINEAR TREND	AGRICULTURAL
	MAGNETIC ENHANCEMENT	ARCHAEOLOGY/GEOLOGY?
	MAGNETIC ENHANCEMENT	ARCHAEOLOGY

N

E6

D1

E14

E5

SB6

SB7

FOOTPATH

4848 00

5041 00

5043 00

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0 50m

Fig. 25. Interpretation of magnetometer data; Area A, Sector 2 (1:1000 @ A3)

Fig. 26. Processed greyscale magnetometer data; Area A, Sector 1 (1:1000 @ A3)

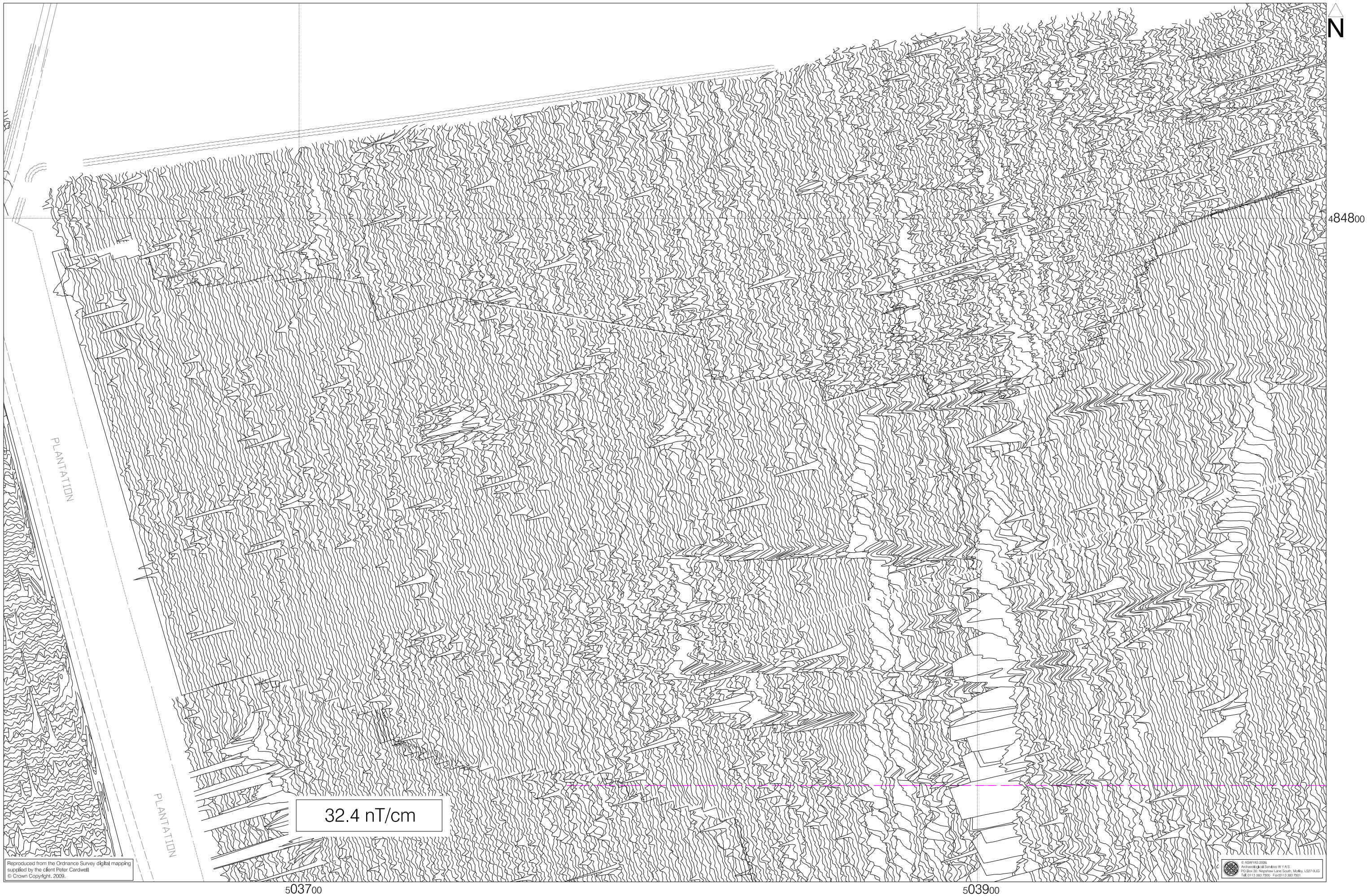

Fig. 27. XY trace plot of unprocessed magnetometer data; Area A, Sector 1 (1:1000 @ A3)

TYPE OF ANOMALY		INTERPRETATION
	MAGNETIC VARIATION	GEOLOGY/ARCHAEOLOGY?
	MAGNETIC ENHANCEMENT	ARCHAEOLOGY/GEOLOGY?
	MAGNETIC ENHANCEMENT	HEARTH/KILN ?
	MAGNETIC ENHANCEMENT	ARCHAEOLOGY
	MAGNETIC DISTURBANCE	FERROUS MATERIAL

TYPE OF ANOMALY		INTERPRETATION
	DIPOLAR ISOLATED	FERROUS MATERIAL
	MAGNETIC ENHANCEMENT	GEOLOGY
	LINEAR TREND	AGRICULTURAL

N

4848 00

E3

E6

K2

E2

E1

E5

E4

TR2

TR1

K1

RB2

TR2

E7

PLANTATION

PLANTATION

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5037 00

5039 00

0 50m

Fig. 28. Interpretation of magnetometer data; Area A, Sector 1 (1:1000 @ A3)

SECTOR DIVISION

1:500 AREA

5.0

-5.0

nT

SEE FIGS 74 - 76
FOR 1:500

SEE FIGS 77 - 79
FOR 1:500

SEE FIGS 83 - 85
FOR 1:500

PLANTATION

N

4848 00

5045 00

5047 00

0 50m

Fig. 29. Processed greyscale magnetometer data; Area D, Sector 1 (1:1000 @ A3)

SECTOR DIVISION

32.4 nT/cm

N

PLANTATION

4848 00

5045 00

5047 00

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0 50m

Fig. 30. XY trace plot of unprocessed magnetometer data; Area D, Sector 1 (1:1000 @ A3)

TYPE OF ANOMALY		INTERPRETATION
•	DIPOLAR ISOLATED	FERROUS MATERIAL
	MAGNETIC ENHANCEMENT	GEOLOGY
	LINEAR TREND	AGRICULTURAL
	MAGNETIC ENHANCEMENT	ARCHAEOLOGY/GEOLOGY?
	MAGNETIC ENHANCEMENT	ARCHAEOLOGY
	MAGNETIC DISTURBANCE	FERROUS MATERIAL

N

D4

E15

E16

E21

E22

PLANTATION

TR3

E17

E18

E19

4848 00

5045 00

5047 00

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0 50m

Fig. 31. Interpretation of magnetometer data; Area D, Sector 1 (1:1000 @ A3)

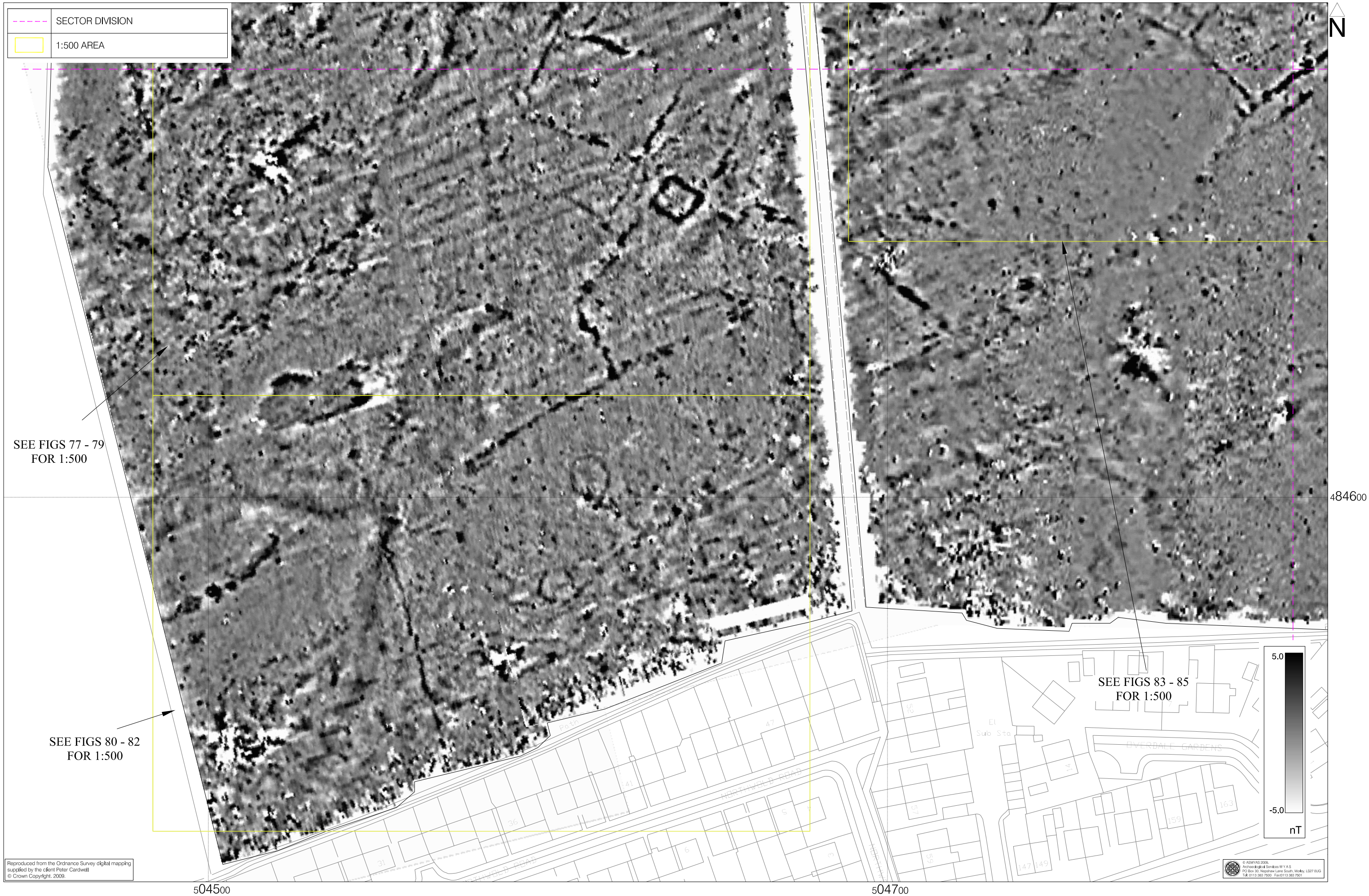

Fig. 32. Processed greyscale magnetometer data; Area D, Sector 2 (1:1000 @ A3)

SECTOR DIVISION

N

4846 00

32.4 nT/cm

5045 00

5047 00

0 50m

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Fig. 33. XY trace plot of unprocessed magnetometer data; Area D, Sector 2 (1:1000 @ A3)

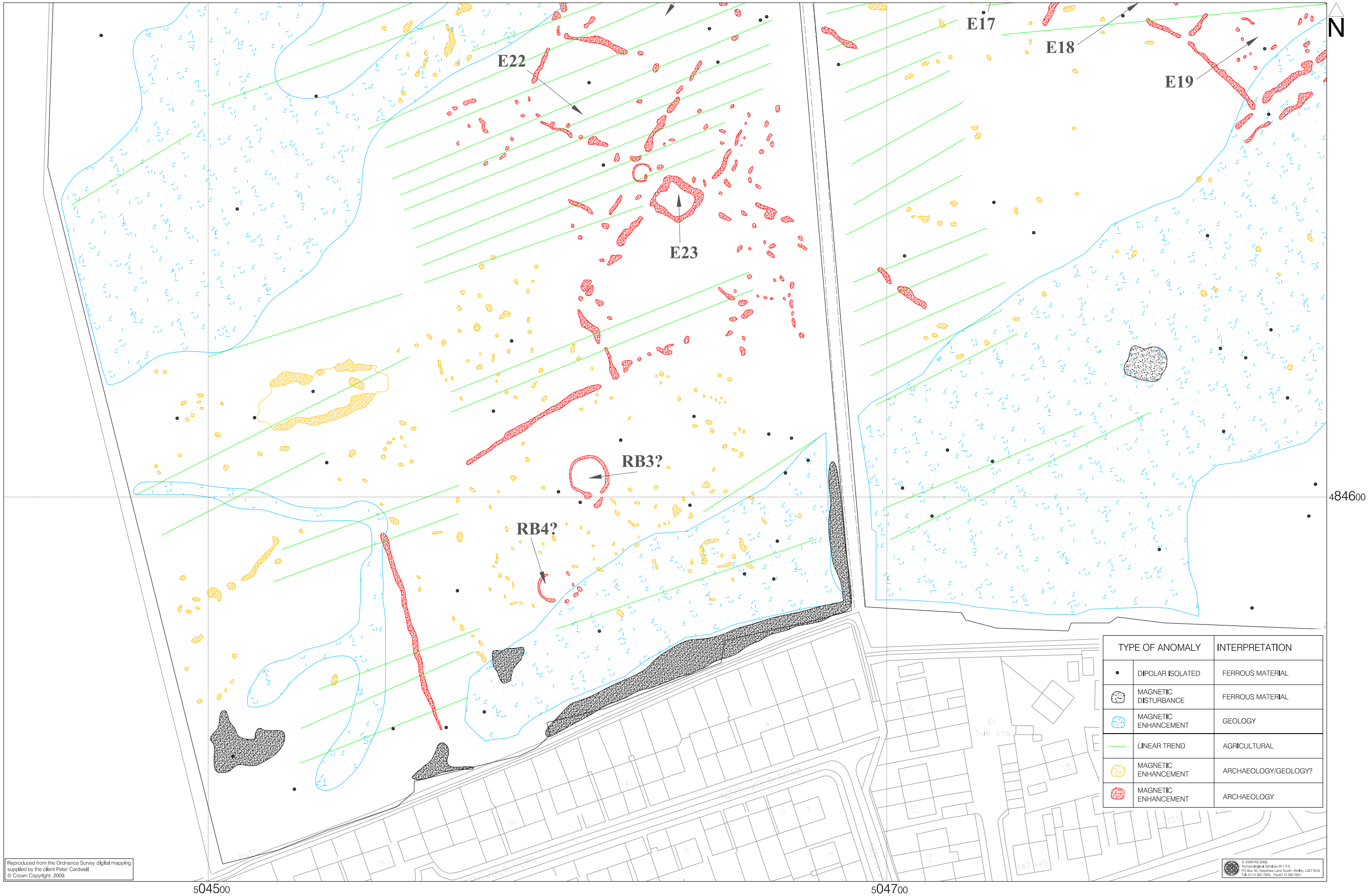

Fig. 34. Interpretation of magnetometer data; Area D, Sector 2 (1:1000 @ A3)

Fig. 35. Processed greyscale magnetometer data; Area D, Sector 3 (1:1000 @ A3)

SECTOR DIVISION

32.4 nT/cm

N

4846$_{00}$

5049$_{00}$

5051$_{00}$

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0 50m

Fig. 36. XY trace plot of unprocessed magnetometer data; Area D, Sector 3 (1:1000 @ A3)

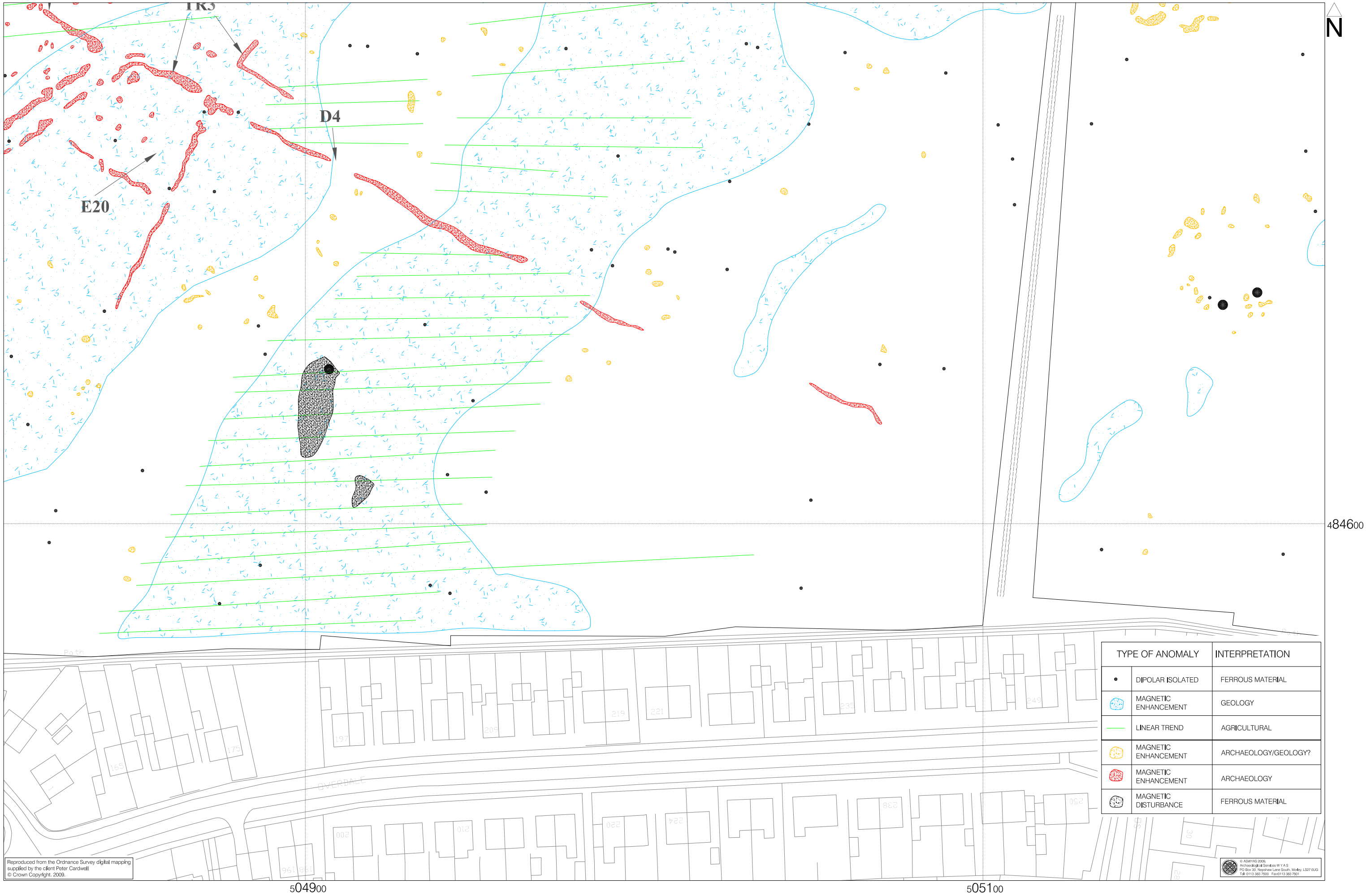

Fig. 37. Interpretation of magnetometer data; Area D, Sector 3 (1:1000 @ A3)

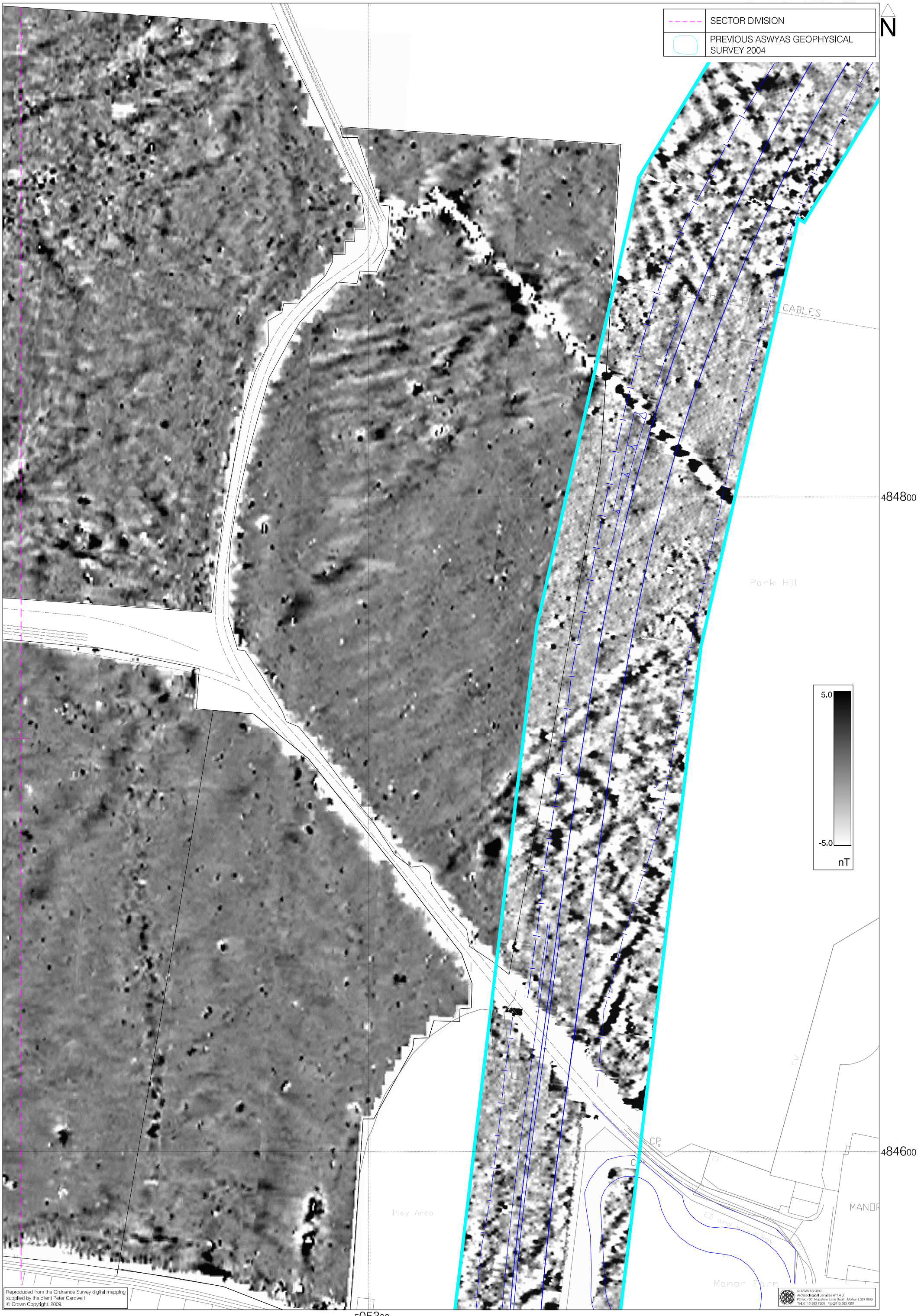

Fig. 38. Processed greyscale magnetometer data; Area B (1:1000 @ A3)

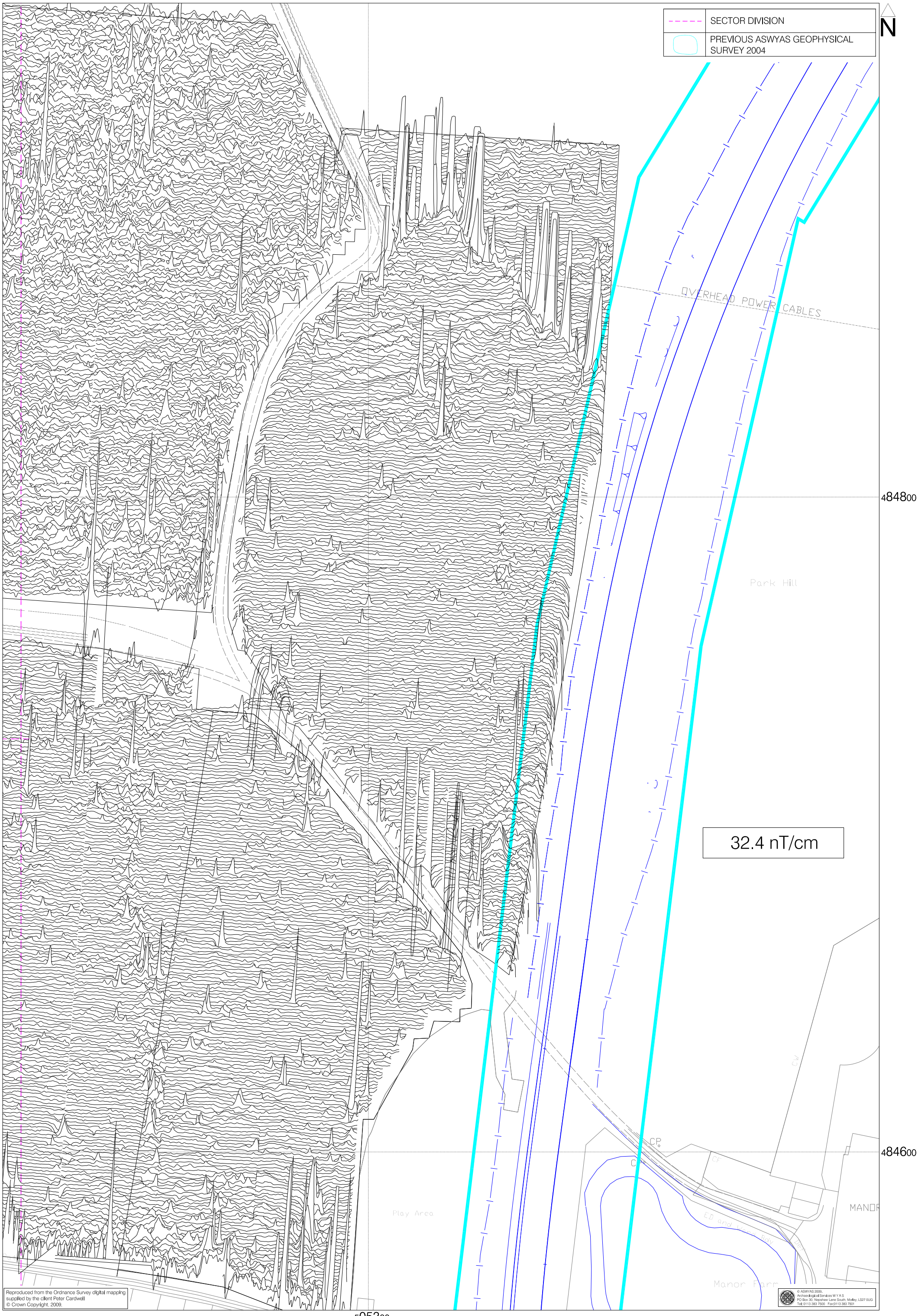

Fig. 39. XY trace plot of unprocessed magnetometer data; Area B (1:1000 @ A3)

	PREVIOUS ASWYAS GEOPHYSICAL SURVEY 2004

TYPE OF ANOMALY		INTERPRETATION
•	DIPOLAR ISOLATED	FERROUS MATERIAL
	MAGNETIC DISTURBANCE	FERROUS MATERIAL
	MAGNETIC ENHANCEMENT	GEOLOGY
	LINEAR TREND	AGRICULTURAL
	MAGNETIC ENHANCEMENT	ARCHAEOLOGY/GEOLOGY?
	MAGNETIC ENHANCEMENT	ARCHAEOLOGY

N

OVERHEAD POWER CABLES

Park Hill

B1?

B2?

B3?

Play Area

Manor Farm

4848 00

4846 00

5053 00

0 50m

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Fig. 40. Interpretation of magnetometer data; Area B (1:1000 @ A3)

SECTOR DIVISION

1:500 AREA

N

PLANTATION

SEE FIGS 83 - 85
FOR 1:500

PLANTATION

PLANTATION

4846 00

5.0

-5.0

nT

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5049 00

5051 00

0 50m

Fig. 41. Processed greyscale magnetometer data; Area D, Sector 4 (1:1000 @ A3)

Fig. 42. XY trace plot of unprocessed magnetometer data; Area D, Sector 4 (1:1000 @ A3)

TYPE OF ANOMALY		INTERPRETATION
•	DIPOLAR ISOLATED	FERROUS MATERIAL
	MAGNETIC ENHANCEMENT	GEOLOGY
	LINEAR TREND	AGRICULTURAL
	MAGNETIC ENHANCEMENT	ARCHAEOLOGY/GEOLOGY?
	MAGNETIC ENHANCEMENT	ARCHAEOLOGY
	MAGNETIC DISTURBANCE	FERROUS MATERIAL

N

PLANTATION

PLANTATION

PLANTATION

TR3

TR3

4846 00

5049 00

5051 00

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0 50m

Fig. 43. Interpretation of magnetometer data; Area D, Sector 4 (1:1000 @ A3)

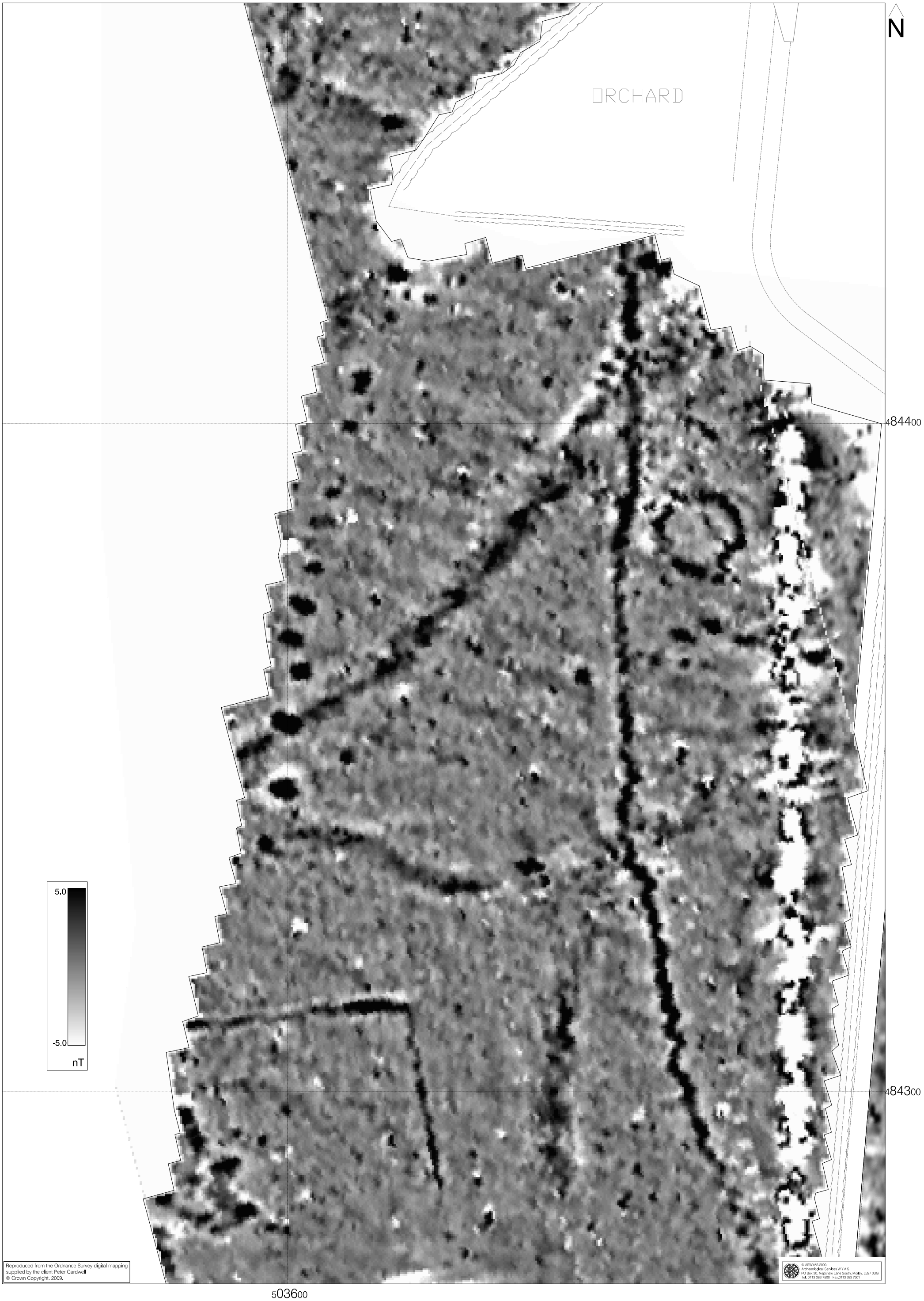

Fig. 44. Processed greyscale magnetometer data from Area C, Sector 2 (1:500 @ A3)

Fig. 45. XY trace plot of unprocessed magnetometer data from Area C, Sector 2 (1:500 @ A3)

TYPE OF ANOMALY		INTERPRETATION
•	DIPOLAR ISOLATED	FERROUS MATERIAL
	MAGNETIC DISTURBANCE	FERROUS MATERIAL
	MAGNETIC ENHANCEMENT	GEOLOGY
	LINEAR TREND	AGRICULTURAL
	MAGNETIC ENHANCEMENT	ARCHAEOLOGY/GEOLOGY?
	MAGNETIC ENHANCEMENT	ARCHAEOLOGY
	LINEAR TREND	SERVICE PIPE

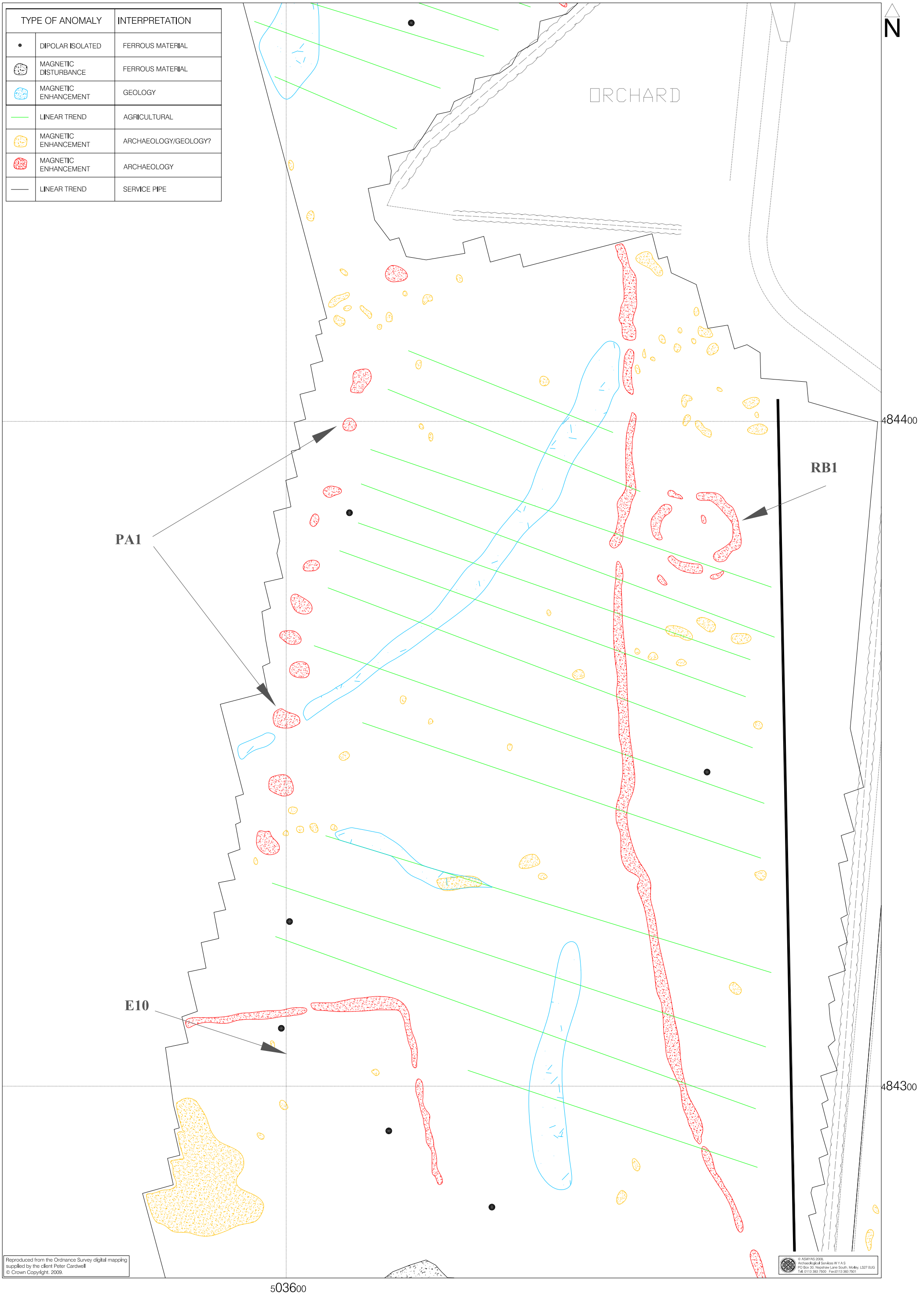

Fig. 46. Interpretation of magnetometer data from Area C, Sector 2 (1:500 @ A3)

N

4846$_{00}$

5.0

-5.0

nT

PLANTATION

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5037$_{00}$

5038$_{00}$

0 25m

Fig. 47. Processed greyscale magnetometer data from Area A, Sector 4 (1:500 @ A3)

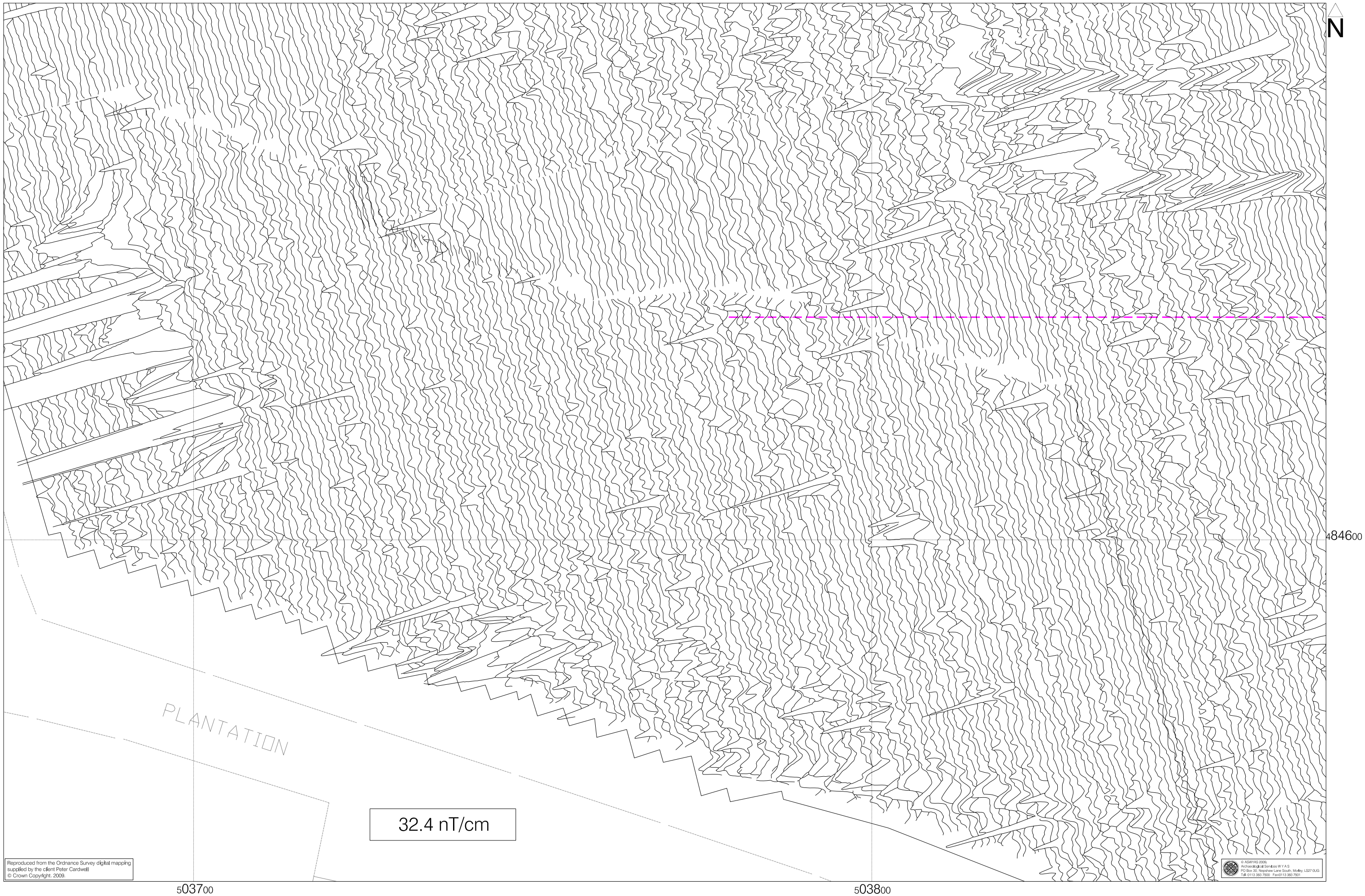

Fig. 48. XY trace plot of unprocessed magnetometer data from Area A, Sector 4 (1:500 @ A3)

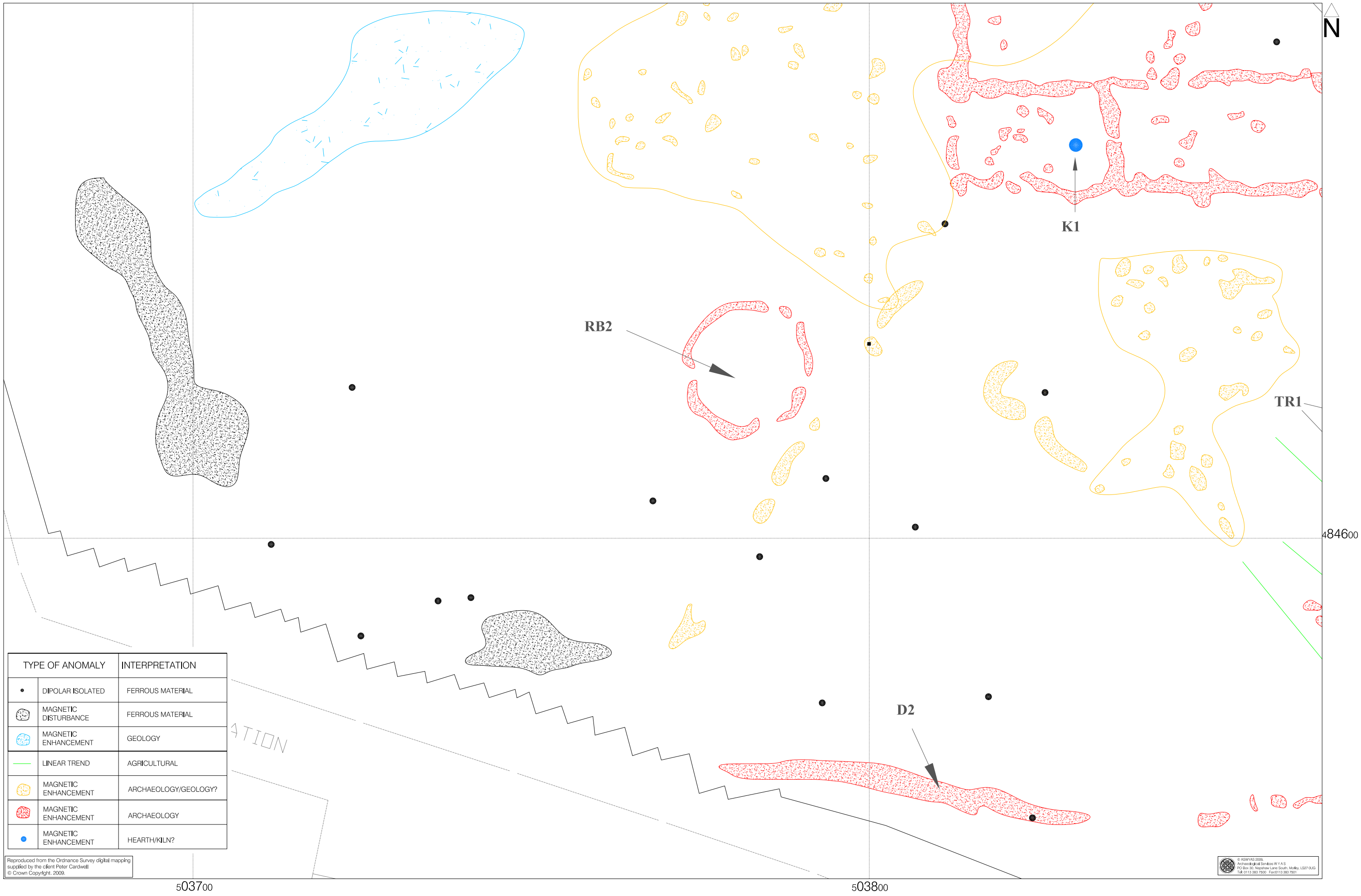

Fig. 49. Interpretation of magnetometer data from Area A, Sector 4 (1:500 @ A3)

N

4844$_{00}$

5.0

-5.0

nT

4843$_{00}$

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5038$_{00}$

5039$_{00}$

0 25m

Fig. 50. Processed greyscale magnetometer data from Area C, Sector 3 (1:500 @ A3)

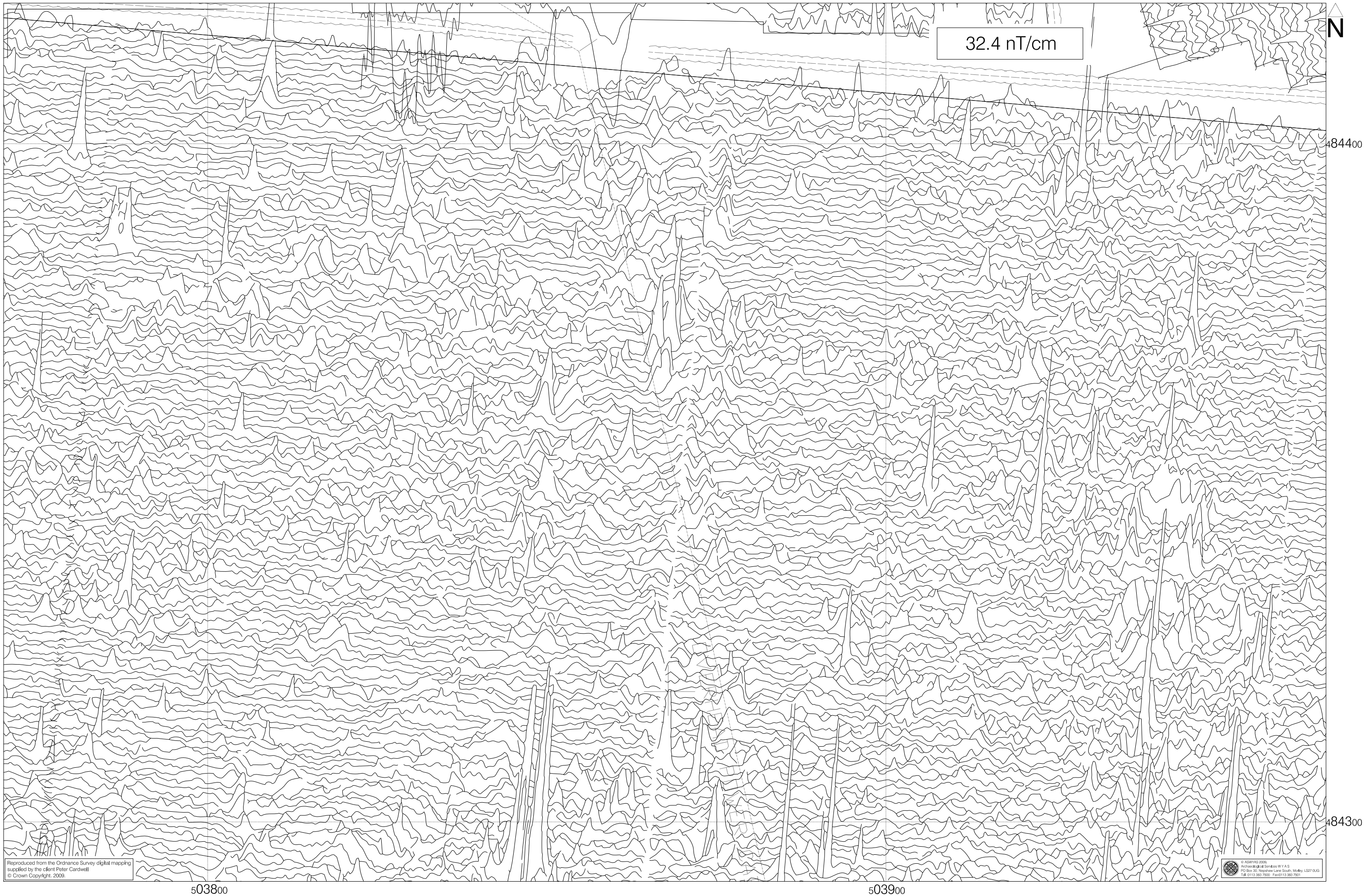

Fig. 51. XY trace plot of unprocessed magnetometer data from Area C, Sector 3 (1:500 @ A3)

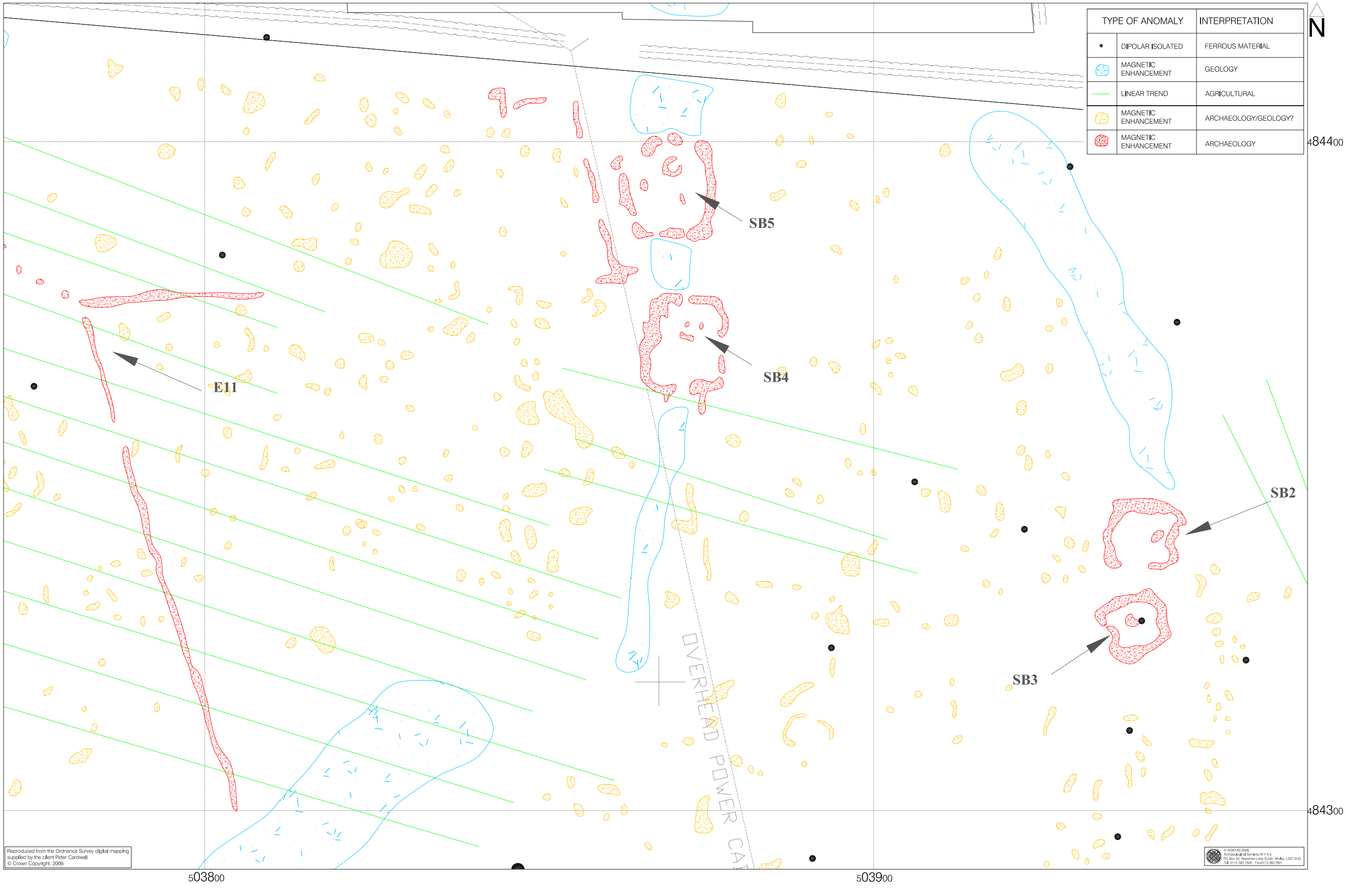

Fig. 52. Interpretation of magnetometer data from Area C, Sector 3 (1:500 @ A3)

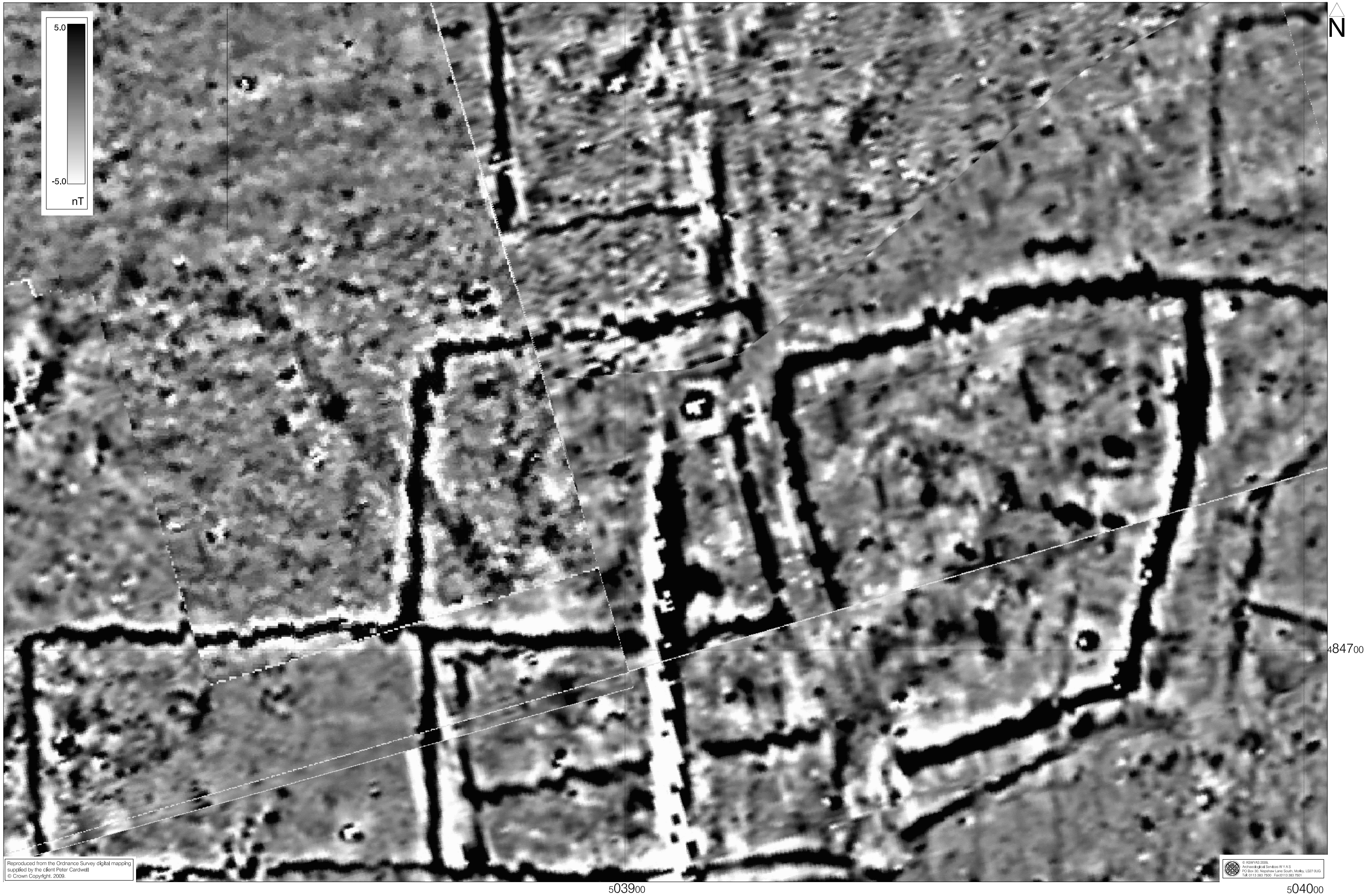

Fig. 53. Processed greyscale magnetometer data from Area A, Sector 1 (1:500 @ A3)

Fig. 54. XY trace plot of unprocessed magnetometer data from Area A, Sector 1 (1:500 @ A3)

TYPE OF ANOMALY		INTERPRETATION
•	DIPOLAR ISOLATED	FERROUS MATERIAL
	MAGNETIC VARIATION	GEOLOGY/ARCHAEOLOGY?
	MAGNETIC ENHANCEMENT	GEOLOGY
	LINEAR TREND	AGRICULTURAL
	MAGNETIC ENHANCEMENT	ARCHAEOLOGY/GEOLOGY?
	MAGNETIC ENHANCEMENT	ARCHAEOLOGY
●	MAGNETIC ENHANCEMENT	HEARTH/KILN?

Fig. 55. Interpretation of magnetometer data from Area A, Sector 1 (1:500 @ A3)

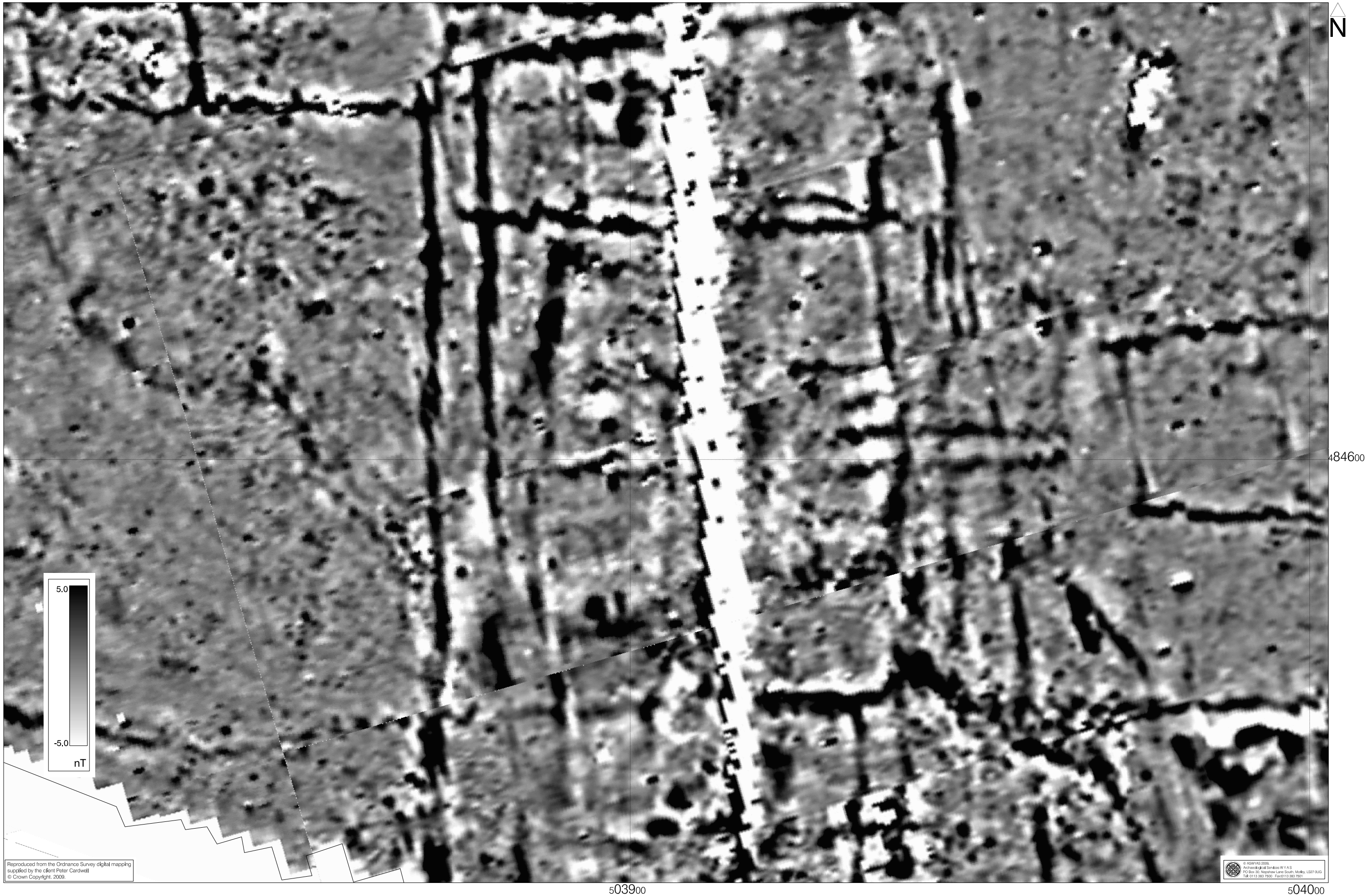

Fig. 56. Processed greyscale magnetometer data from Area C, Sector 4 (1:500 @ A3)

Fig. 57. XY trace plot of unprocessed magnetometer data from Area A, Sector 4 (1:500 @ A3)

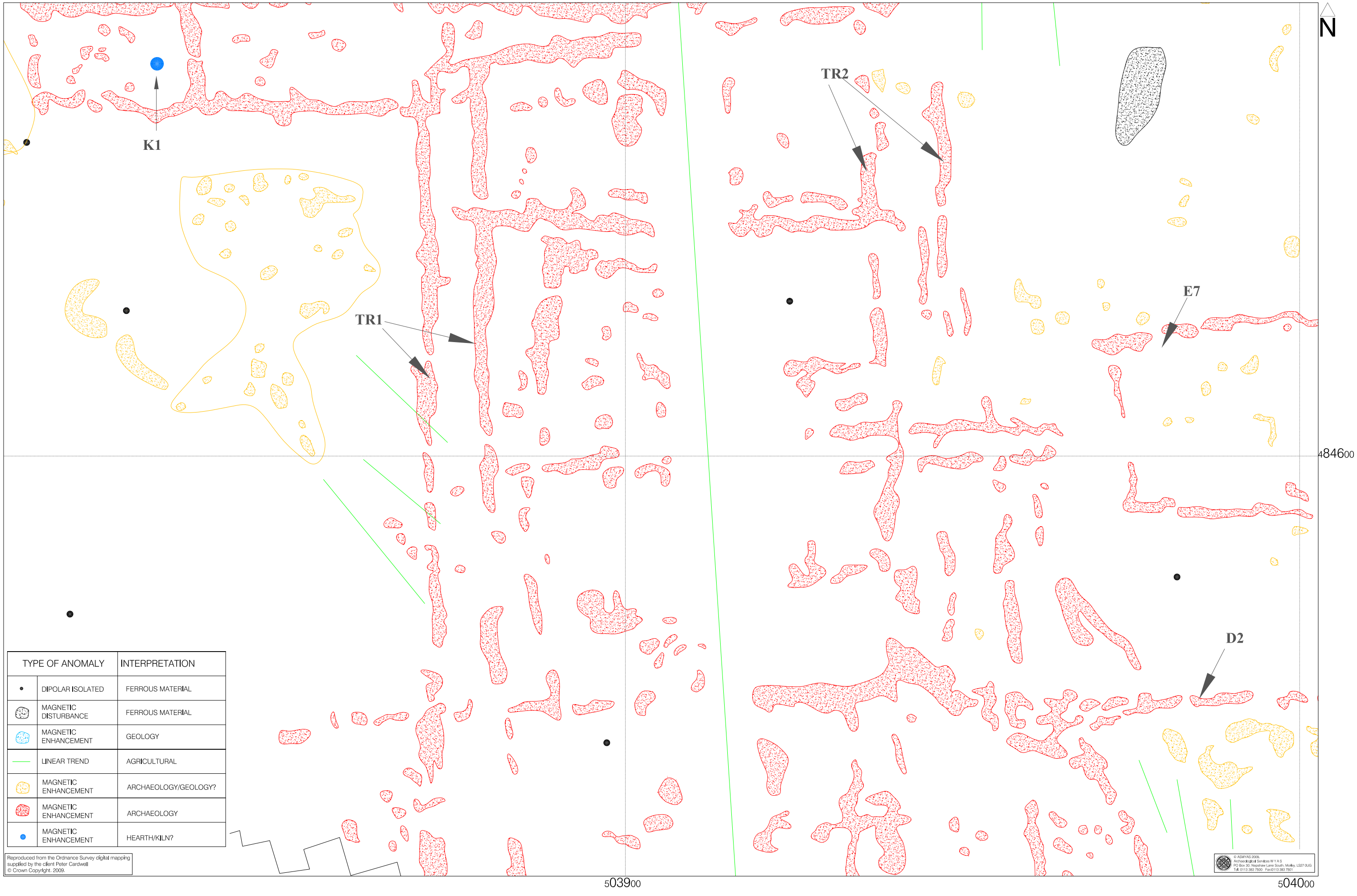

Fig. 58. Interpretation of magnetometer data from Area A, Sector 4 (1:500 @ A3)

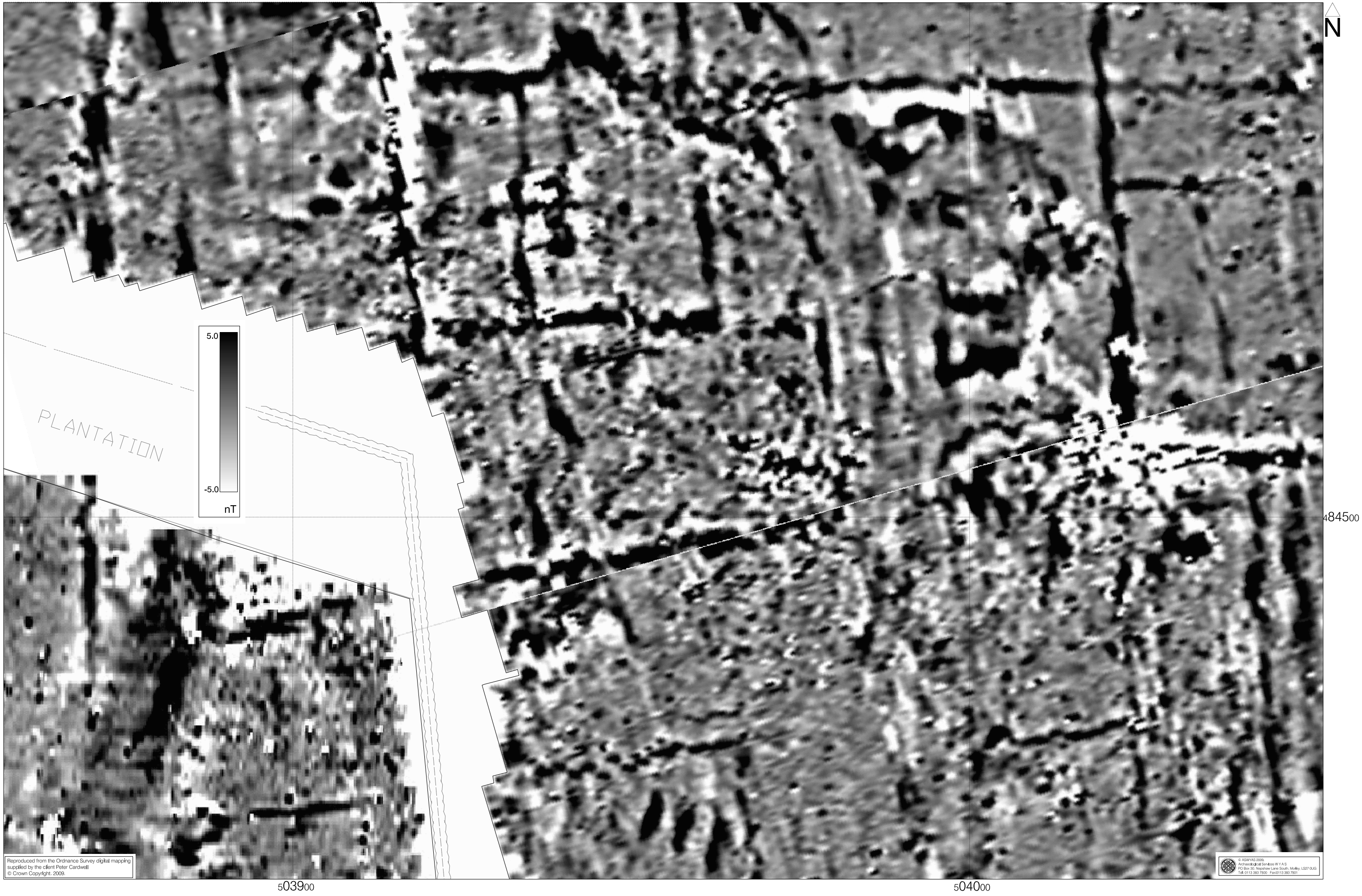

Fig. 59. Processed greyscale magnetometer data from Area A & C, Sector 4 (1:500 @ A3)

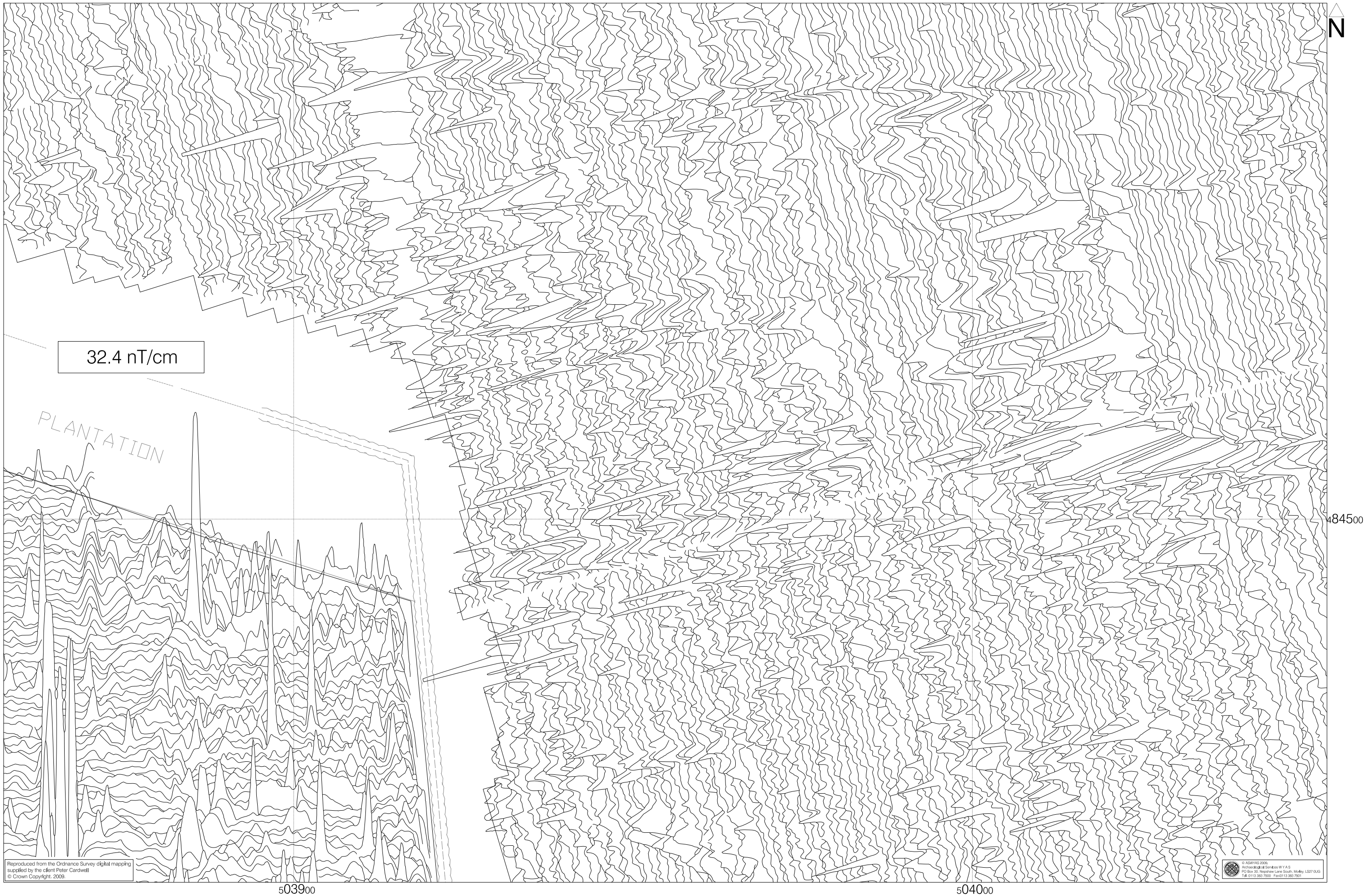

Fig. 60. XY trace plot of unprocessed magnetometer data from Area A & C, Sector 4 (1:500 @ A3)

TYPE OF ANOMALY		INTERPRETATION
•	DIPOLAR ISOLATED	FERROUS MATERIAL
	MAGNETIC ENHANCEMENT	GEOLOGY
	LINEAR TREND	AGRICULTURAL
	MAGNETIC ENHANCEMENT	ARCHAEOLOGY/GEOLOGY?
	MAGNETIC ENHANCEMENT	ARCHAEOLOGY

D2

E8

N

PLANTATION

4845 00

5039 00

5040 00

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0 25m

Fig. 61. Interpretation of magnetometer data from Area A & C, Sector 4 (1:500 @ A3)

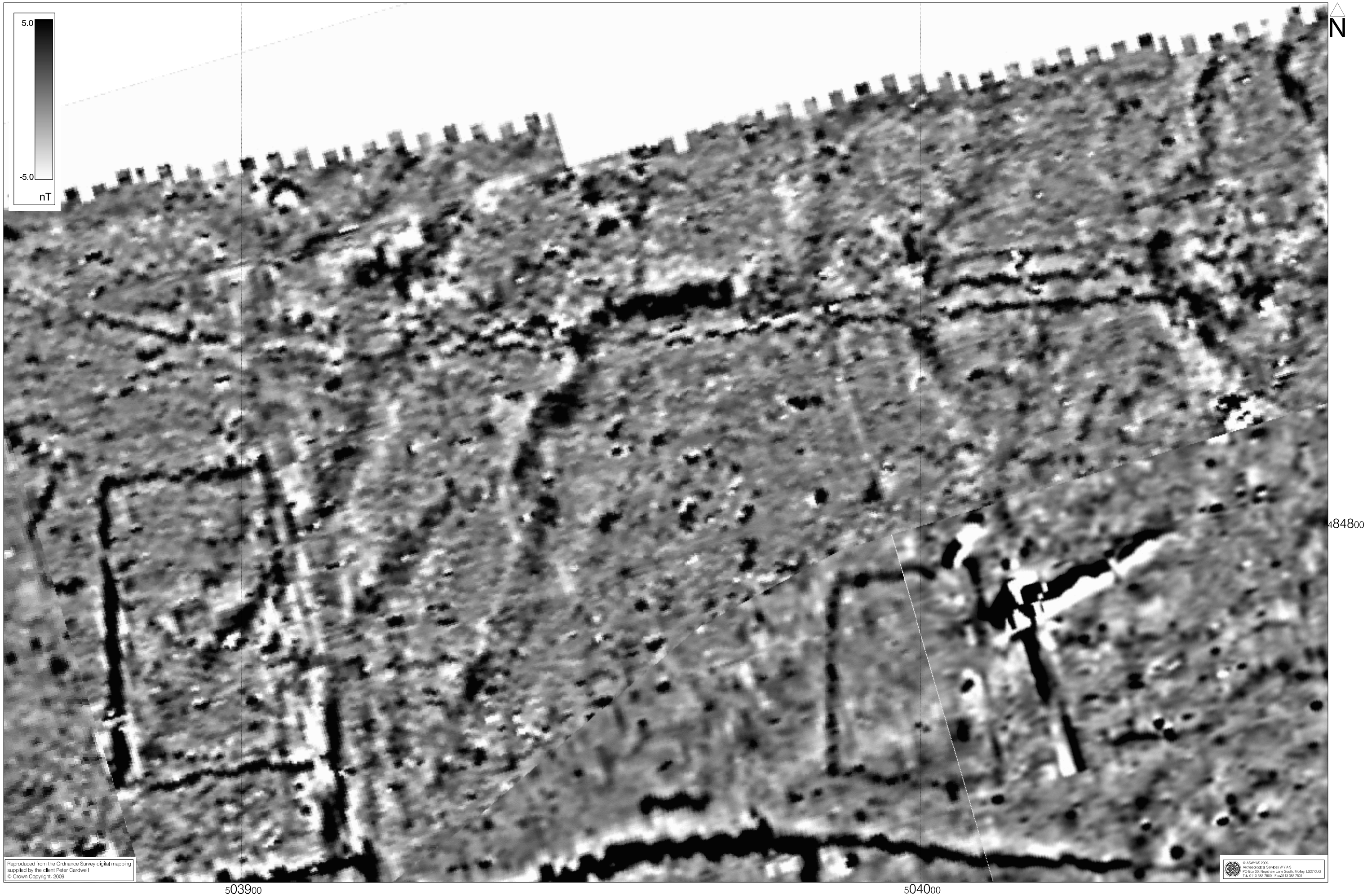

Fig. 62. Processed greyscale magnetometer data from Area A, Sector 1 & 2 (1:500 @ A3)

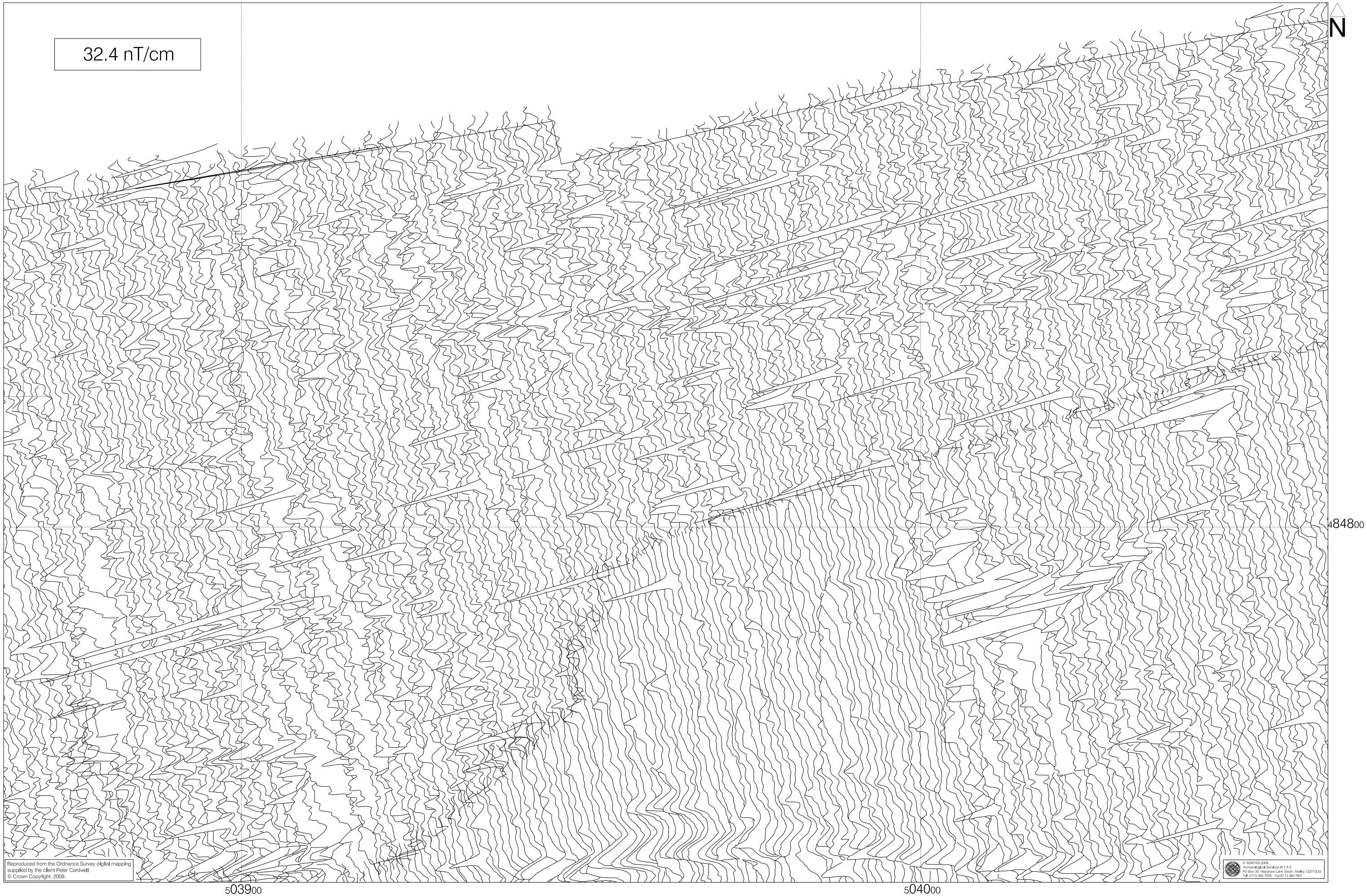

Fig. 63. XY trace plot of unprocessed magnetometer data from Area A, Sector 1 & 2 (1:500 @ A3)

TYPE OF ANOMALY		INTERPRETATION
•	DIPOLAR ISOLATED	FERROUS MATERIAL
	MAGNETIC ENHANCEMENT	GEOLOGY
	MAGNETIC ENHANCEMENT	ARCHAEOLOGY/GEOLOGY?
	MAGNETIC ENHANCEMENT	ARCHAEOLOGY

N

E3

E6

E1

D1

4848$_{00}$

5039$_{00}$

5040$_{00}$

0 25m

Fig. 64. Interpretation of magnetometer data from Area A, Sector 1 & 2 (1:500 @ A3)

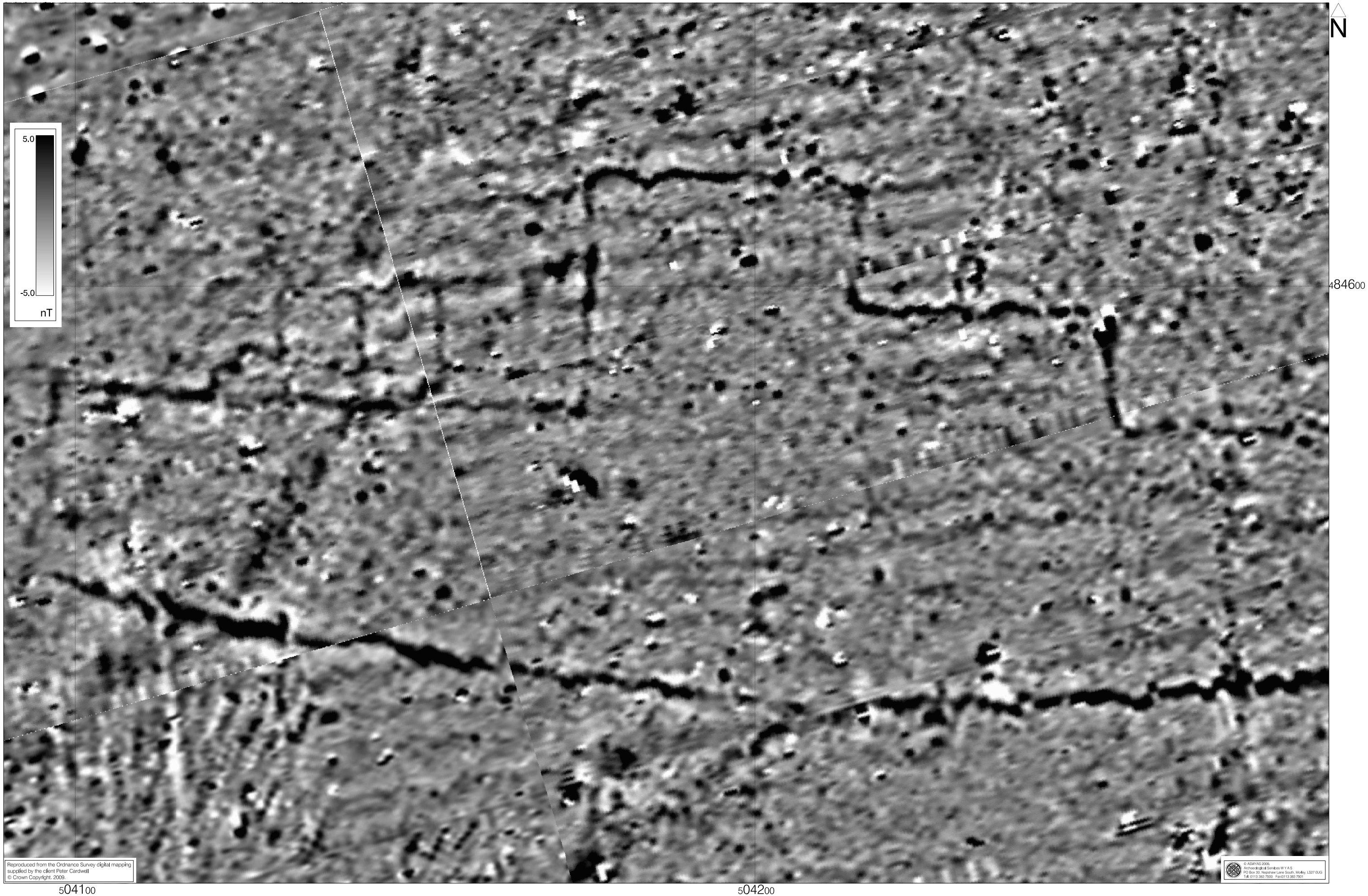

Fig. 65. Processed greyscale magnetometer data from Area A, Sector 3 (1:500 @ A3)

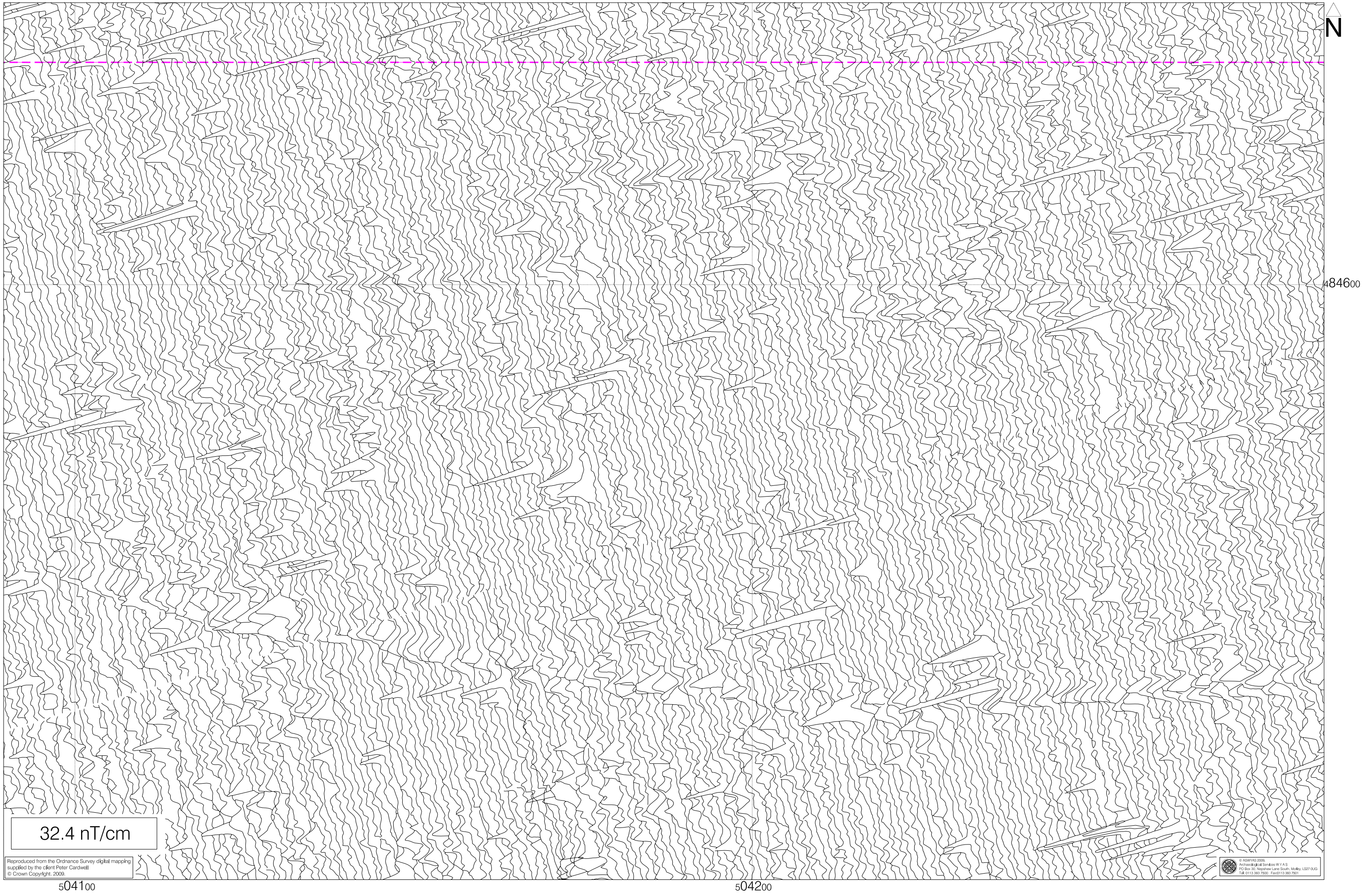

Fig. 66. XY trace plot of unprocessed magnetometer data from Area A, Sector 3 (1:500 @ A3)

TYPE OF ANOMALY		INTERPRETATION
•	DIPOLAR ISOLATED	FERROUS MATERIAL
	MAGNETIC ENHANCEMENT	GEOLOGY
	LINEAR TREND	AGRICULTURAL
	MAGNETIC ENHANCEMENT	ARCHAEOLOGY/GEOLOGY?
	MAGNETIC ENHANCEMENT	ARCHAEOLOGY

N

E13

D2

4846 00

5041 00

5042 00

0 25m

Fig. 67. Interpretation of magnetometer data from Area A, Sector 3 (1:500 @ A3)

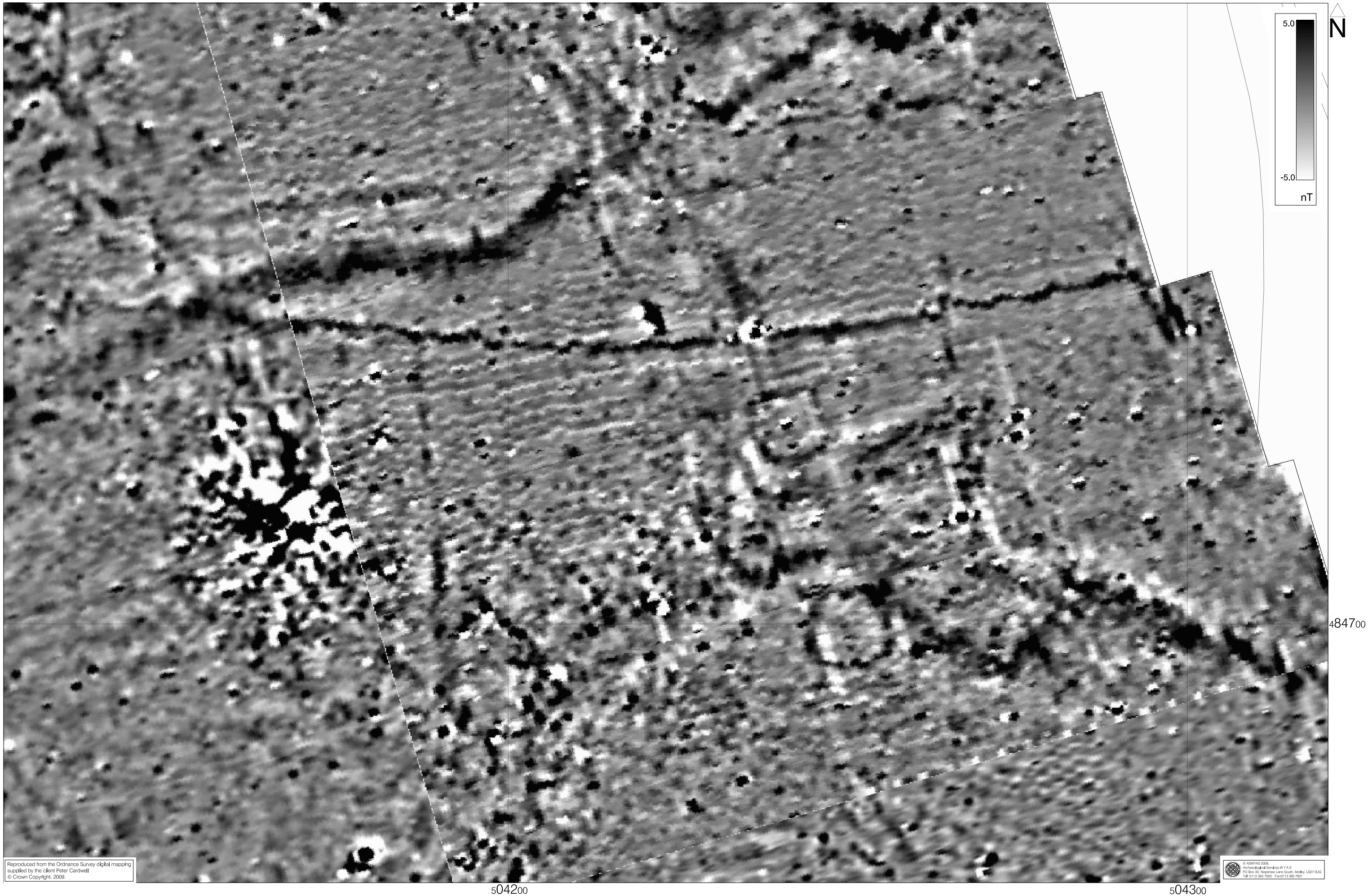

Fig.68. Processed greyscale magnetometer data from Area A, Sector 2 (1:500 @ A3)

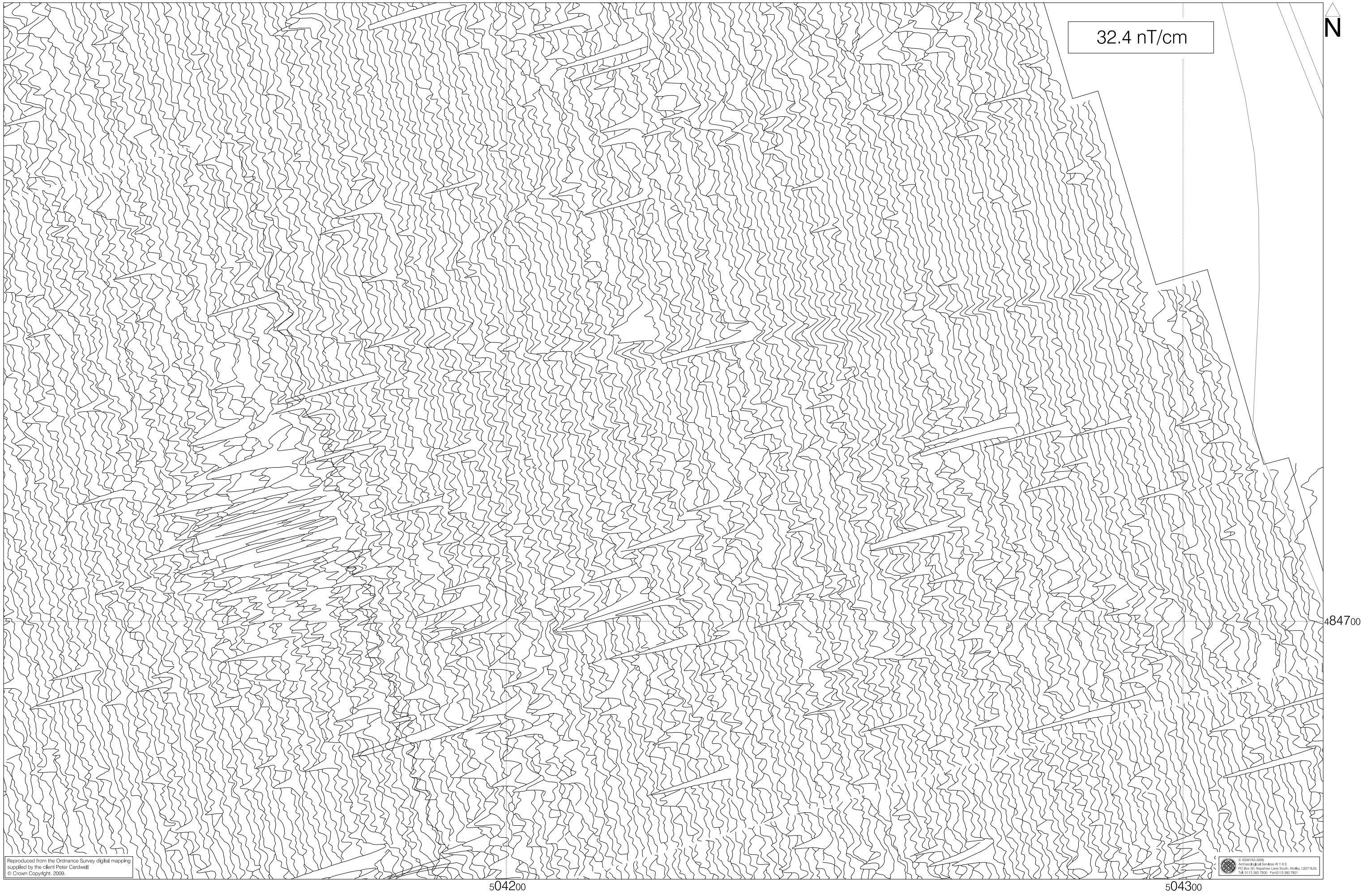

Fig.69. XY trace plot of unprocessed magnetometer data from Area A, Sector 2 (1:500 @ A3)

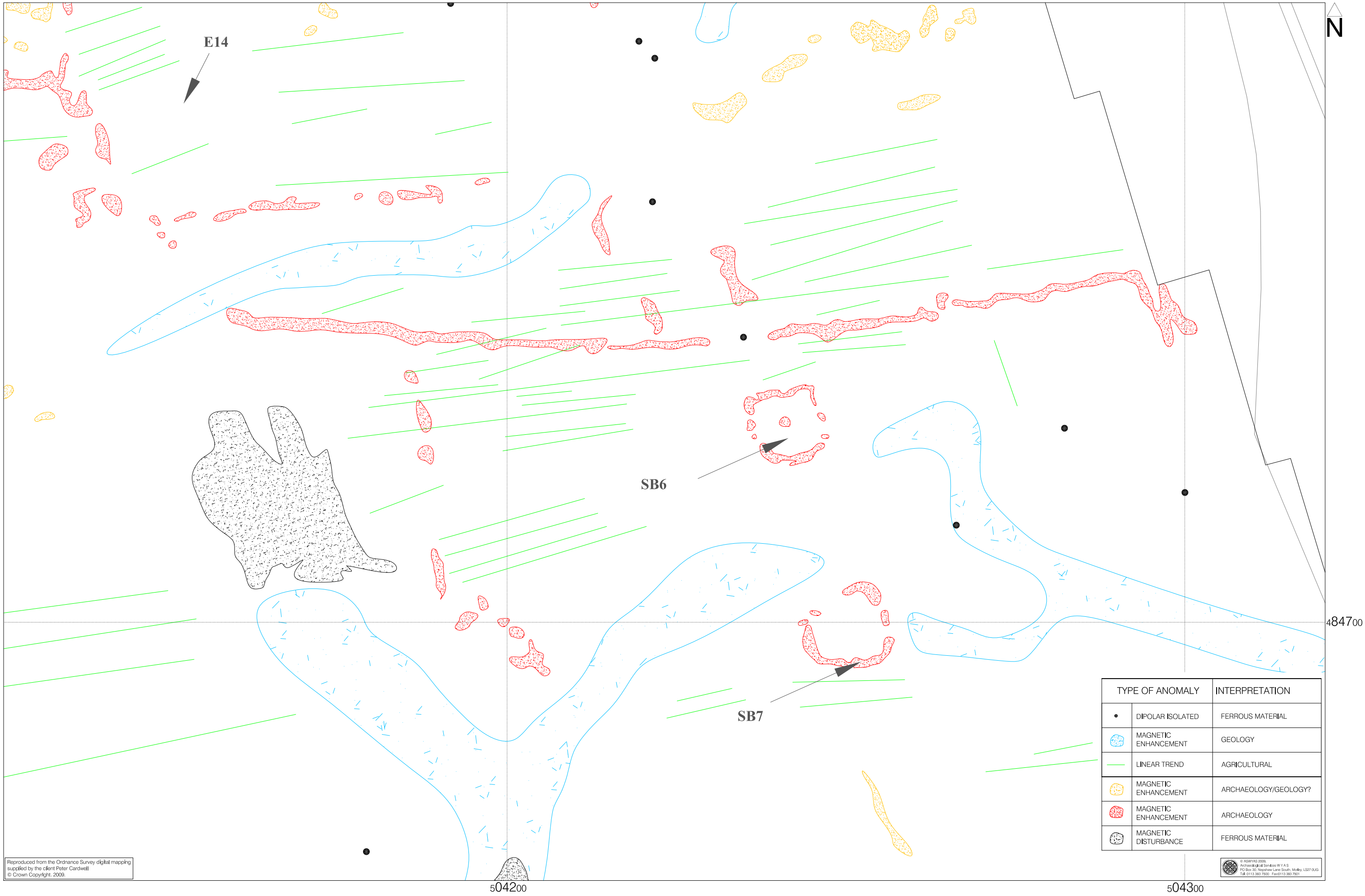

Fig. 70. Interpretation of magnetometer data from Area A, Sector 2 (1:500 @ A3)

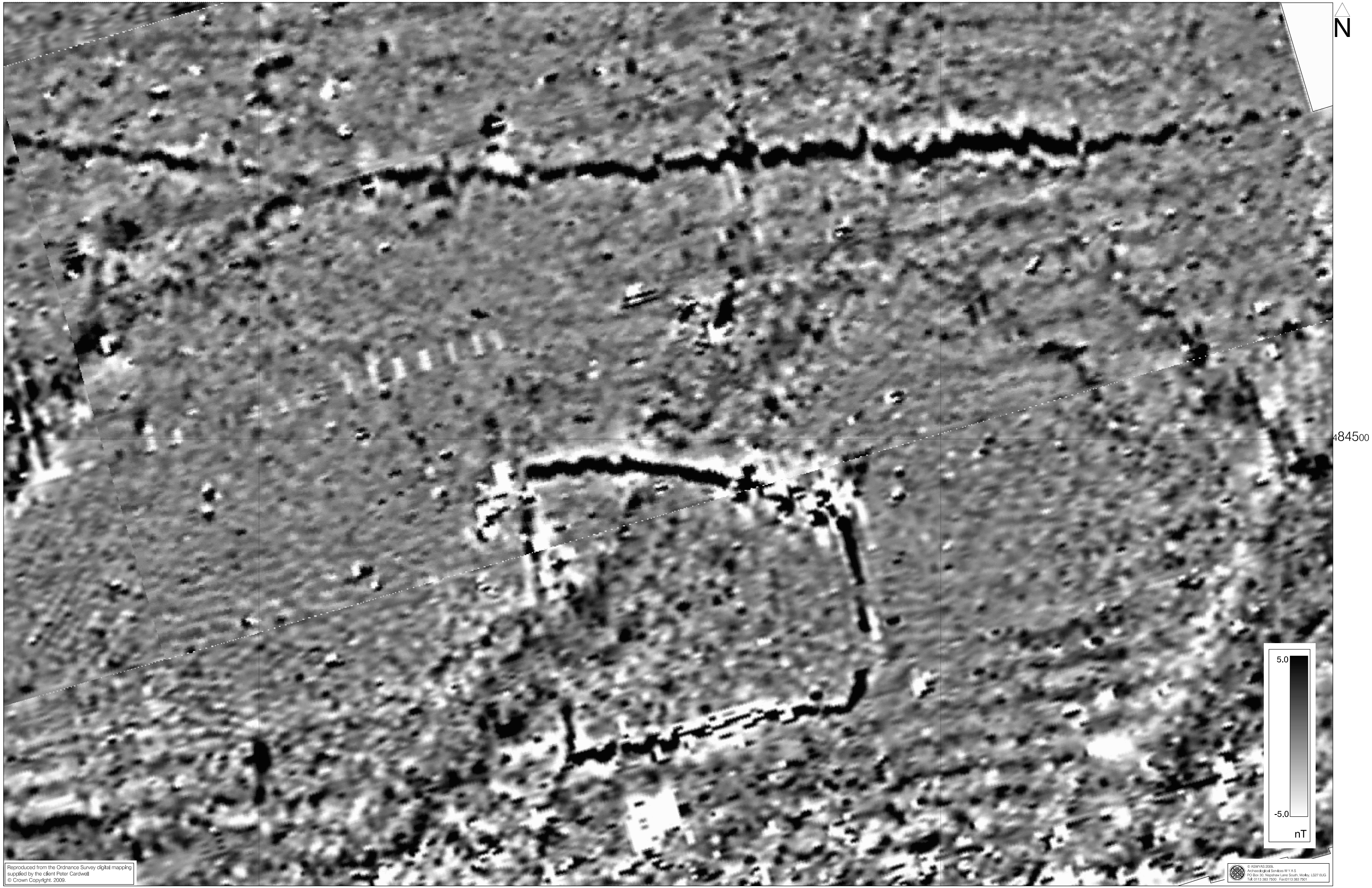

Fig. 71. Processed greyscale magnetometer data from Area A, Sector 3 (1:500 @ A3)

Fig. 72. XY trace plot of unprocessed magnetometer data from Area A, Sector 3 (1:500 @ A3)

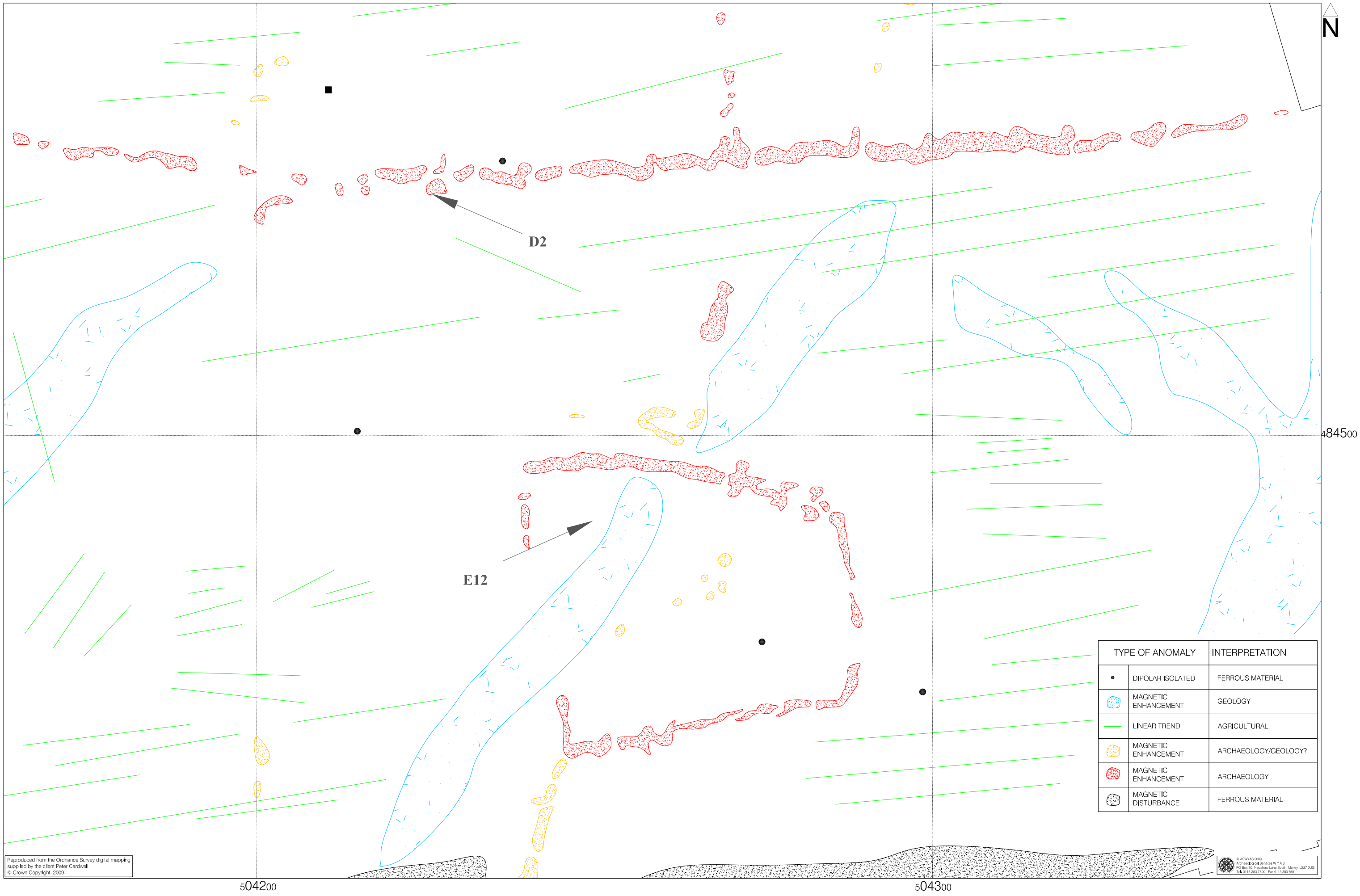

Fig. 73. Interpretation of magnetometer data from Area A, Sector 3 (1:500 @ A3)

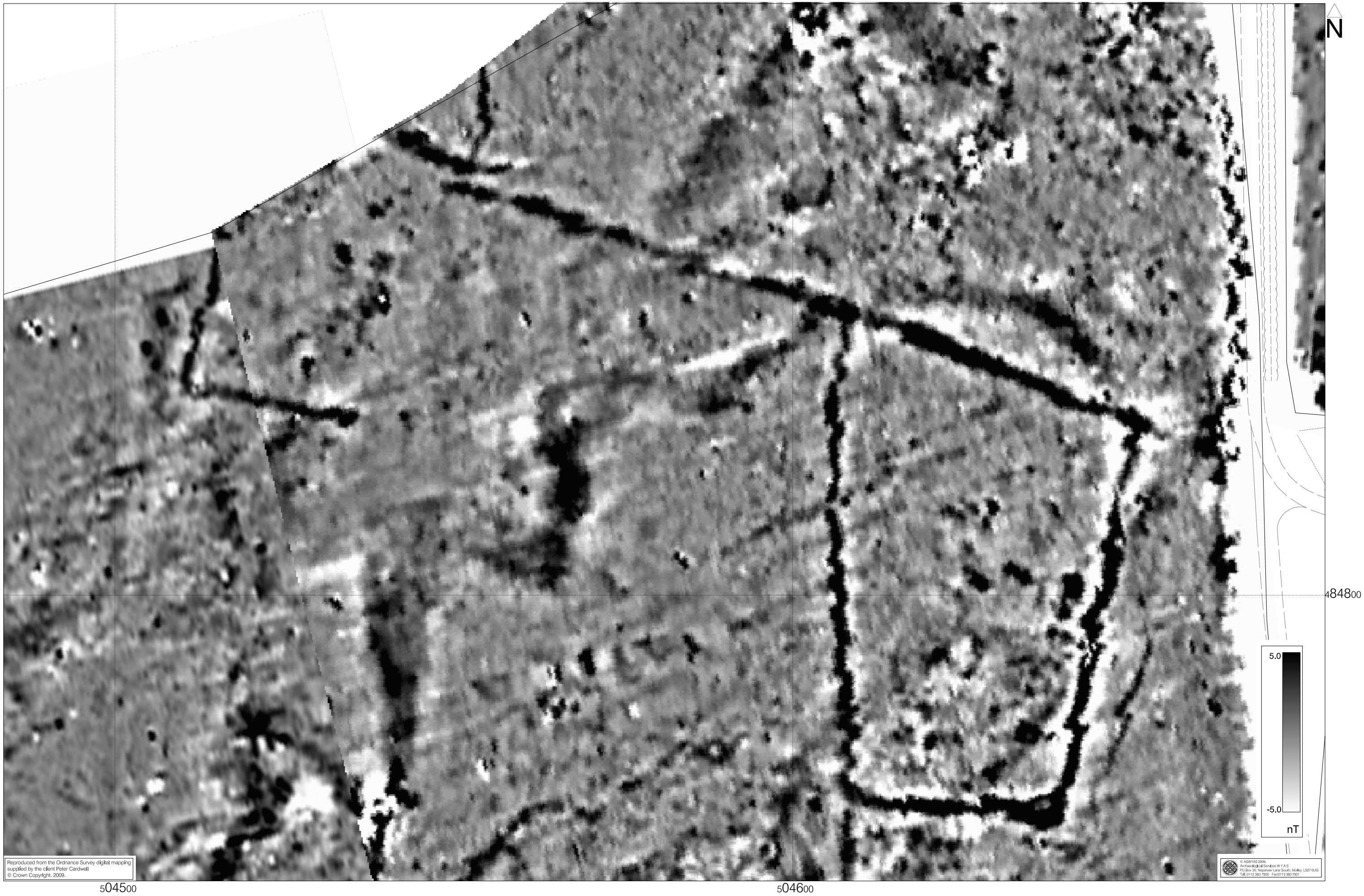

Fig. 74. Processed greyscale magnetometer data from Area D, Sector 1 (1:500 @ A3)

Fig. 75. XY trace plot of unprocessed magnetometer data from Area D, Sector 1 (1:500 @ A3)

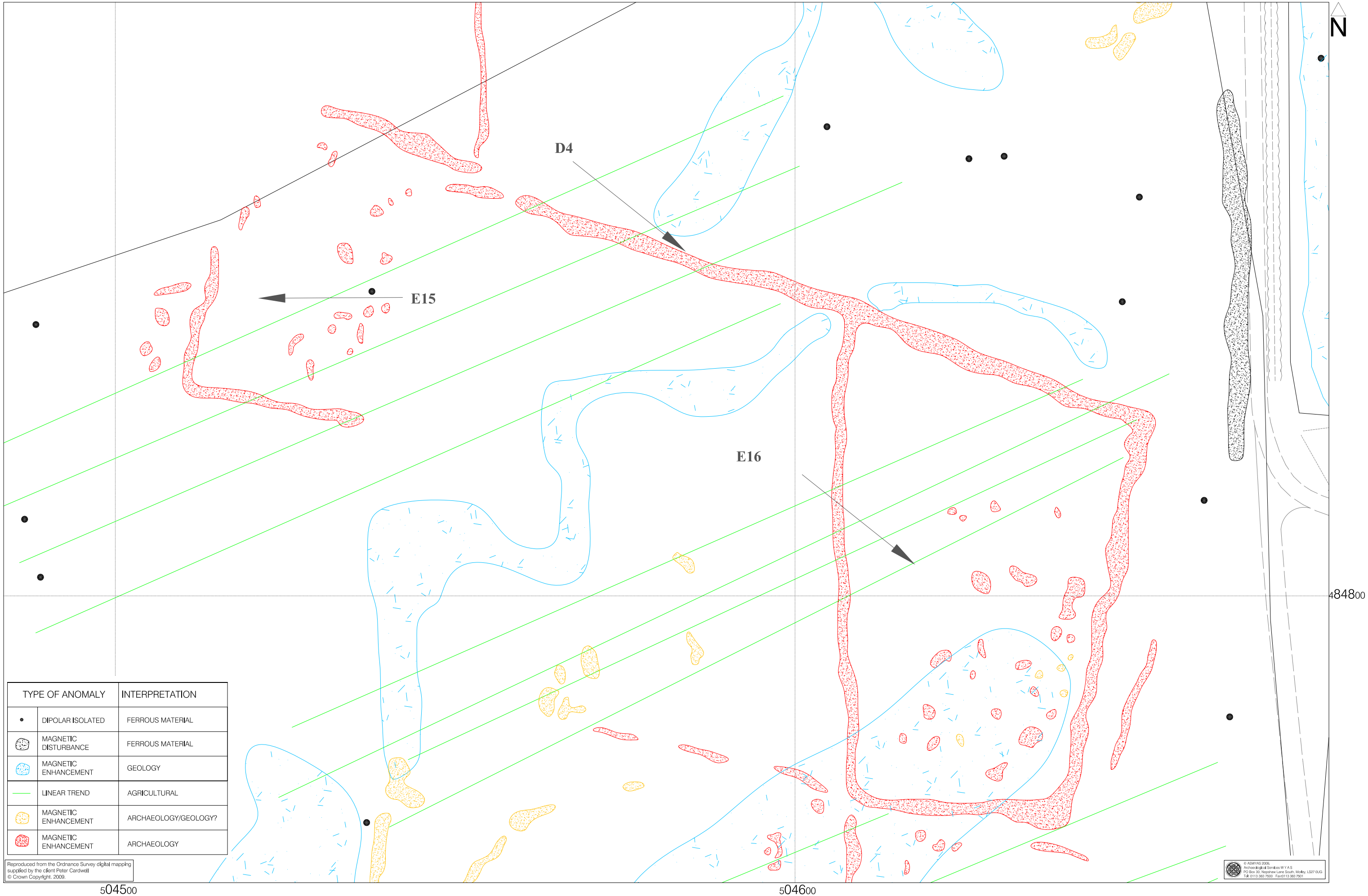

Fig. 76. Interpretation of magnetometer data from Area D, Sector 1 (1:500 @ A3)

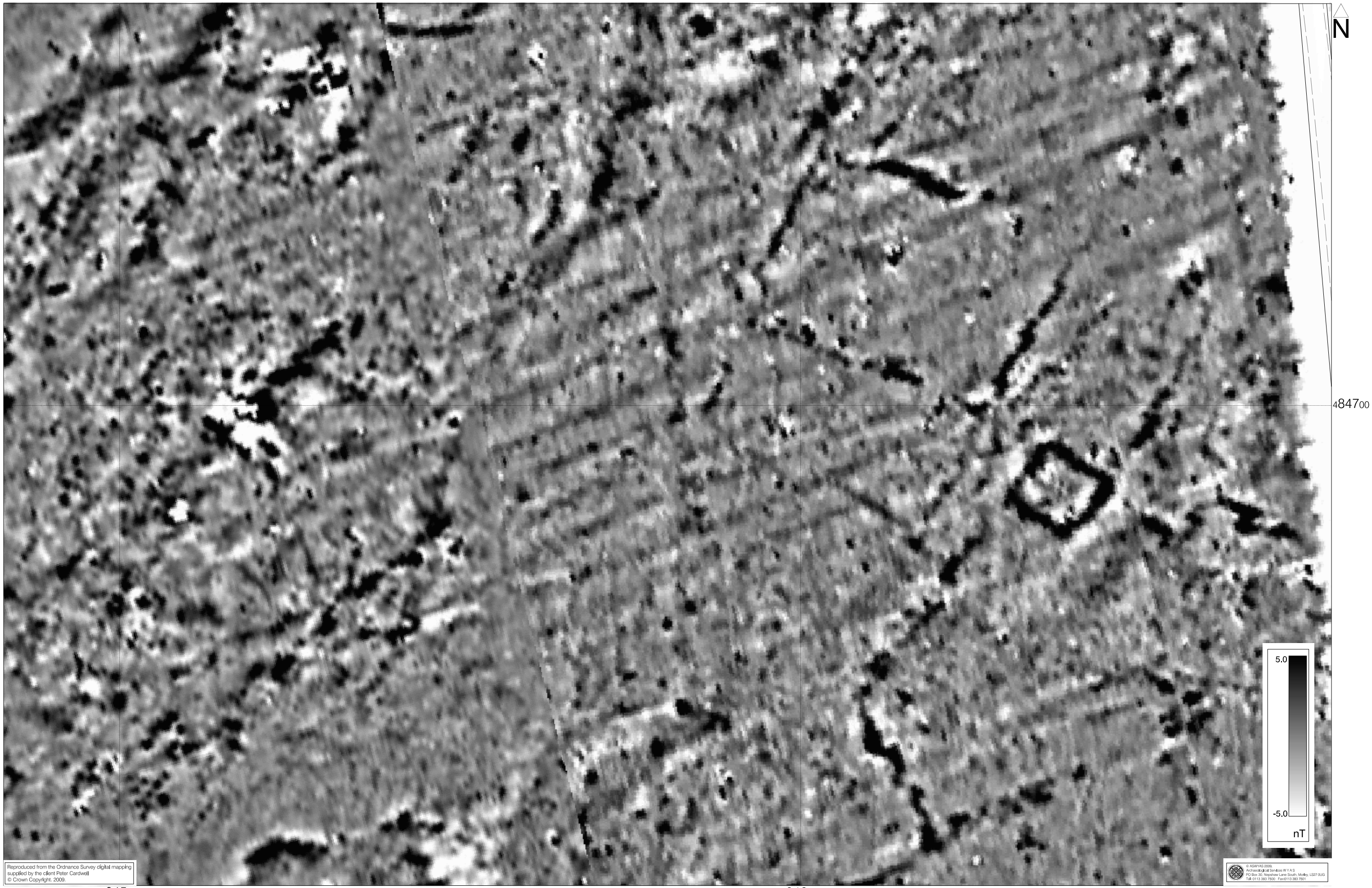

Fig. 77. Processed greyscale magnetometer data from Area D, Sector 1 & 2 (1:500 @ A3)

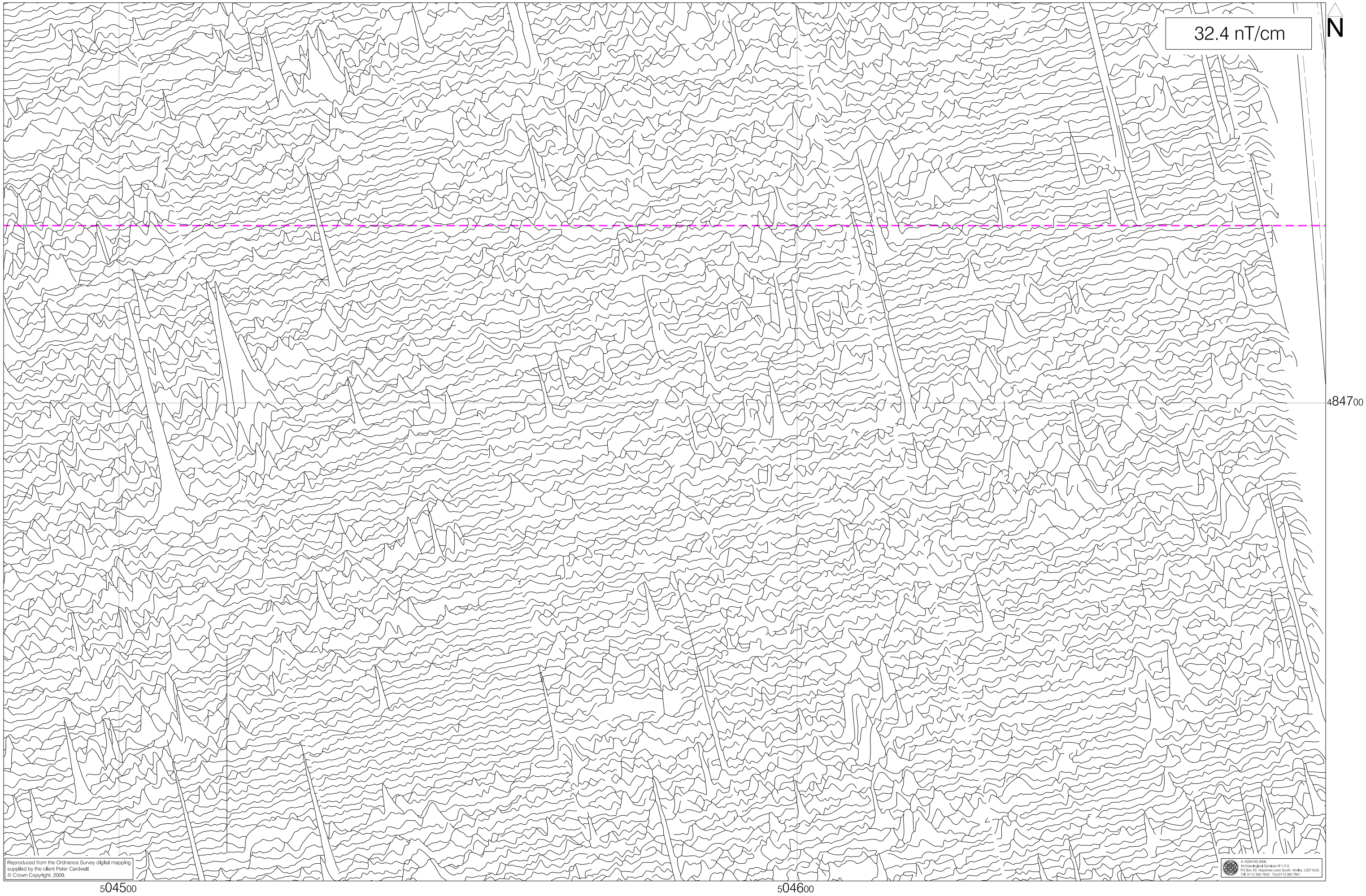

Fig. 78. XY trace plot of unprocessed magnetometer data from Area D, Sector 1 & 2 (1:500 @ A3)

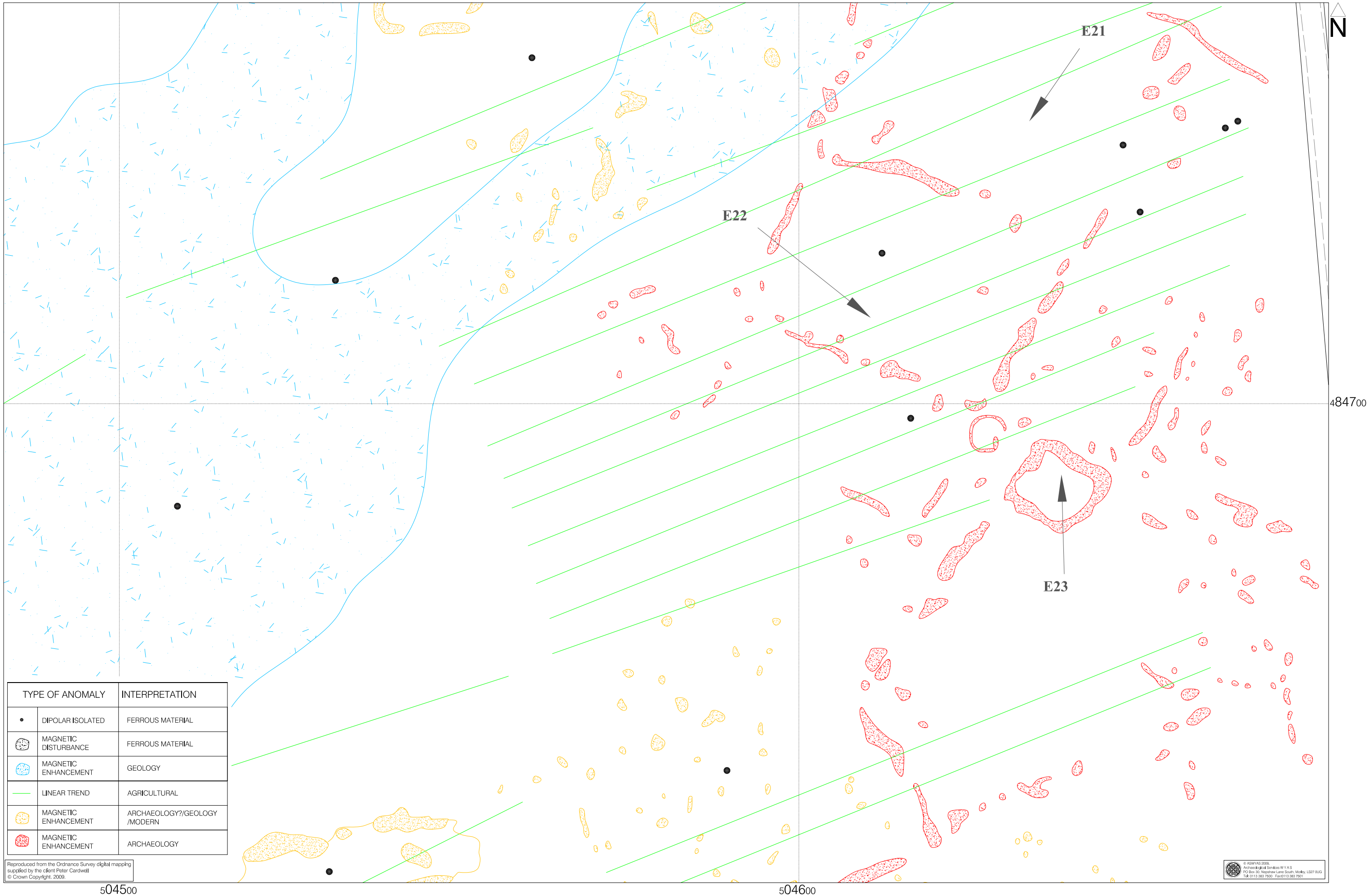

Fig. 79. Interpretation of magnetometer data from Area D, Sector 1& 2 (1:500 @ A3)

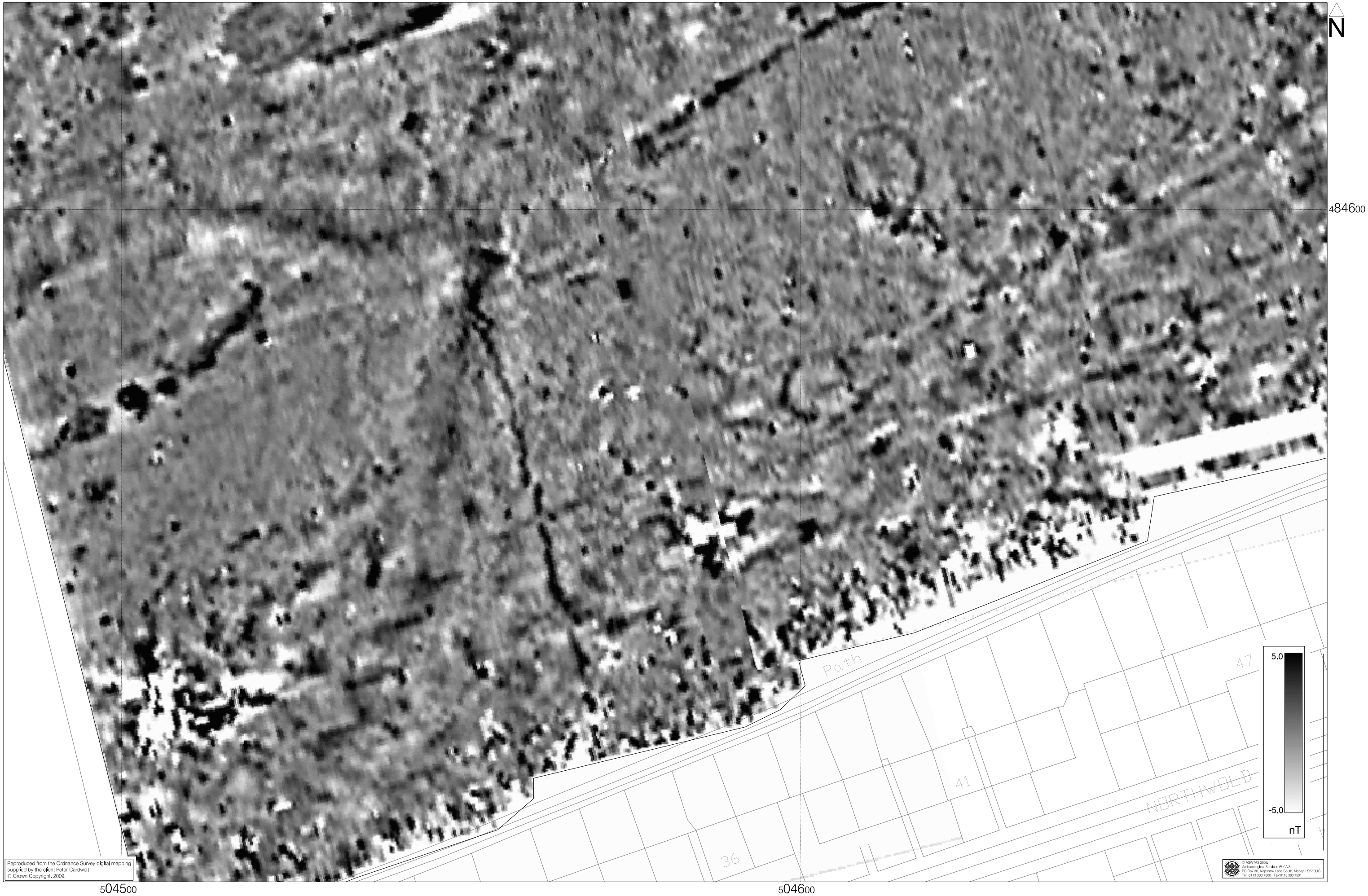

Fig. 80. Processed greyscale magnetometer data from Area D, Sector 2 (1:500 @ A3)

N

4846^{00}

32.4 nT/cm

47

41

36

NORTHWOLD ROAD

Reproduced from the Ordnance Survey digital mapping supplied by the client Peter Cardwell
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5045^{00}

5046^{00}

0 25m

Fig. 81. XY trace plot of unprocessed magnetometer data from Area D, Sector 2 (1:500 @ A3)

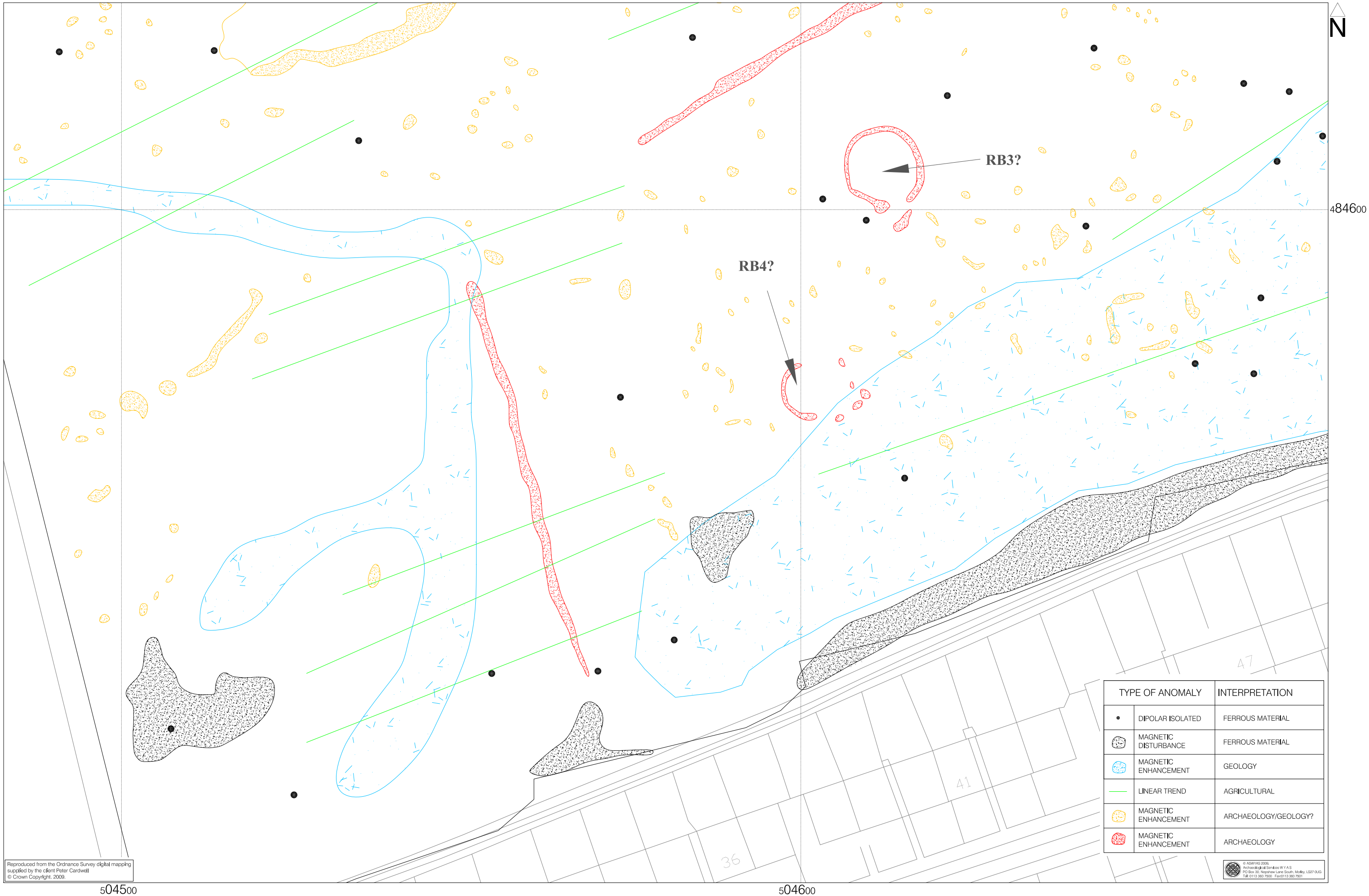

Fig. 82. Interpretation of magnetometer data from Area D, Sector 2 (1:500 @ A3)

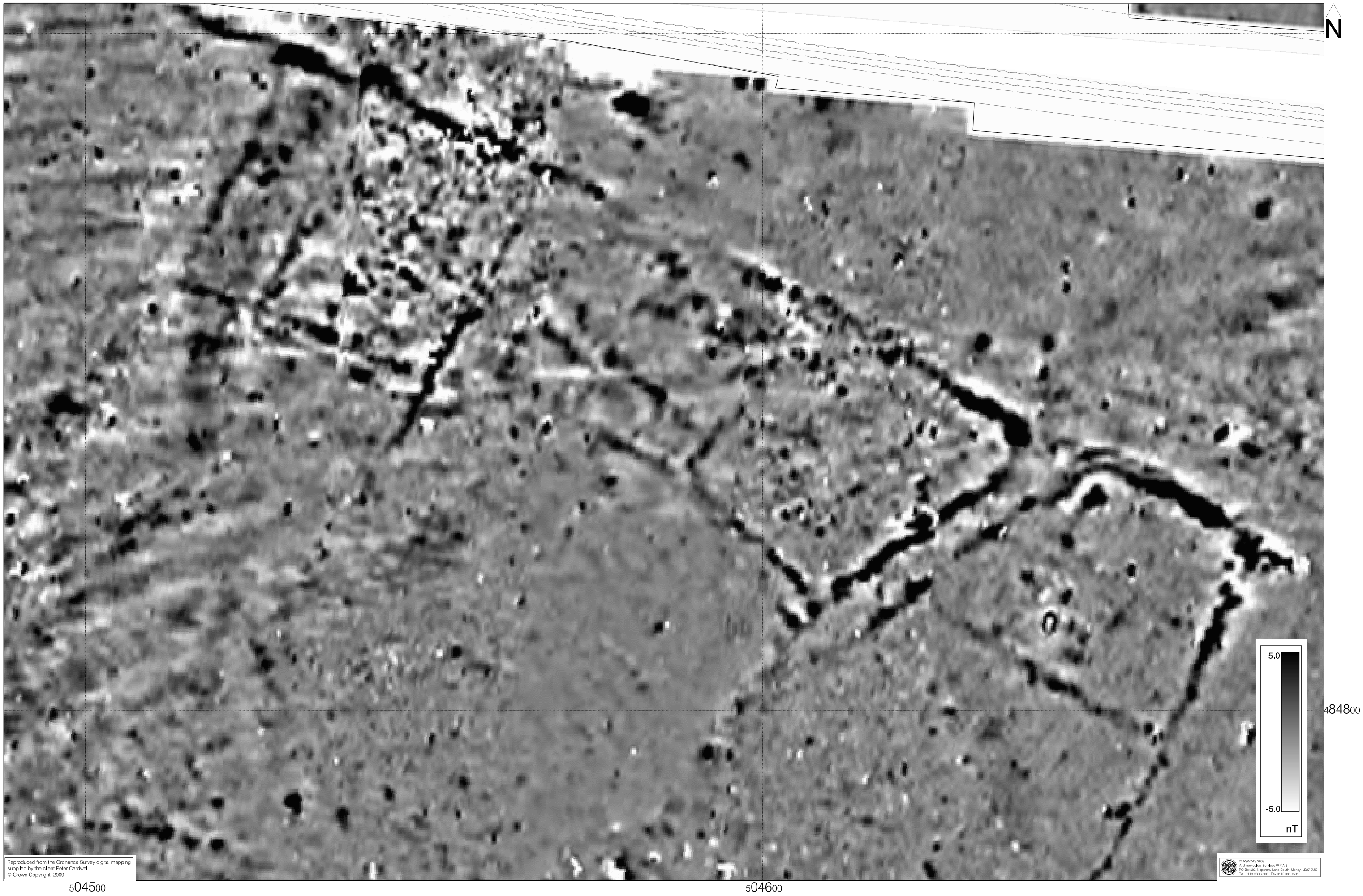

Fig. 83. Processed greyscale magnetometer data from Area D, Sectors 1,2,3 & 4 (1:500 @ A3)

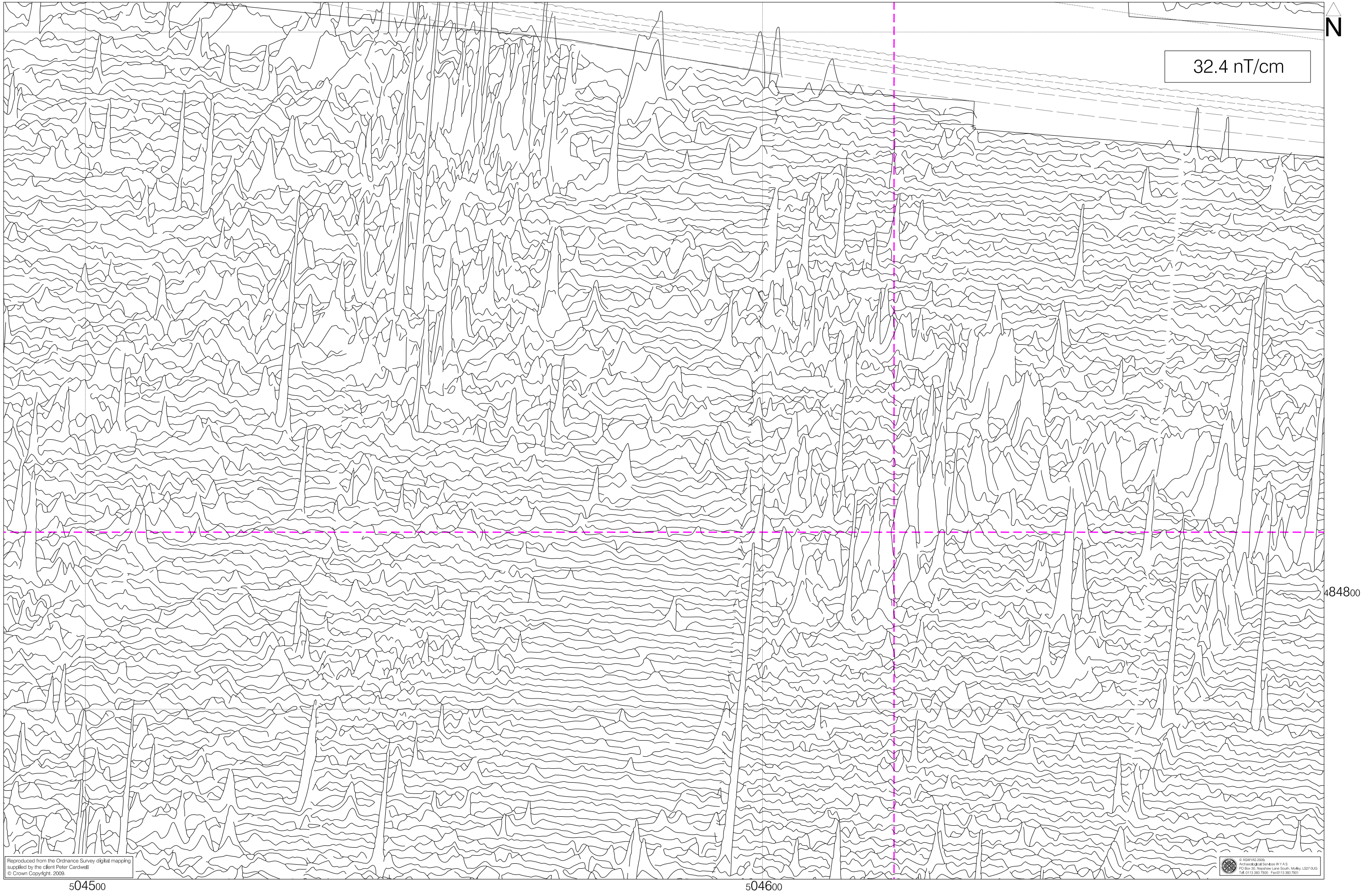

Fig. 84. XY trace plot of unprocessed magnetometer data from Area D, Sectors 1,2,3 & 4 (1:500 @ A3)

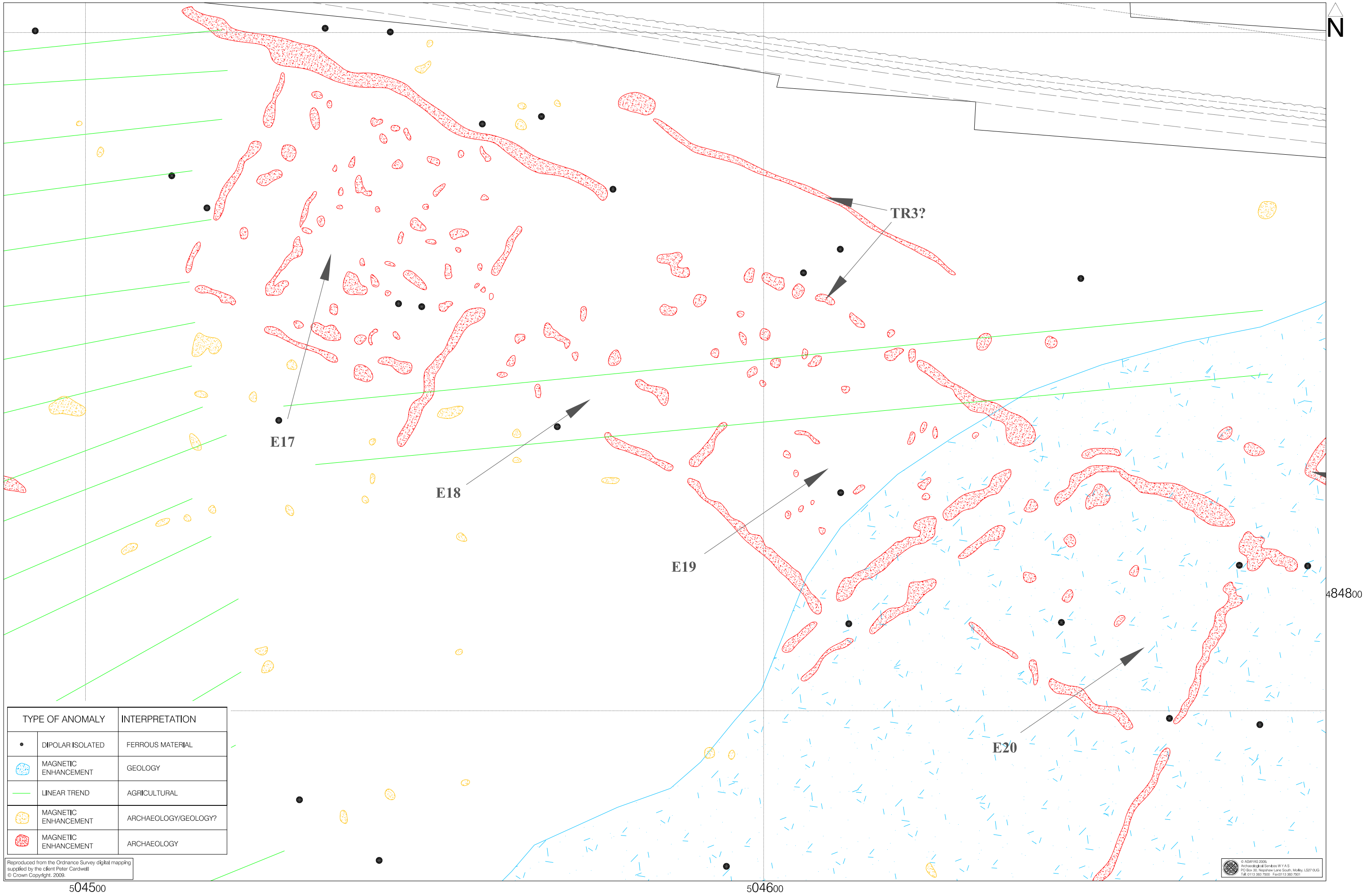

Fig. 85. Interpretation of magnetometer data from Area D, Sectors 1,2,3 & 4 (1:500 @ A3)

Appendix 1: Magnetic survey - technical information

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 haemetite. 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 and the fermentation and bacterial effects associated with rubbish decomposition. The area of enhancement is usually quite large, mainly due to the tendency of discard areas to extend beyond the limit of the occupation site itself, and spreading by the plough. An advantage of magnetic susceptibility over magnetometry is that a certain amount of occupational activity will cause the same proportional change in susceptibility, however weakly magnetic is the soil, and so does not depend on the magnetic contrast between the topsoil and deeper layers. Susceptibility survey is therefore able to detect areas of occupation even in the absence of cut features. On the other hand susceptibility survey is more vulnerable to the masking effects of layers of colluvium and alluvium as the technique, using the Bartington system, can generally only measure variation in the first 0.15m of ploughsoil.

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.

Methodology: Magnetic Susceptibility Survey

There are two methods of measuring the magnetic susceptibility of a soil sample. The first involves the measurement of a given volume of soil, which will include any air and moisture that lies within the sample, and is termed volume specific susceptibility. This method results in a bulk value that it not necessarily fully representative of the constituent components of the sample. For field surveys a Bartington MS2 meter with MS2D field loop is used due to its speed and simplicity. The second technique overcomes this potential problem by taking into account both the volume and mass of a sample and is termed mass specific susceptibility. However, mass specific readings cannot be taken in the field where the bulk properties of a soil are usually unknown and so volume specific readings must be taken. Whilst these values are not fully representative they do allow general comparisons across a site and give a broad indication of susceptibility changes. This is usually enough to assess the susceptibility of a site and evaluate whether enhancement has occurred.

Data Processing and Presentation

The data from the magnetic susceptibility survey has been presented in this report as unprocessed. Mapinfo (Pitney Bowes) was used to display the results as a Thematic Map.

Methodology: Gradiometer Survey

There are two main methods of using the fluxgate gradiometer for commercial evaluations. The first of these is referred to as ***magnetic scanning*** and requires the operator to visually identify anomalous responses on the instrument display panel whilst covering the site in widely spaced traverses, typically 10m apart. The instrument logger is not used and there is therefore no data collection. Once anomalous responses are identified they are marked in the field with bamboo canes and approximately located on a base plan. This method is usually employed as a means of selecting areas for detailed survey when only a percentage sample of the whole site is to be subject to detailed survey.

The disadvantages of magnetic scanning are that features that produce weak anomalies (less than 2nT) are unlikely to stand out from the magnetic background and so will be difficult to detect. The coarse sampling interval means that discrete features or linear features that are parallel or broadly oblique to the direction of traverse may not be detected. If linear features are suspected in a site then the traverse direction should be perpendicular (or as close as is possible within the physical constraints of the site) to the orientation of the suspected features. The possible drawbacks mentioned above mean that a ‘negative’ scanning result should be validated by sample detailed magnetic survey (see below).

The second method is referred to as ***detailed survey*** and employs the use of a sample trigger to automatically take readings at predetermined points, typically at 0.25m intervals, on zig-zag traverses 1m apart. These readings are stored in the memory of the instrument and are later dumped to computer for processing and interpretation. Detailed survey allows the visualisation of weaker anomalies that may not have been detected by magnetic scanning.

During this survey a Bartington Grad601 magnetic gradiometer was used taking readings on the 0.1nT range, at 0.25m intervals on zig-zag traverses 1m apart within 30m by 30m square grids. The instrument was checked for electronic and mechanical drift at a common point and calibrated as necessary. The drift from zero was not logged.

Data Processing and Presentation

The detailed gradiometer data has been presented in this report in XY trace and greyscale formats. In the former format the data shown is 'raw' with no processing other than grid biasing having been done. The data in the greyscale images has been interpolated and selectively filtered to remove the effects of drift in instrument calibration and other artificial data constructs and to maximise the clarity and interpretability of the archaeological anomalies.

An XY plot presents the data logged on each traverse as a single line with each successive traverse incremented on the Y-axis to produce a 'stacked' plot. A hidden line algorithm has been employed to block out lines behind major 'spikes' and the data has been clipped. The main advantage of this display option is that the full range of data can be viewed, dependent on the clip, so that the 'shape' of individual anomalies can be discerned and potentially archaeological anomalies differentiated from 'iron spikes'. Geoplot 3 software was used to create the XY trace plots.

Geoplot 3 software was used to interpolate the data so that 3600 readings were obtained for each 30m by 30m grid. The same program was used to produce the greyscale images. All greyscale plots are displayed using a linear incremental scale.

Appendix 2: Survey location information

The site grid was laid out using a Geodimeter 600s total station theodolite and tied in to the corners of buildings and other permanent landscape features and to temporary reference points (survey marker stakes) that were established and left in place following completion of the fieldwork for accurate geo-referencing. The locations of the temporary reference points are shown on Figure 4 and the Ordnance Survey grid co-ordinates tabulated below. The internal accuracy of the survey grid relative to these markers is better than 0.05m. The survey grids were then superimposed onto a map base provided by the client as a 'best fit' to produce the displayed block locations. Overall there was a good correlation between the local survey and the digital map base and it is estimated that the average 'best fit' error is better than ±1.5m. However, it should be noted that Ordnance Survey co-ordinates for 1:2500 map data have an error of ±1.9m at 95% confidence. This potential error must be considered if co-ordinates are measured off for relocation purposes. The locations for the following Stations can be found on the adjoining figure.

Station	**Easting**	**Northing**
A	503528.7124	484727.9334
B	503578.9247	484824.5307
C	503611.9073	484774.3928
D	503619.2556	484801.3112
E	503687.8716	484822.1806
F	503691.4999	484392.1366
G	503817.5686	484520.4752
H	503858.0699	484413.6181
I	503875.3196	484429.9887
J	503886.1701	484276.1858
K	504452.9149	484726.2517
L	504460.0491	484655.3173
M	504690.6629	484585.7047
N	504967.0351	484786.4577
O	504999.6360	484772.3280
P	505053.1039	484567.7000
Q	505164.9596	484768.7431

R	505269.6914	484831.2719
S	505345.7381	484652.7908

Archaeological Services WYAS cannot accept responsibility for errors of fact or opinion resulting from data supplied by a third party.

Appendix 3: Geophysical archive

The geophysical archive comprises:-

- an archive disk containing compressed (WinZip 8) files of the raw data, report text (Microsoft Word 2000), and graphics files (Adobe Illustrator CS2 and AutoCAD 2008) files.
- a full copy of the report

At present the archive is held by Archaeological Services WYAS although it is anticipated that it may eventually be lodged with the Archaeology Data Service (ADS). Brief details may also be forwarded for inclusion on the English Heritage Geophysical Survey Database after the contents of the report are deemed to be in the public domain (i.e. available for consultation in the relevant Historic Environment Record).

Bibliography

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