ARCHAEOLOGICAL SERVICES WYAS

Gomm Valley
High Wycombe
Buckinghamshire

Geophysical Survey

Report no. 2661

October 2014

Client: Hyder Consulting (UK)

REGISTERED · IA · ORGANISATION

Gomm Valley
High Wycombe
Buckinghamshire

Geophysical Survey

Summary

A geophysical (magnetometer) survey covering 19.6 hectares was carried out on land that is proposed to be developed to the east of High Wycombe, Buckinghamshire. No anomalies of obvious archaeological potential have been recorded. Anomalies indicative of service pipes, variations in the bedrock geology, soils and topography have been identified. Within the north of the survey area, two clusters of magnetic enhancement anomalies have been identified that are 200m south of fieldwalking find spots. These anomalies may indicate archaeology, although a geological origin is deemed more likely. On the basis of the survey, the archaeological potential of the site is considered to be low.

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Report Information

Client:	Hyder Consulting (UK) Limited
Address:	The Mill, Brimscombe Port, Stroud, Gloucester GL5 2QG
Report Type:	Geophysical Survey
Location:	High Wycombe
County:	Buckinghamshire
Grid Reference:	SU 8964 9245
Period(s) of activity:	modern
Report Number:	2661
Project Number:	4301
Site Code:	GVG14
OASIS ID:	archaeol11-195005
Planning Application No.:	
HER Event No:	n/a
Museum Accession No.:	n/a
Date of fieldwork:	October 2014
Date of report:	October 2014
Project Management:	Sam Harrison BSc MSc MIfA
Fieldwork:	Ross Bishop BA
	Tom Fildes BA
	Dan Waterfall BA
Report:	Sam Harrison
Illustrations:	David Harrison BSc MA MIfA and Sam Harrison
Photography:	Site staff
Research:	n/a

Authorisation for distribution: ---

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1 Introduction

Archaeological Services WYAS (ASWYAS) were commissioned by Lara Bishop of Hyder Consulting (the Consultant) on behalf of Friends Life Ltd (the Client), to undertake a geophysical (magnetometer) survey of land near High Wycombe, Buckinghamshire (see Fig. 1). The results of the survey will be used to support a planning application for the proposed development of the site. The work was undertaken in accordance with a Project Design (Webb 2014) supplied to and approved by the client and the Senior Archaeology Planning Officer to Buckinghamshire County Council, with guidance contained within the National Planning Policy Framework (NPPF 2012) and in line with current best practice (David *et al.* 2008). The survey was carried out between October 13th and October 16th 2014 to provide additional information on the archaeological potential of the site.

Site location, topography and land-use

The proposed development area (PDA) is located at the eastern edge of High Wycombe, in an area known as Gomm Valley. The PDA is situated to the east of Cock Lane, west of Hammersley Lane and immediately north of the Peregrine Business Centre. The site is situated on the slopes of a valley, ranging from 140m above Ordnance Datum (aOD) in the north and 70m aOD in the south. The PDA covers approximately 19.6 hectares and is split up into four fields, centred at SU 8964 9245. All the fields were under a young arable crop at the time of survey (see plates).

Soils and geology

The underlying bedrock comprises various chalk formations including Seaford, Newhaven, Lewes Nodular and New Pit Type formations. There are no superficial deposits within the PDA (British Geological Survey 2014).

The soils in this area are unclassified, although they are thought to be classed in the Andover 1 association, characterised as shallow, well drained calcareous silts (Soil Survey of England and Wales 1983).

2 Archaeological Background

A Cultural Heritage Desk-Based Assessment (Hyder 2014) concluded that no heritage assets are located within the survey area, due to no previous archaeological works having been carried out in this area. Heritage assets identified through fieldwalking, 200m to the north of the survey area, indicate the potential for sub-surface features dating to the later prehistoric, Roman and medieval periods.

3 Aims, Methodology and Presentation

The main aim of the geophysical survey was to provide sufficient information to enable an assessment to be made of the impact of development on potential sub-surface archaeological remains and for further evaluation or mitigation proposals, if appropriate, to be recommended. To achieve this aim a magnetometer survey covering all of the PDA was undertaken.

The general objectives of the geophysical survey were:

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

Magnetometer survey

The site grid was laid out using a Trimble VRS differential Global Positioning System (Trimble 5800 model). 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 (OS) mapping, is shown in Figure 1. Figure 2 is a large scale (1:4000) location plan displaying the processed magnetic data whilst Figure 3 shows the overall interpretation of the magnetometer data, at the same scale. Large scale (1:1000) plots of the data in greyscale and XY trace plot formats together with interpretation graphics at the same scale are presented in figures 4 to 21 inclusive.

Further technical information on the equipment used, data processing and survey methodologies are given in Appendix 1and Appendix 2. Appendix 3 describes the composition and location of the site archive and Appendix 4 is a copy of the completed OASIS form.

The survey methodology, report and any recommendations comply with the Project Design (Webb 2014) and guidelines outlined by English Heritage (David *et al.* 2008), the Institute for Archaeologists (IfA 2013) and Buckinghamshire County Council. All figures reproduced from Ordnance Survey (OS) 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

Across most of the site the magnetic background is relatively 'quiet' resulting in a fairly uniform grey tone to the data. Against this magnetic background a number of anomalies have been identified. These are categorised according to their origin and discussed below with reference to specific anomalies shown in the interpretative figures.

Ferrous and Modern Anomalies

Ferrous responses, visible either as individual 'spike' anomalies or more extensive areas of magnetic disturbance, are typically caused by modern ferrous (magnetic) debris, either on the ground surface or in the plough-soil, or are due to the proximity of magnetic material in field boundaries, buildings or other above ground features. Little importance is normally given to such anomalies, unless there is any supporting evidence for an archaeological interpretation. Ferrous debris or material is common on rural sites, often being present as a consequence of manuring or tipping/infilling. Throughout the PDA individual iron 'spike' anomalies are common and generally there is no obvious pattern or clustering to their distribution to suggest anything other than a random background scatter of ferrous debris in the soil.

A service pipe, anomaly **A**, can be seen traversing Fields 1-3 in a general north/south direction. A second service pipe, **B**, has been identified along the southern boundary, running south-east/north-west.

Seven high magnitude dipolar anomalies (**C** to **I** inclusive) are likely to be due to steel reinforcing within wooden OHL poles.

Agricultural Anomalies

In the south-west of Field 2 a single linear anomaly, **J**, parallel with the east/west boundary is interpreted as a ploughing headland.

Geological Anomalies

Throughout the survey area a number of discrete anomalies, characterised as localised areas of enhanced magnetic response, have been identified. These anomalies are interpreted as geological in origin, being caused by variation in the composition of the soils from which they derive.

Several linear trend anomalies in the south-west of the PDA are thought to be caused by an accumulation of magnetically enhanced material within fissures in the chalk bedrock and by localised areas of soil creep within the valley landscape.

Linear trend anomalies have also been identified (**K-O** inclusive) that have been interpreted as geological in origin. These are thought to be caused by topographical variation as they are located at the base of slopes (see Fig. 2).

Possible Archaeological Anomalies

Within Field 1, two clusters of anomalies, with an increased magnetic enhancement than the geological anomalies (see above) have been recorded, anomalies **P** and **Q**. These anomalies are located towards the top of the ridge, 200m south of the fieldwalking finds. It is possible that any of these may have an archaeological origin. However, it is considered more likely that these anomalies are due to variations in the soils and underlying bedrock geology.

5 Conclusions

The magnetic survey has not identified any anomalies of obvious archaeological potential. The majority of the anomalies identified in the survey are due to variations in the soils, topography and bedrock geology. Two service pipes have been recorded within the PDA. Two clusters of magnetic enhancement anomalies, near to fieldwalking findspots in the north of the PDA may suggest an archaeological origin, however it is considered more likely that these anomalies are geological in origin.

On the basis of the geophysical survey the archaeological potential of the site is assessed as low.

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.

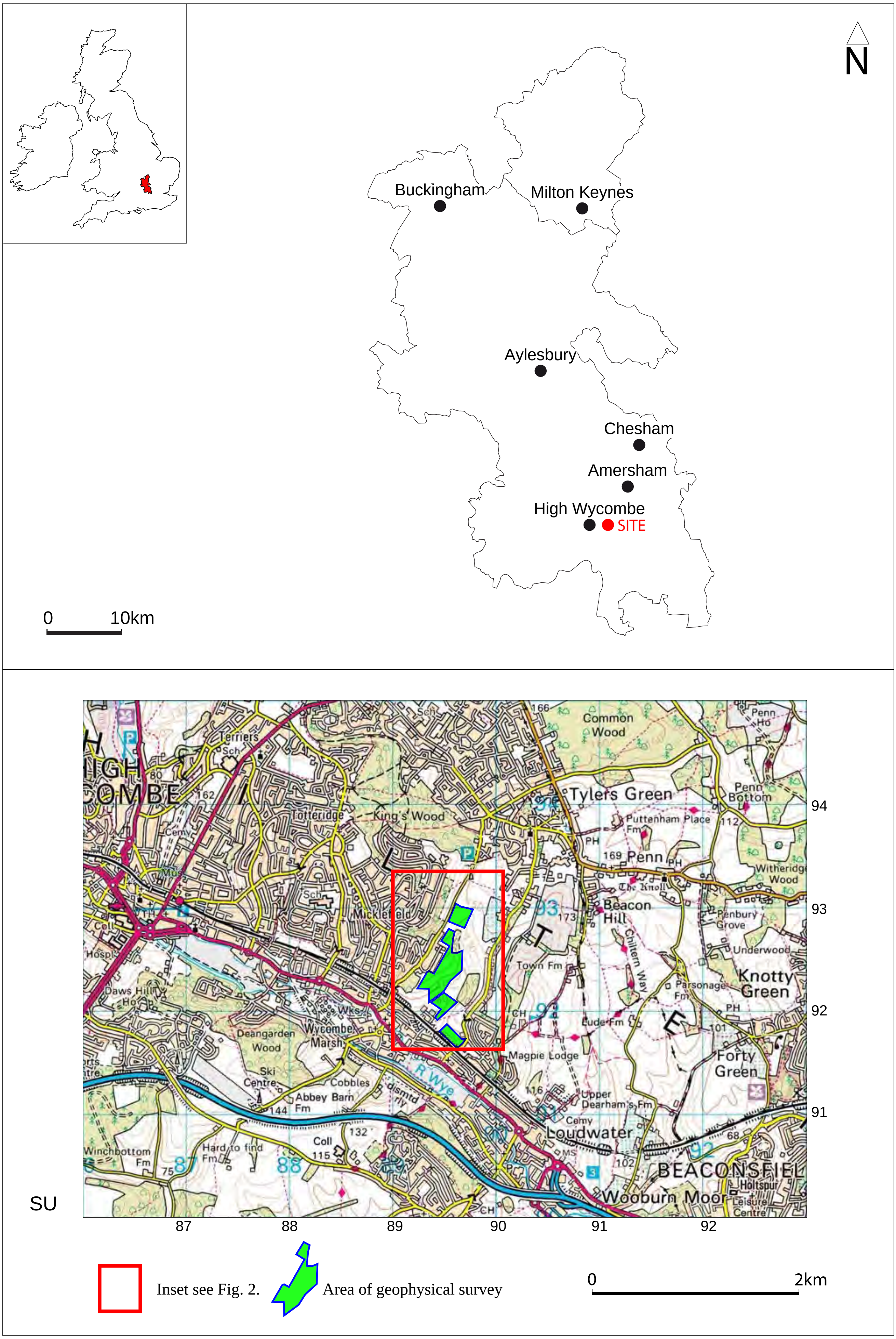

Fig. 1. Site location

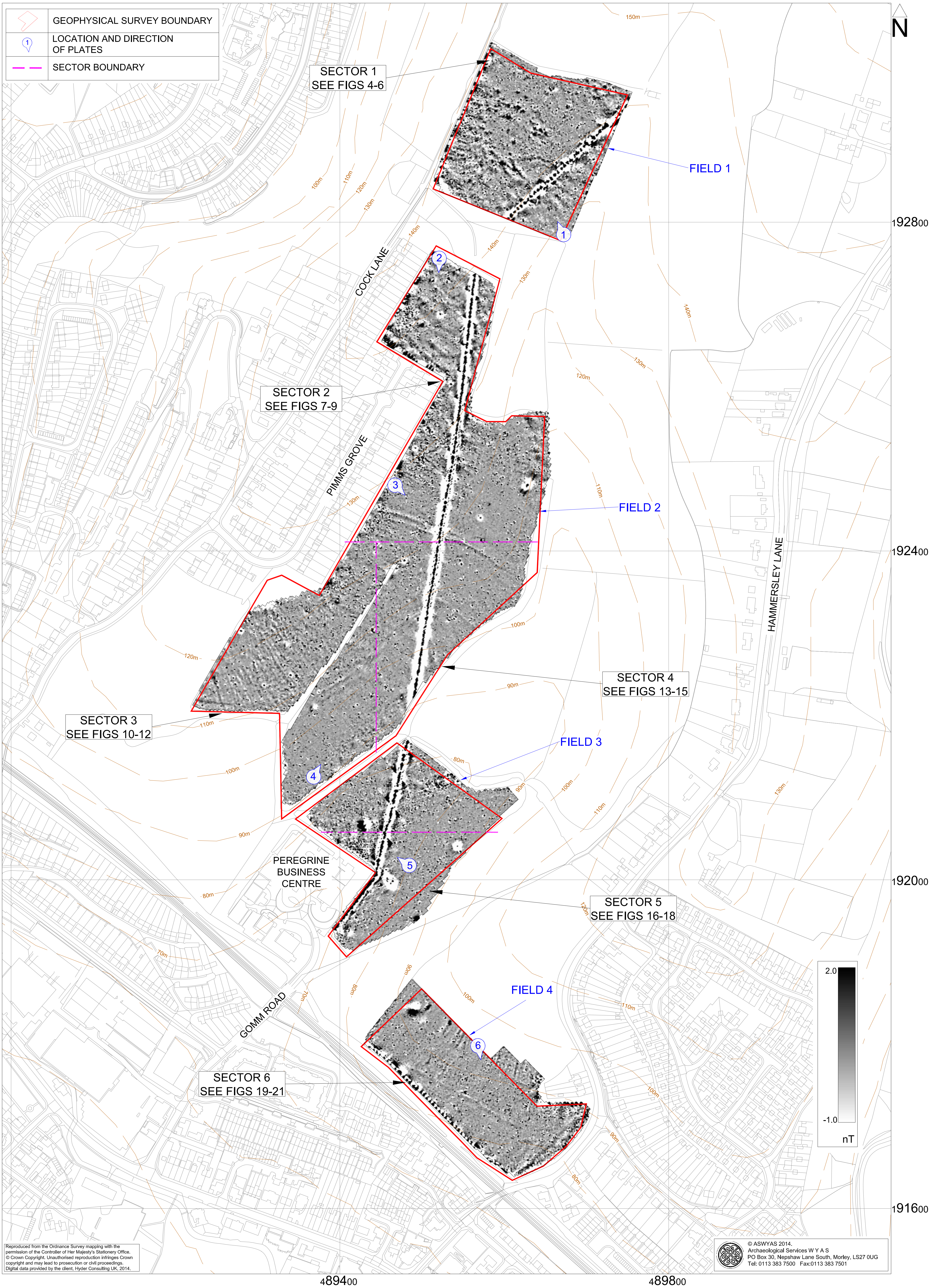

Fig. 2. Survey location showing greyscale magnetometer data and contour detail (1:4000 @ A3)

0 100m

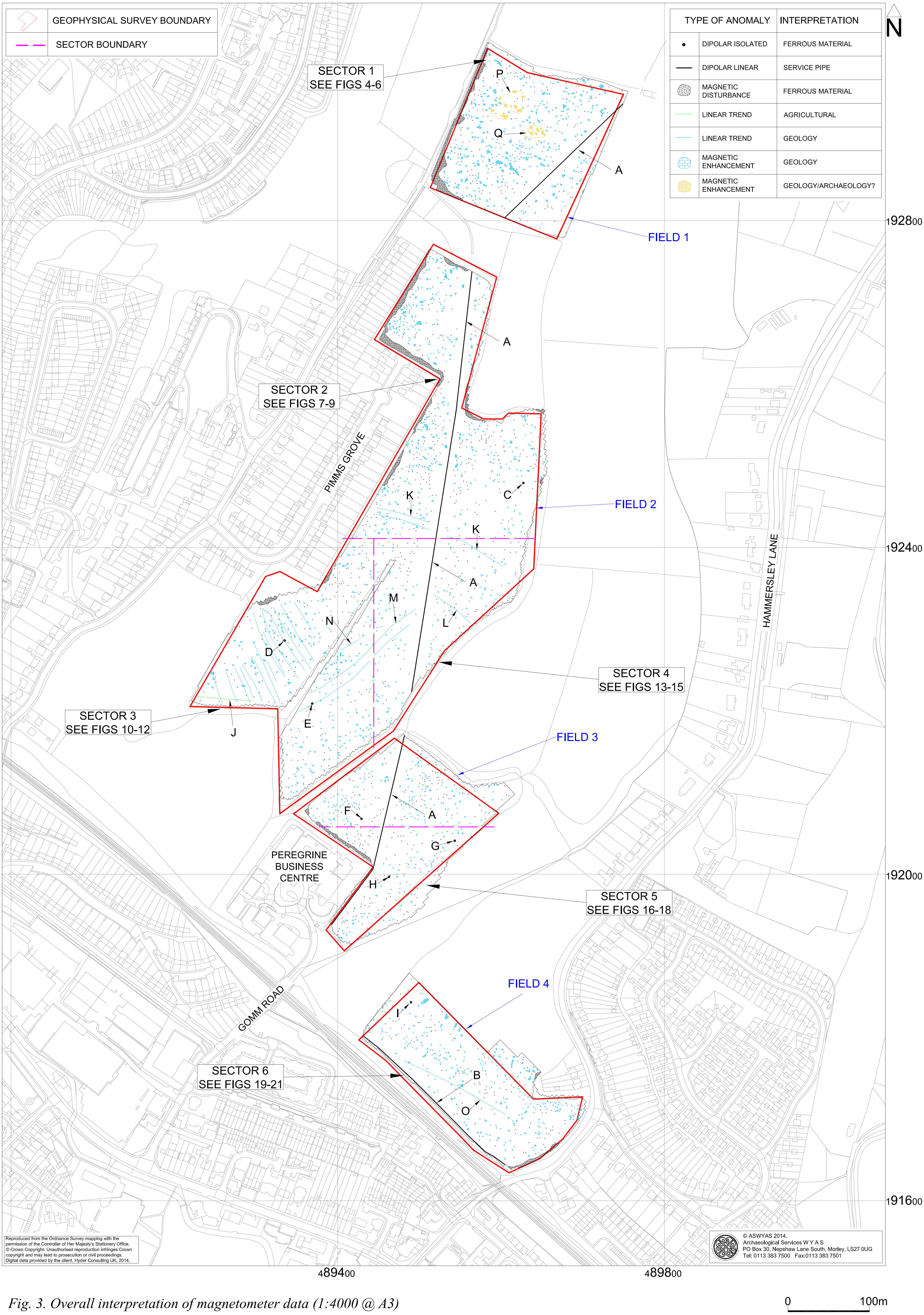

Fig. 3. Overall interpretation of magnetometer data (1:4000 @ A3)

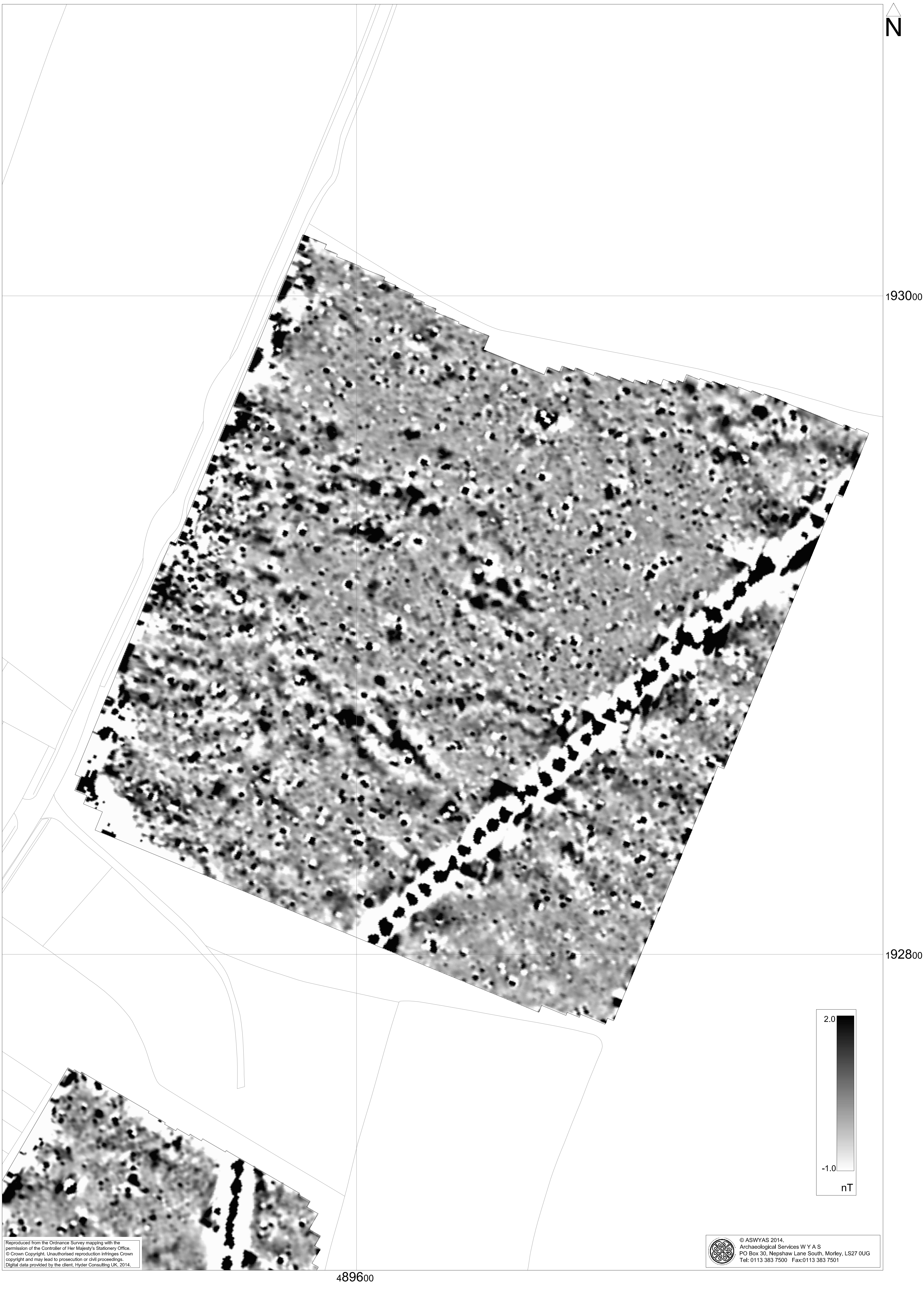

Fig. 4. Processed greyscale magnetometer data; Sector 1 (1:1000 @ A3)

0 50m

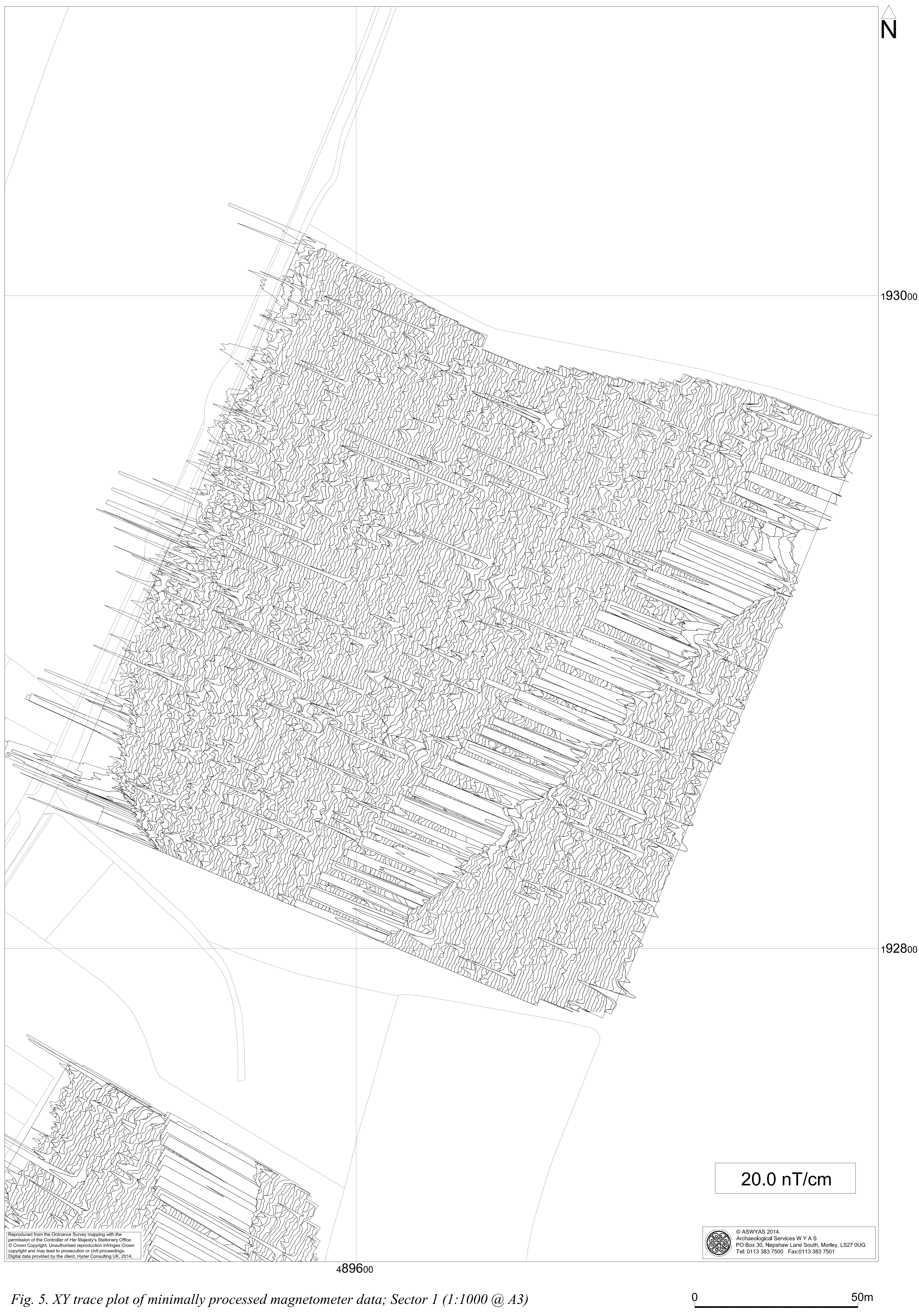

Fig. 5. XY trace plot of minimally processed magnetometer data; Sector 1 (1:1000 @ A3)

0 50m

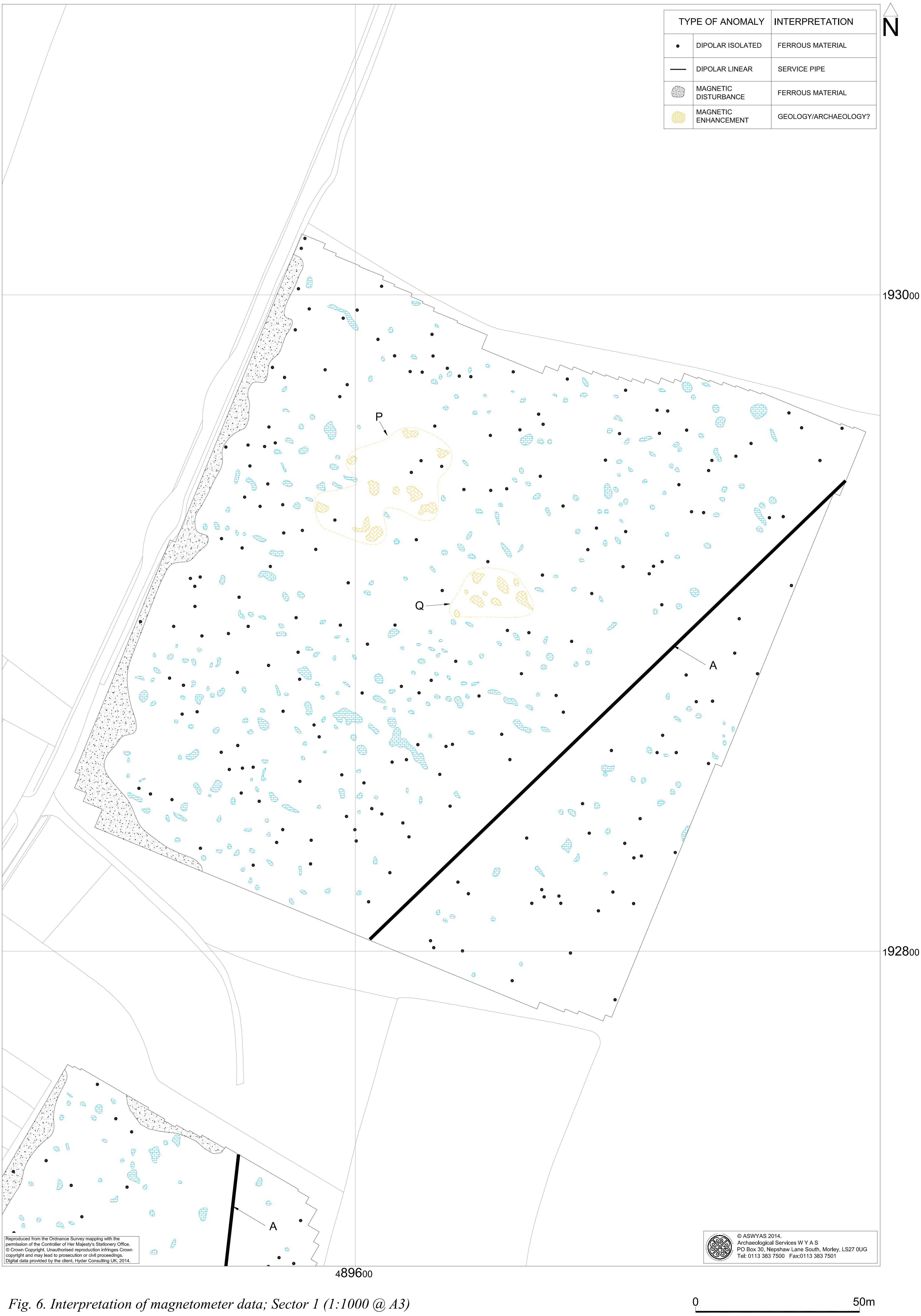

Fig. 6. Interpretation of magnetometer data; Sector 1 (1:1000 @ A3)

Fig. 7. Processed greyscale magnetometer data; Sector 2 (1:1000 @ A3)

Fig. 8. XY trace plot of minimally processed magnetometer data; Sector 2 (1:1000 @ A3)

Fig. 9. Interpretation of magnetometer data; Sector 2 (1:1000 @ A3)

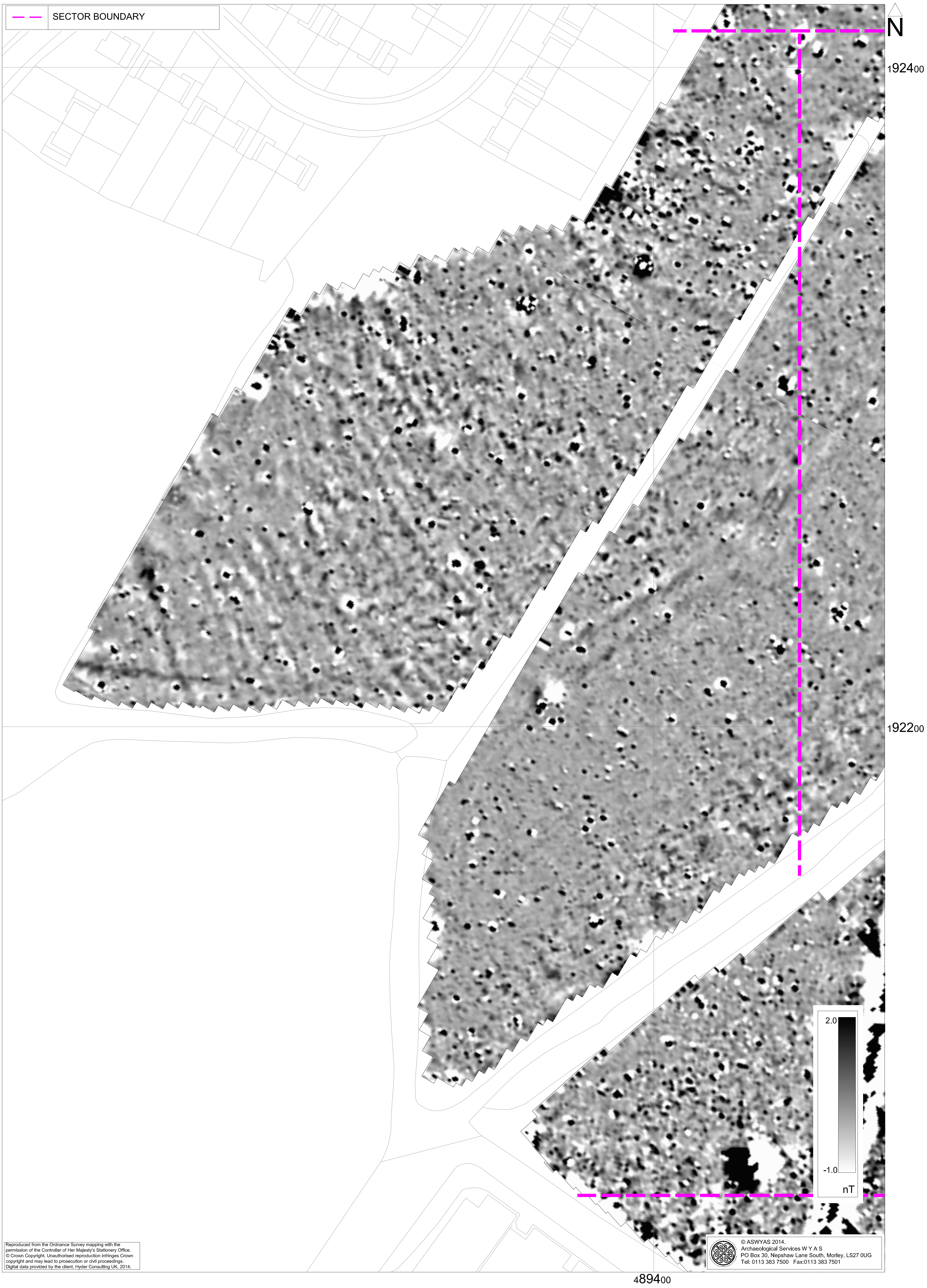

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Fig. 10. Processed greyscale magnetometer data; Sector 3 (1:1000 @ A3)

Fig. 11. XY trace plot of minimally processed magnetometer data; Sector 3 (1:1000 @ A3)

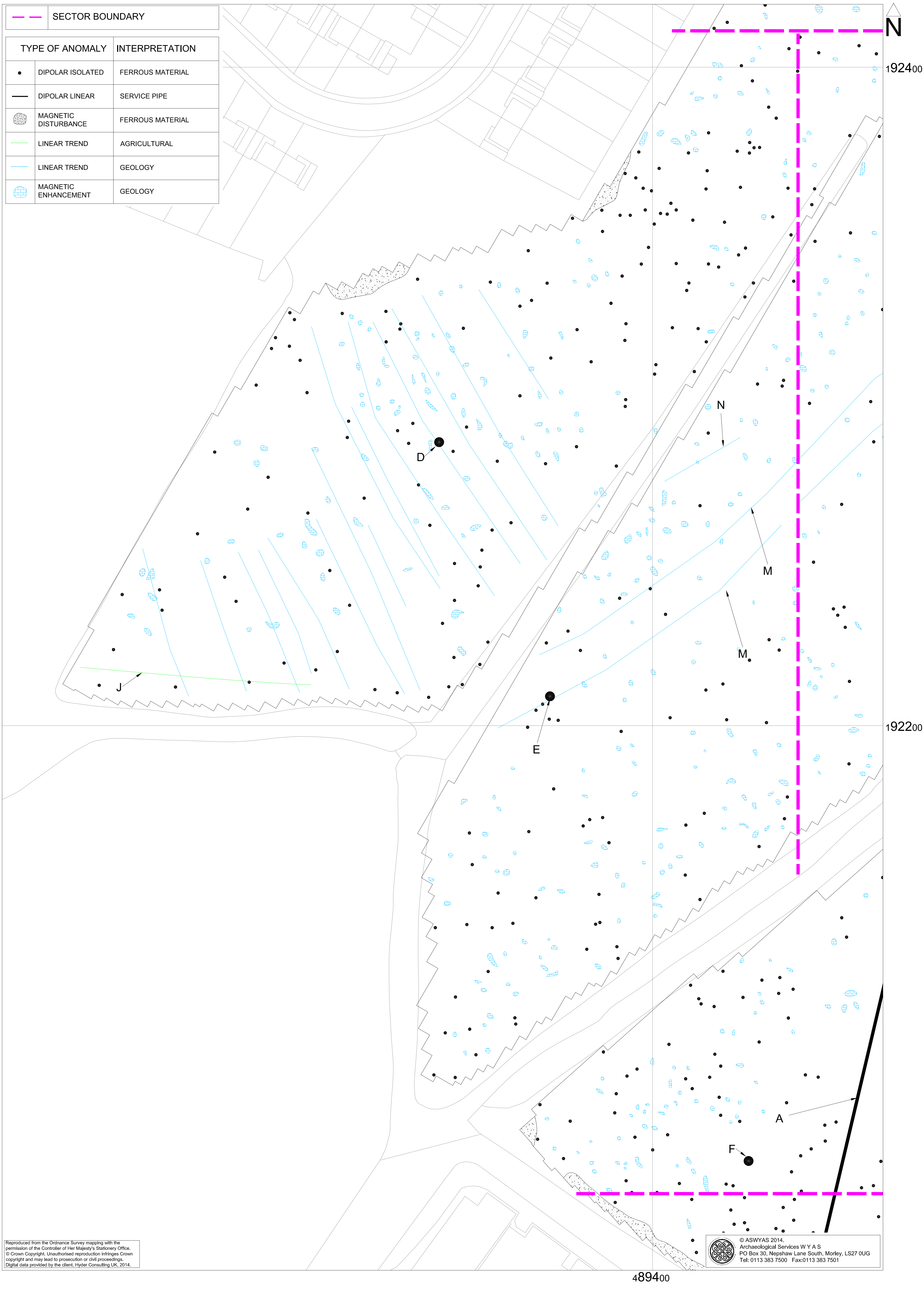

Fig. 12. Interpretation of magnetometer data; Sector 3 (1:1000 @ A3)

0 50m

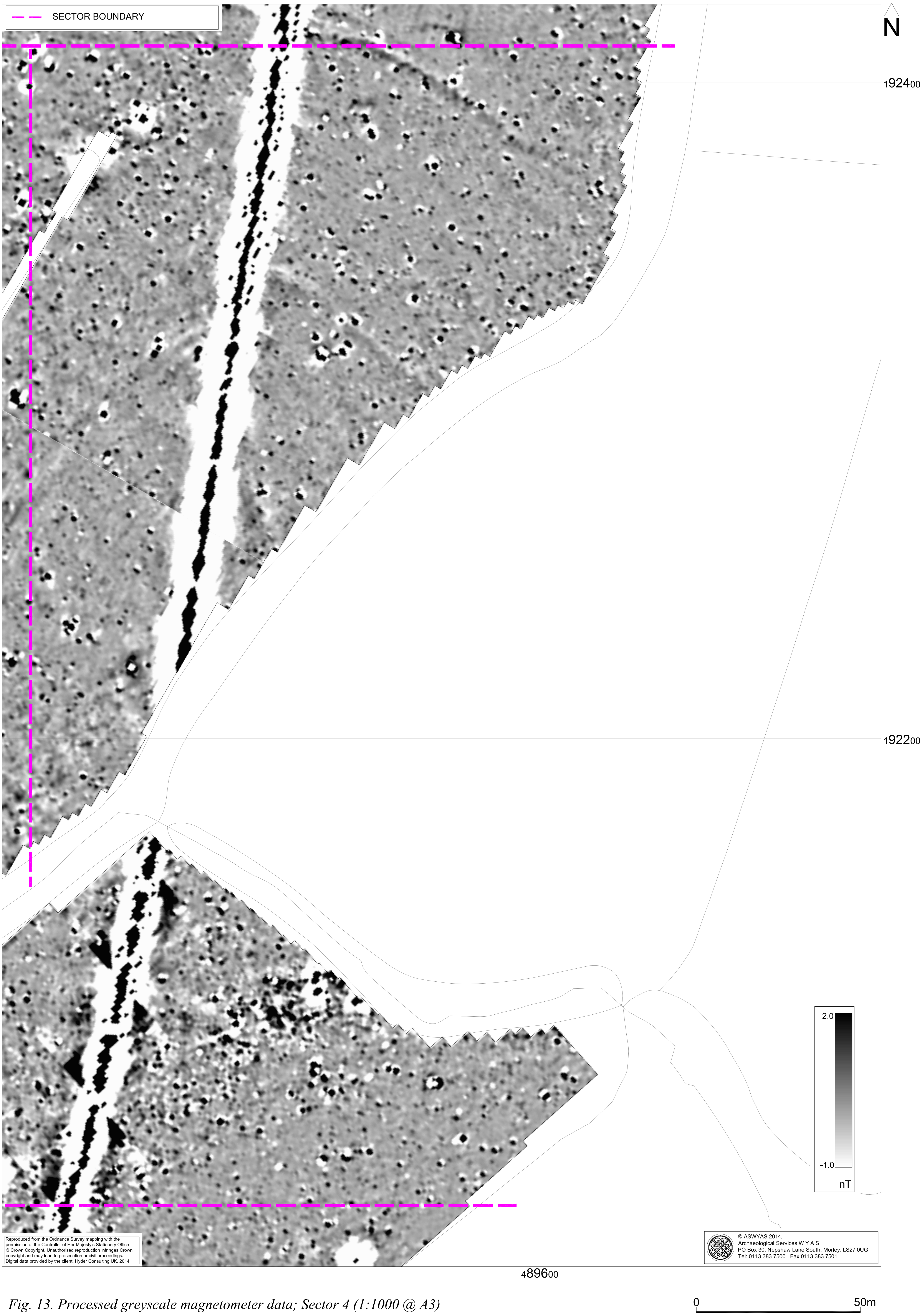

Fig. 13. Processed greyscale magnetometer data; Sector 4 (1:1000 @ A3)

Fig. 14. XY trace plot of minimally processed magnetometer data; Sector 4 (1:1000 @ A3)

0 50m

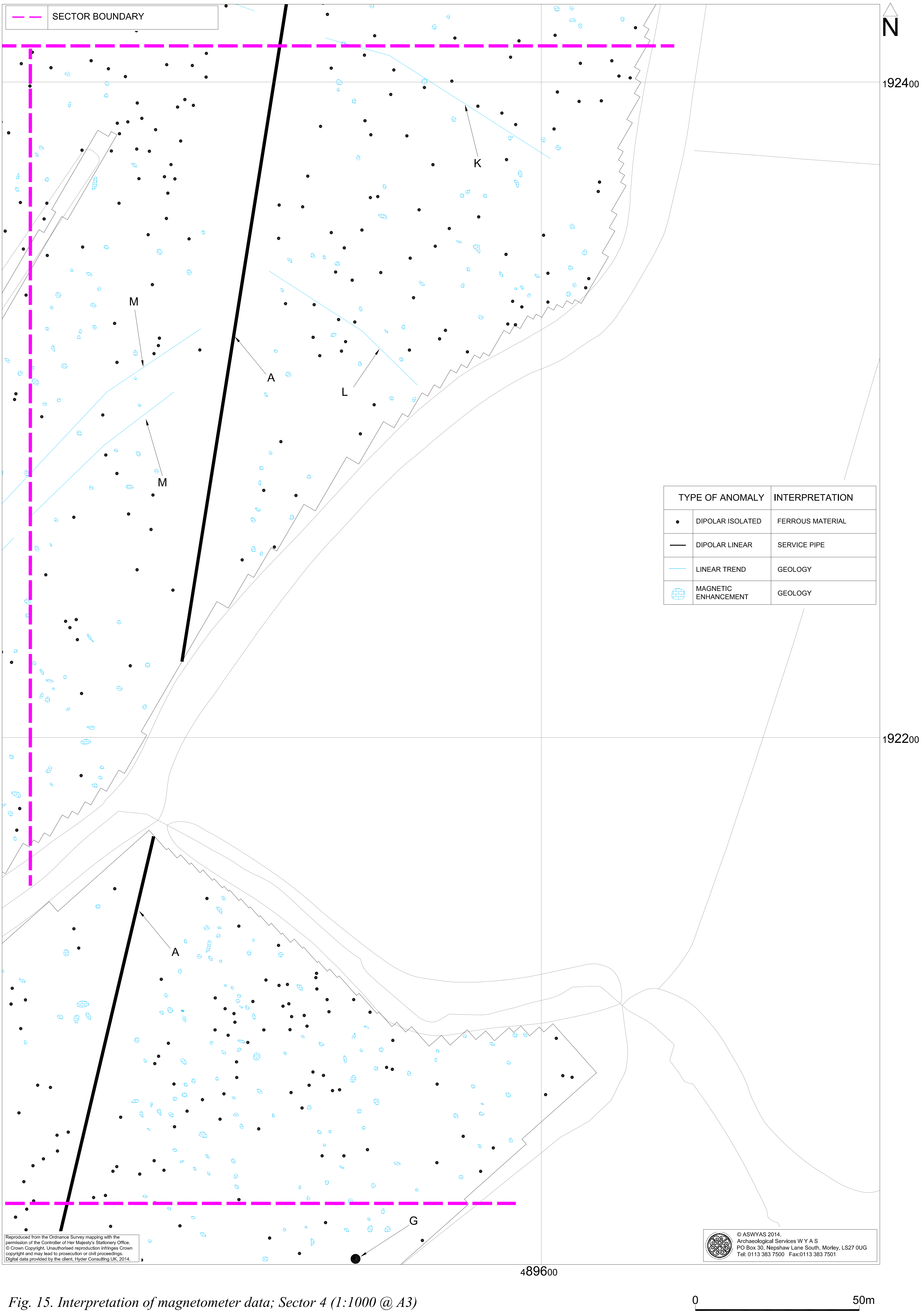

Fig. 15. Interpretation of magnetometer data; Sector 4 (1:1000 @ A3)

Fig. 16. Processed greyscale magnetometer data; Sector 5 (1:1000 @ A3)

Fig. 17. XY trace plot of minimally processed magnetometer data; Sector 5 (1:1000 @ A3)

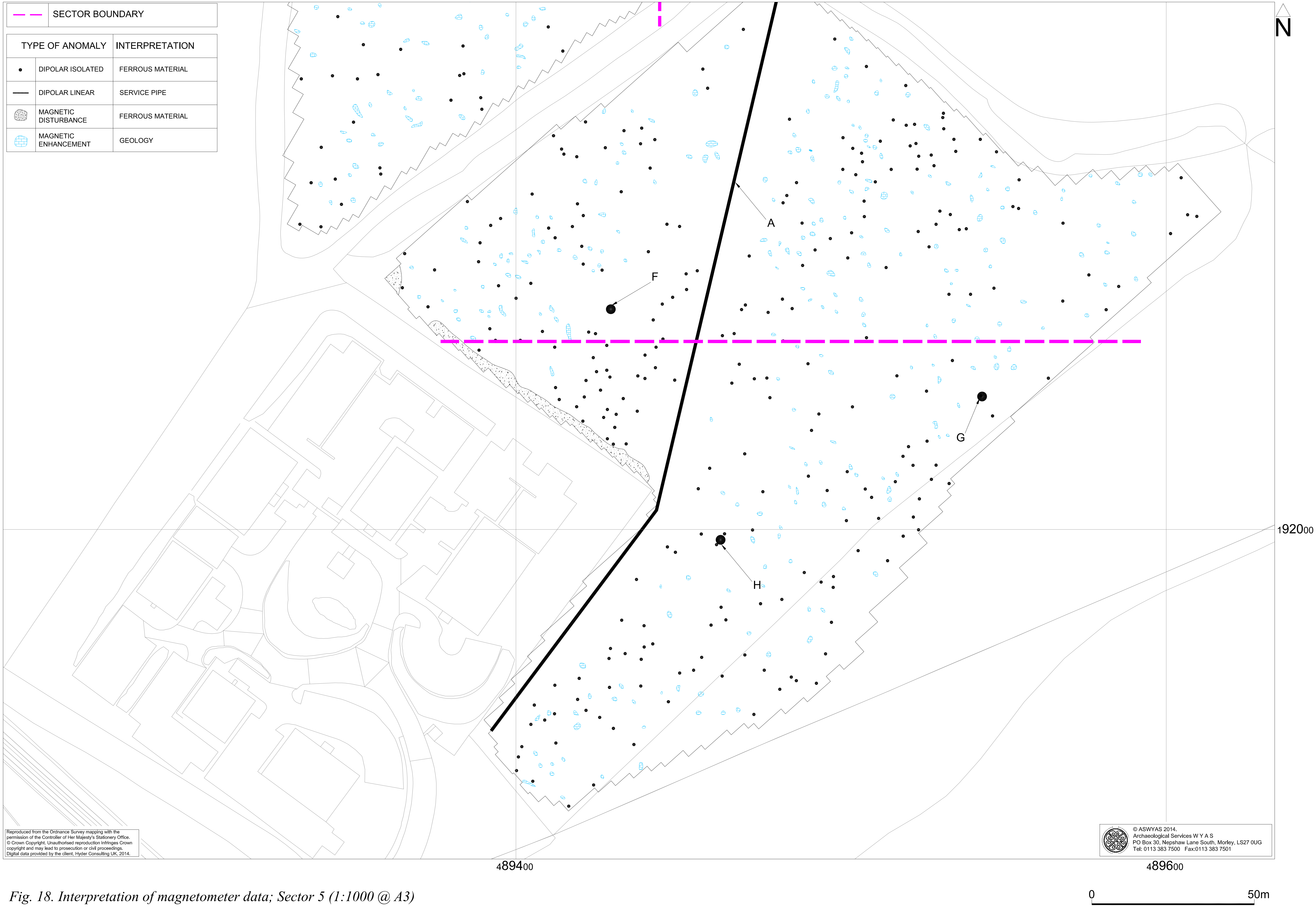

Fig. 18. Interpretation of magnetometer data; Sector 5 (1:1000 @ A3)

Fig. 19. Processed greyscale magnetometer data; Sector 6 (1:1000 @ A3)

Fig. 20. XY trace plot of minimally processed magnetometer data; Sector 6 (1:1000 @ A3)

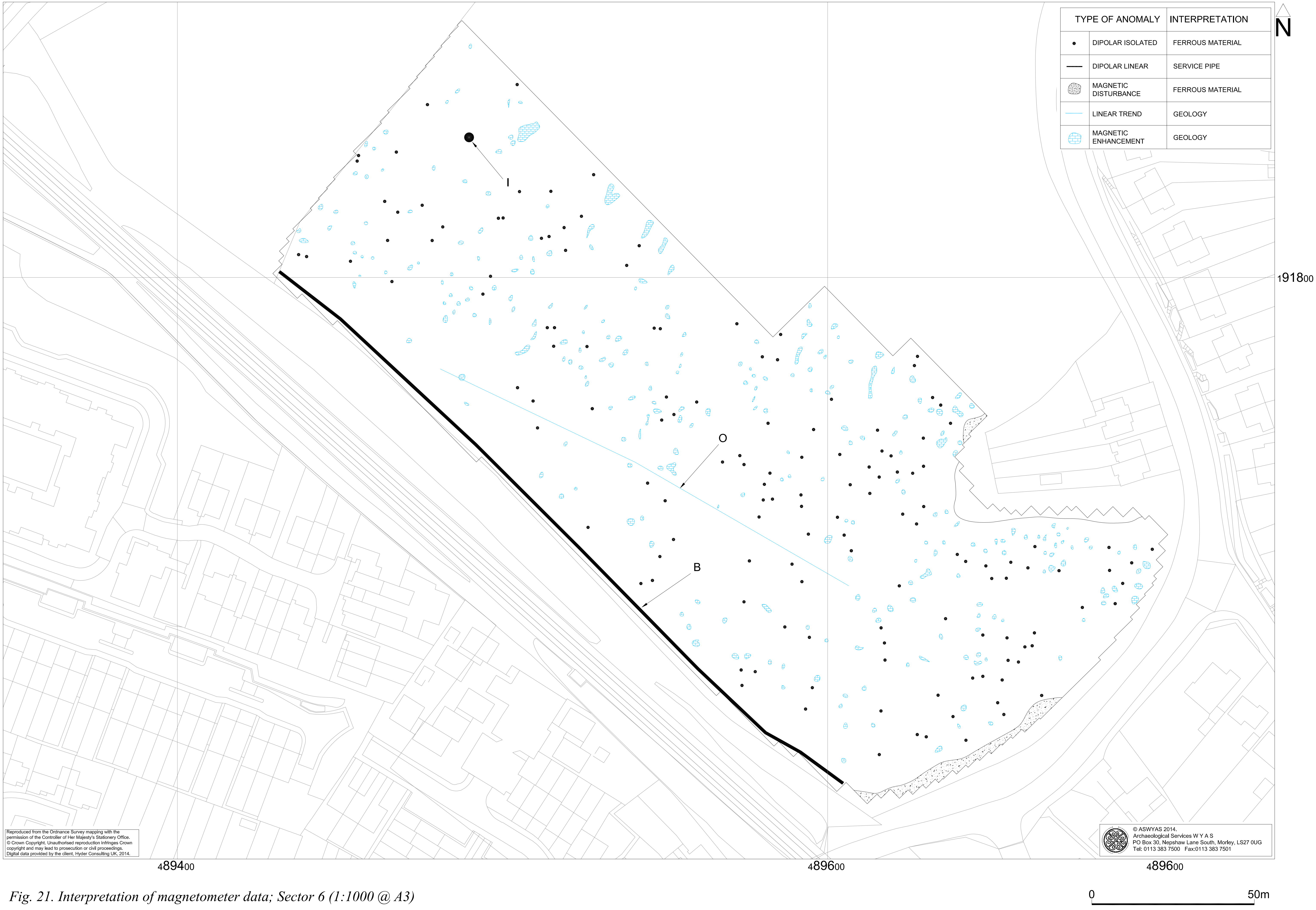

Fig. 21. Interpretation of magnetometer data; Sector 6 (1:1000 @ A3)

Plate 1. General view of Field 1, looking north-west

Plate 2. General view of Field 2, looking south

Plate 3. General view of Field 2, looking south-east

Plate 4. General view of Field 2, looking north-east

Plate 5. General view of Field 3, looking north-west

Plate 6. General view of Field 4, looking south

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.

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.

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.

Appendix 2: Survey location information

The site grid was laid out using a Trimble VRS differential Global Positioning System (Trimble 5800 model). The accuracy of this equipment is better then 0.01m. The survey grids 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 co-ordinates are measured off hard copies of the mapping rather than using the digital co-ordinates.

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; and

- 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 Buckinghamshire Historic Environment Record).

Appendix 4: OASIS Form

OASIS DATA COLLECTION FORM: England

Printable version

OASIS ID: archaeol11-195005

Project details

Project name	Gomm Valley, High Wycomb
Short description of the project	A geophysical (magnetometer) survey covering 19.6 hectares was carried out on land that is proposed to be developed to the east of High Wycombe, Buckinghamshire. No anomalies of obvious archaeological potential have been recorded. Anomalies indicative of service pipes, variations in the bedrock geology, soils and topography have been identified. Within the north of the survey area, two clusters of magnetic enhancement anomalies have been identified that are 200m south of fieldwalking find spots. These anomalies may indicate archaeology, although a geological origin is deemed more likely. On the basis of the survey, the archaeological potential of the site is considered to be low.
Project dates	Start: 13-10-2014 End: 16-10-2014
Previous/future work	Not known / Not known
Any associated project reference codes	4301 - Contracting Unit No.
Any associated project reference codes	GVG14 - Sitecode
Type of project	Field evaluation
Site status	None
Current Land use	Cultivated Land 4 - Character Undetermined
Monument type	N/A None
Monument type	N/A None
Significant Finds	N/A None
Significant Finds	N/A None
Methods & techniques	"Geophysical Survey"
Development type	Rural residential
Prompt	National Planning Policy Framework - NPPF
Position in the planning process	Not known / Not recorded
Solid geology	Seaford, Newhaven, Lewes Nodular and New Pit Type formations

(other)	
Drift geology (other)	NONE
Techniques	Magnetometry

Project location

Country	England
Site location	BUCKINGHAMSHIRE WYCOMBE HIGH WYCOMBE Gomm Valley
Study area	19.60 Hectares
Site coordinates	SU 8964 9245 51.6232488185 -0.704948942002 51 37 23 N 000 42 17 W Point

Project creators

Name of Organisation	Archaeological Services WYAS
Project brief originator	Archaeological Services WYAS
Project design originator	Archaeological Services WYAS
Project director/manager	Harrison, S.
Project supervisor	Waterfall, D.
Type of sponsor/funding body	Developer

Project archives

Physical Archive Exists?	No
Digital Archive recipient	N/A
Digital Contents	"other"
Digital Media available	"Geophysics"
Paper Archive recipient	N/A
Paper Contents	"other"
Paper Media available	"Report"

Project bibliography 1

Publication type	Grey literature (unpublished document/manuscript)
Title	Gomm Valley, High Wycombe, Geophysical survey
Author(s)/Editor(s)	Harrison, S.
Other bibliographic details	Report Number 2661

Date	2014
Issuer or publisher	ASWYAS
Place of issue or publication	2014
Description	A4 Blue comb bound report

Entered by	Sam Harrison (sharrison@aswyas.com)
Entered on	12 November 2014

OASIS:

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Bishop, L. 2014. *Gomm Valley: Cultural Heritage Desk-Based Assessment* Unpublished Hyder Client Report No. 003 UA006219 UE21R01 DBA