WYAS Archaeological Services

Westacott

Barnstaple

Devon

Geophysical Survey

Report no. 3014
September 2017

Client: Barwood Development Securities Limited

West Yorkshire Joint Services

Westacott,
Barnstaple,
Devon

Geophysical Survey

Summary

A geophysical (magnetometer) survey, was undertaken on approximately 55 hectares of land located to the east of Westcott, Barnstaple, Devon. Archaeological responses have been detected predominantly in the northwest of the survey area. Most notably a rectilinear enclosures. Responses that have been interpreted as possible archaeology have also been detected in the northeast of the survey area. Agricultural trends can be seen throughout the survey area in the form of ploughing, field drains and former field boundaries. Heightened magnetic responses across the central portion of the survey area suggest disturbance to the geology resulting from the 20th century woodland clearance. Across the site ferrous anomalies have been identified. Therefore, based on the results and interpretation of the data, the archaeological potential lies predominantly in the northwest of the survey area, but low across the remainder of the site.

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Services

Report Information

Client:	Barwood Development Securities Limited
Address:	Grange Park Court, Roman Way, Northampton NN4 5EA
Report Type:	Geophysical Survey
Location:	Barnstaple
County:	Devon
Grid Reference:	SS 5917 3215
Period(s) of activity:	Prehistoric/ Medieval/ Modern
Report Number:	3014
Project Number:	6682
Site Code:	WAS17
OASIS ID:	archaeol1-295473
Date of fieldwork:	June/July 2017
Date of report:	July 2017
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1 Introduction

Archaeological Services WYAS (ASWYAS) were commissioned by the Environmental Dimension Partnership Ltd. (EDP) on behalf of Barwood Development Securities Limited (the Client), to undertake a geophysical (magnetometer) survey on land at Westacott, Barnstaple, Devon. Guidance contained within the National Planning Policy Framework (DCLG 2012) was followed, in line with current best practice (CIfA 2014; David *et al*. 2008). The survey was carried out between the 26th June – 14th July 2017 to provide additional information on the archaeological resource of the Proposed Development Area (PDA).

Site location, topography and land-use

The survey area comprises c.55ha of grazing land located to the east of the village of Westacott, Barnstaple. Of this, approximately two hectares of the scheme was unsuitable for surey due to maize crop, (Area 2), and four hectares was unsurveyable in the southwest corner due to vegetation height, Areas 13 and 14.

The site is bound on its southern limit by the A361, to the east by Acland Road and pasture fields and in the north and west by further pastoral fields. The survey area is approximately 3km to the east of Barnstaple. The entire PDA comprises 11 fields of varying size divided by established hedges or fences. The survey area is centred at SS 5917 3215.

Overall the topography of the scheme is positioned on a gentle, southward facing slope. However the level of elevation varies across the target area, the northwest portions of the scheme are at a greater elevation than that of the southwest.

Soils and geology

The bedrock geology of the survey area is dominated by sedimentary rock, specifically mudstones of the Pilton mudstone formation. This is overlain by a superficial geology of Taw River terrace deposits consisting of gravel, sand and silts (BGS 2017). The soils of the area have been characterised as belonging to the Denbigh 1 association (541j) as well drained fine loamy and fine silty soils over rock.

2 Archaeological Background

Within 1km of the site, there is evidence of a number of previously identified archaeological assets ranging from post-medieval ridge and furrow to medieval farmsteads. A search on the Heritage Gateway (www.heritagegateway.org.uk, 2017) shows that Area 7 (Sector 2) has an uncommon field name – Canna Park (HER number MDV119426) one that is usually encountered immediately adjacent to a farmstead, suggesting that the presence of a lost cottage or farmstead lies within the vicinity.

Immediately northeast of the site lies a 15th century hall-house know as Acland Barton (monument number 339991) and was probably built c.1470-80 by the Acland Family. It was remodelled in 1591 and the 17th century, and later converted to a farmhouse (www.pastscape.org.uk, 2017).

To the south of site, on the route of the A361 lies a deserted hamlet or farm which may be of Saxon origin (monument number 896516). The deserted settlement presumably called Pill (monument number 34063) lies to the south.

3 Aims and Methodology

The aims and objectives of the programme of geophysical survey was to gather sufficient information to establish the presence/absence, character and extent, of any archaeological remains within the specific area to inform an assessment of the archaeological potential of the site and any further investigation strategies, should they be necessary. To achieve this aim, a magnetometer survey covering all amenable parts of the PDA was undertaken (see Fig. 2).

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 R6 model). The survey was undertaken using Bartington Grad601 magnetic gradiometers. These were employed taking readings at 0.25m intervals on zig-zag traverses 1.0m 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 displays processed magnetometer data at a scale of 1:6000 with Figure 3 displaying an overall interpretation at the same scale. The processed and minimally processed data, together with an interpretation of the survey results are presented in Figures 4 to 30 inclusive at a scale of 1:1000.

Technical information on the equipment used, data processing and survey methodologies are given in Appendix 1. Technical information on locating the survey area is provided in

Appendix 2. Appendix 3 describes the composition and location of the archive. A copy of the completed OASIS form is included in Appendix 4.

The survey methodology, report and any recommendations comply with guidelines outlined by English Heritage (David *et al.* 2008) and by the Chartered Institute for Archaeologists (CIfA 2014). 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 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 (see Figures 4 to 30)

Ferrous anomalies

Ferrous anomalies, as individual 'spikes', or as large discrete areas are typically caused by ferrous (magnetic) material, either on the ground surface or in the plough-soil. Little importance is normally given to such anomalies, unless there is any supporting evidence for an archaeological interpretation, as modern ferrous debris or material is common on rural sites, often being present as a consequence of manuring or tipping/infilling. There are concentrations of this magnetic disturbance along the edges of a number of the surveyed fields, likely to represent the build-up of plough soil. In addition to a number of sporadic isolated bipolar ferrous anomalies across the survey area.

In Area 13, Sector 3, a linear dipolar response was identified, this was interpreted as a modern service pipe.

Geological anomalies

The survey has detected multiple clusters of low magnitude anomalies that have been interpreted as geological in origin. It is thought that the responses have been detected because of the variation in the composition and depth of the soils and deposits of superficial material in which they derive. This may also be a direct result of the variation in topography previously mentioned. The higher regions of the survey area (Sectors 1 and 2) are more likely to be comprised of more silty and magnetic material that is closer to the surface in certain areas than others. Two main clusters occur where former woodland has been historically removed and geological material has been brought closer to the surface (Sectors 5 and 7). Overall, the survey area generally appears to generally have a uniform geology.

Agricultural anomalies

The survey area towards the east, is covered in regular spaced, linear anomalies, consistent with evidence of modern and possibly historic ploughing activity. These trends follow the orientation of the extant field system, so a modern interpretation is perhaps more feasible.

Towards the north western corner of the scheme (Sector 1), a former field boundary has been identified as a direct result of examination of historic mapping

Within Sectors 5, 6 and 7 (Figs 16 - 24) in the middle of the scheme, former field boundaries have been identified, and are still visible as a slight earthwork on the ground. Examination of historic mapping for the area shows that the boundary was once present during the late 1800's.

Field drains can be distinguished by identifying their unique magnetic signature, giving a faintly dipolar response, significantly weaker than that of the ferrous pipes caused by the firing of the ceramic material. Examples of which have been identified in Sector 5 (Figs 16 - 18).

Possible archaeological anomalies

Within Sector 6 (Figs 19-21) in the northeast of the survey area there are a small number of possible linear features, interpreted as two separate groupings. The three small linear features to the east (**B**) are orientated along a different axis to known field boundaries recorded in historic mapping. Whilst the larger grouping of features to the southwest (**C**) is more likely to represent a small, rectangular, enclosure. With larger linear bounding features along its east and south borders, trending north/south and east/west respectively.

Archaeological anomalies

Area 1, divided between Sectors 1 and 2 (Figs 4 - 9) also houses features of particular archaeological interest (**A**). These multiple linear responses are representative of a possible enclosure, and these features may have acted as bounding ditches. There is no cartographic evidence of these features, hence an archaeological interpretation has been given.

5 Conclusions

The magnetic survey has detected a large rectilinear enclosure, thought to be archaeological in origin.

In addition to the archaeology, agricultural ploughing trends, field drains and former field boundaries can be seen. The results of the survey clearly indicate that the archaeology within the PDA has experienced truncation as a result of the historical and modern agricultural regime. Heightened magnetic responses across the central portion of the survey area suggest disturbance to the geology resulting in the 20th century woodland clearance.

Based on the results of the geophysical survey, the archaeological potential of the northwest section of the survey area is deemed to be high in this well-defined areas, but low to moderate across the remainder of the survey area.

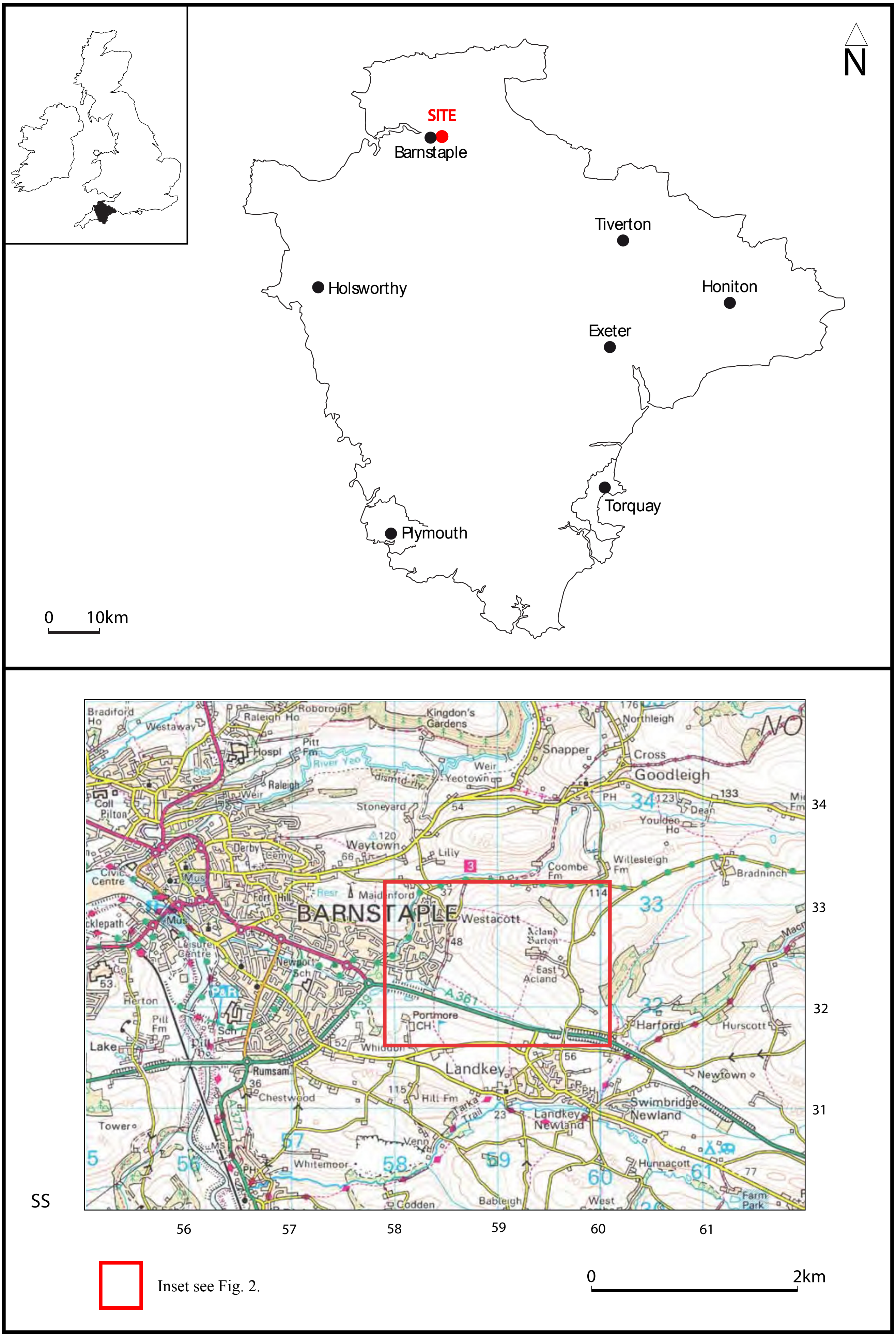

Fig. 1. Site location

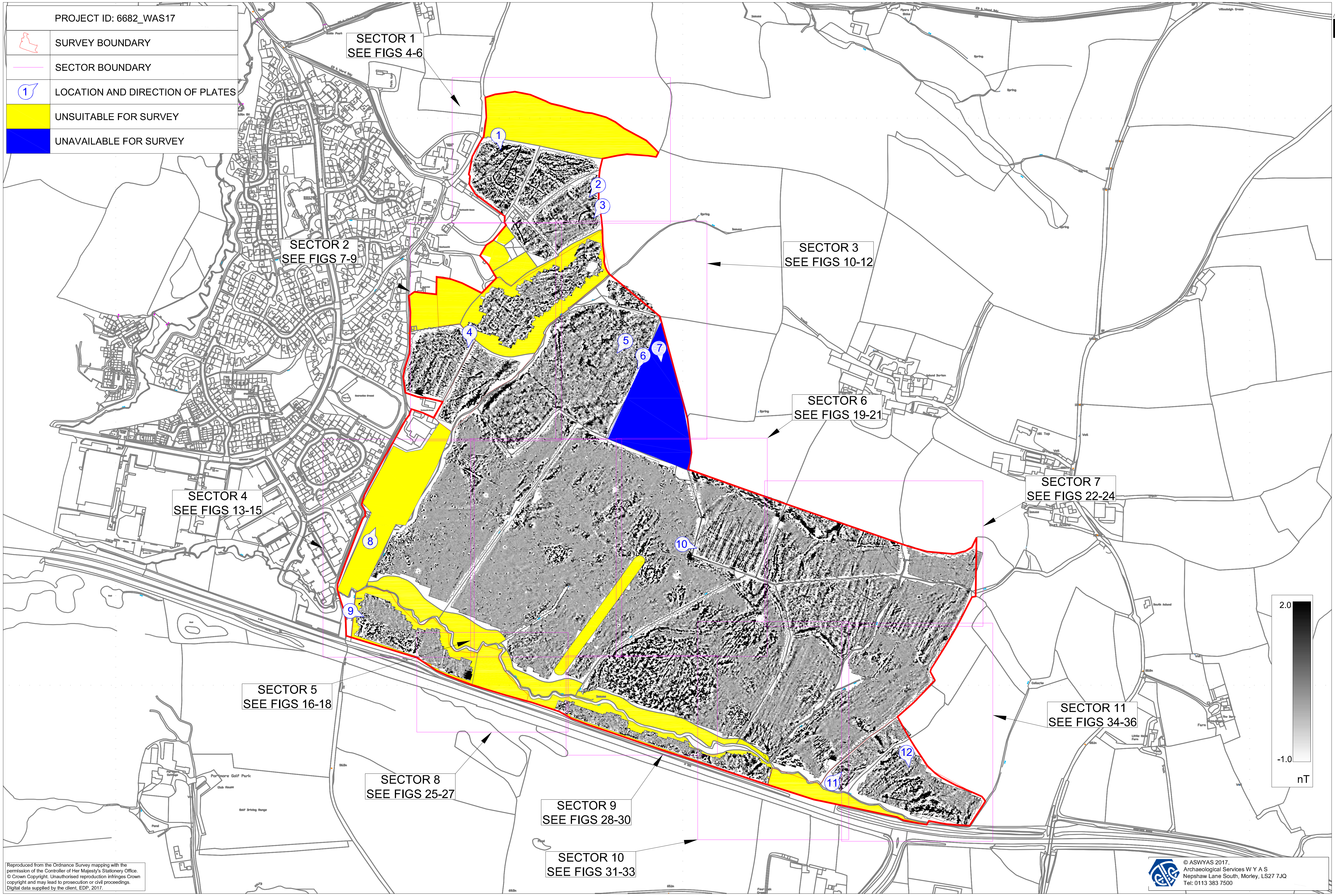

Fig. 2. Survey location showing greyscale magnetometer data (1:6000 @ A3)

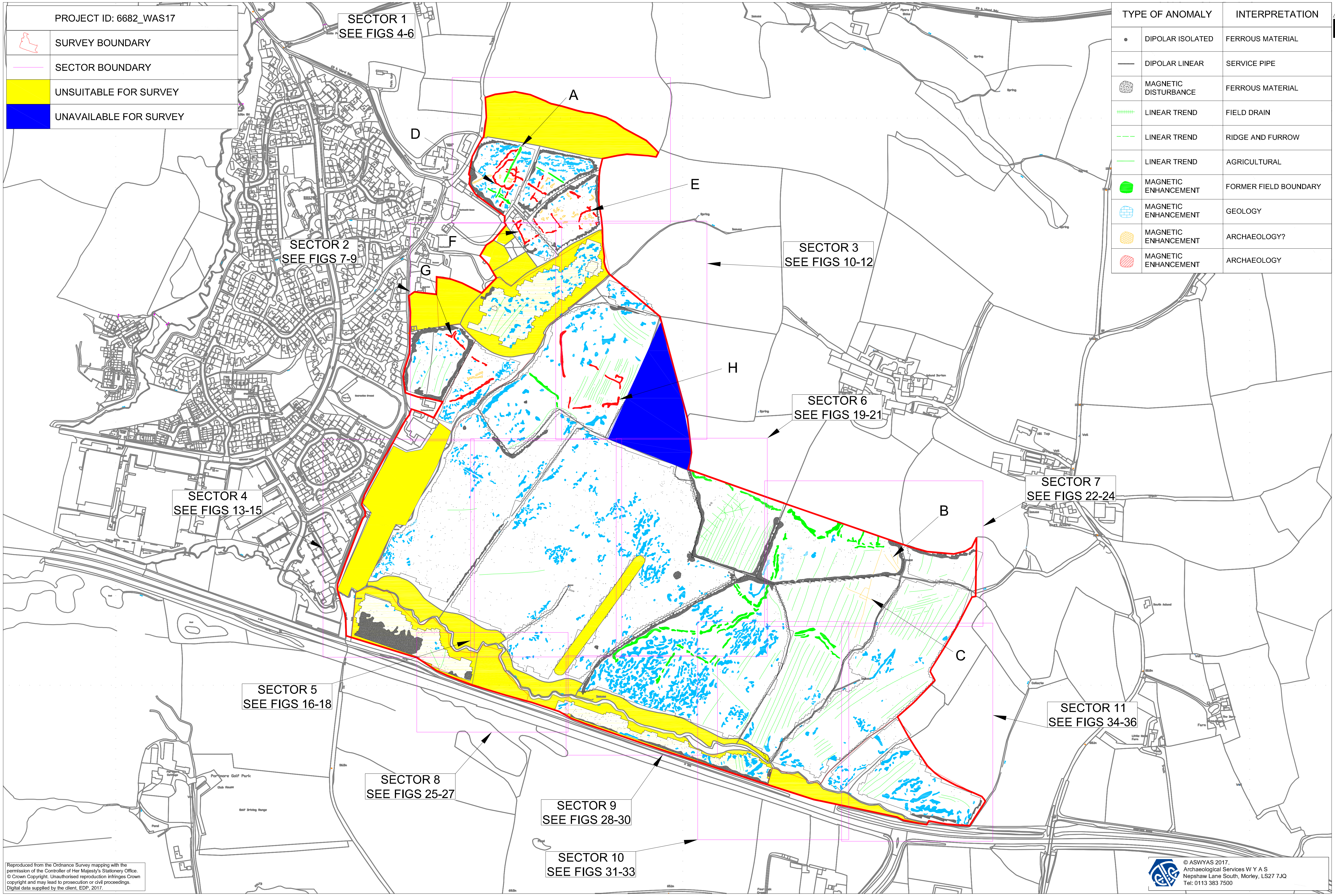

Fig. 3. Overall interpretation of magnetometer data (1:6000 @ A3)

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

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

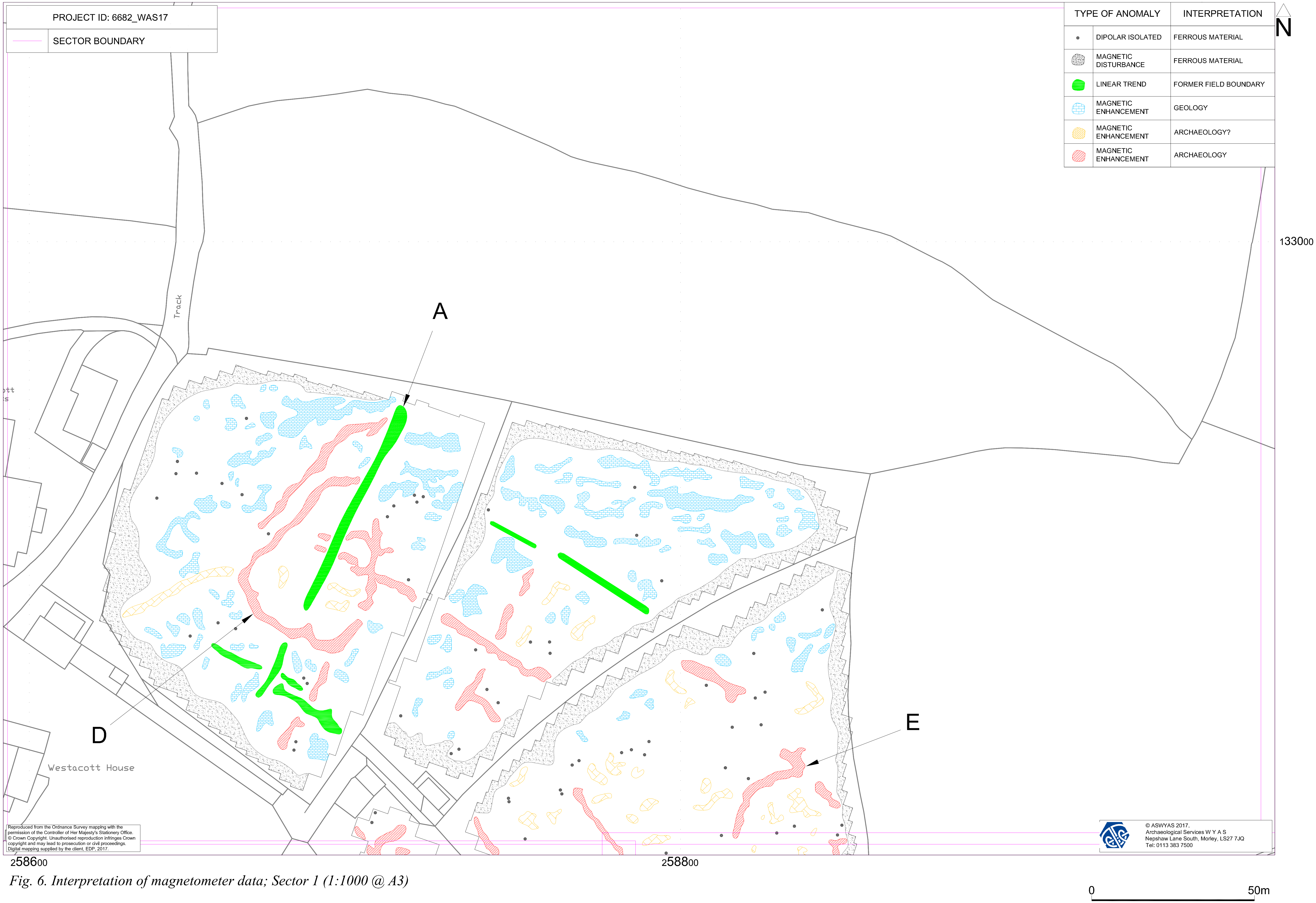

Fig. 6. Interpretation of magnetometer data; Sector 1 (1:1000 @ A3)

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

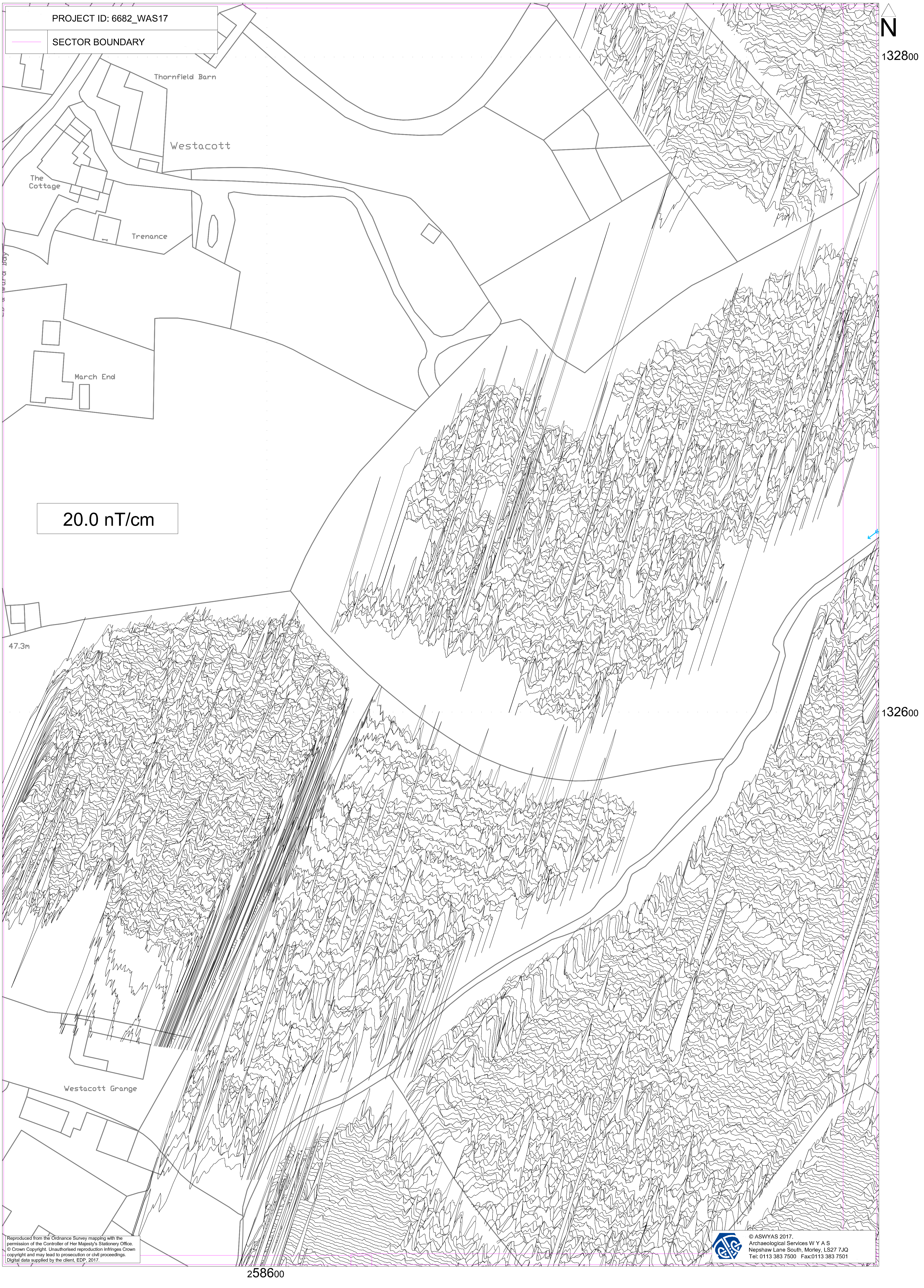

Fig. 8. XY trace plot of minimally processed magnetometer data; Sector 2 (1:1000 @ A3)

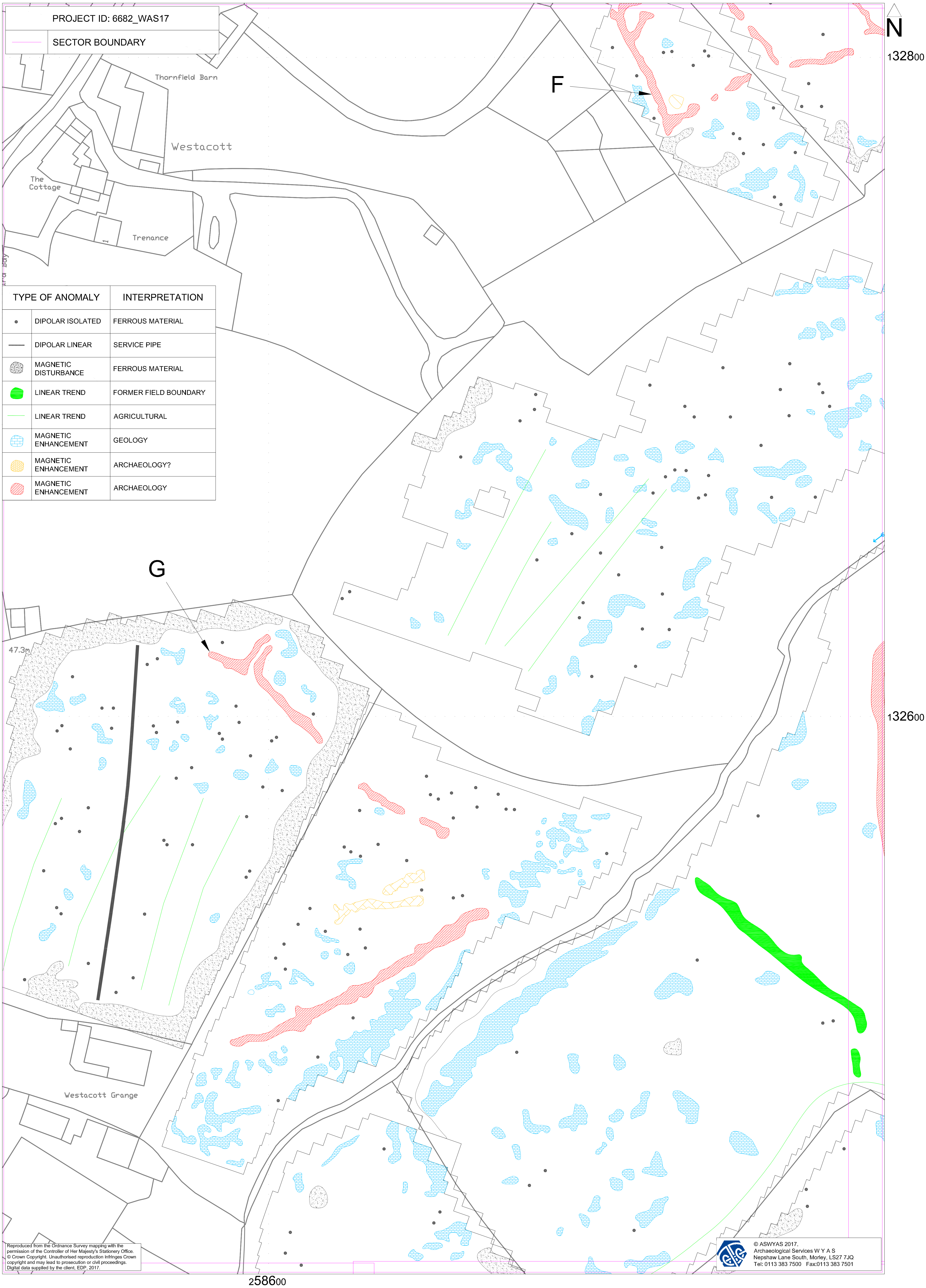

Fig. 9. Interpretation of magnetometer data; Sector 2 (1:1000 @ A3)

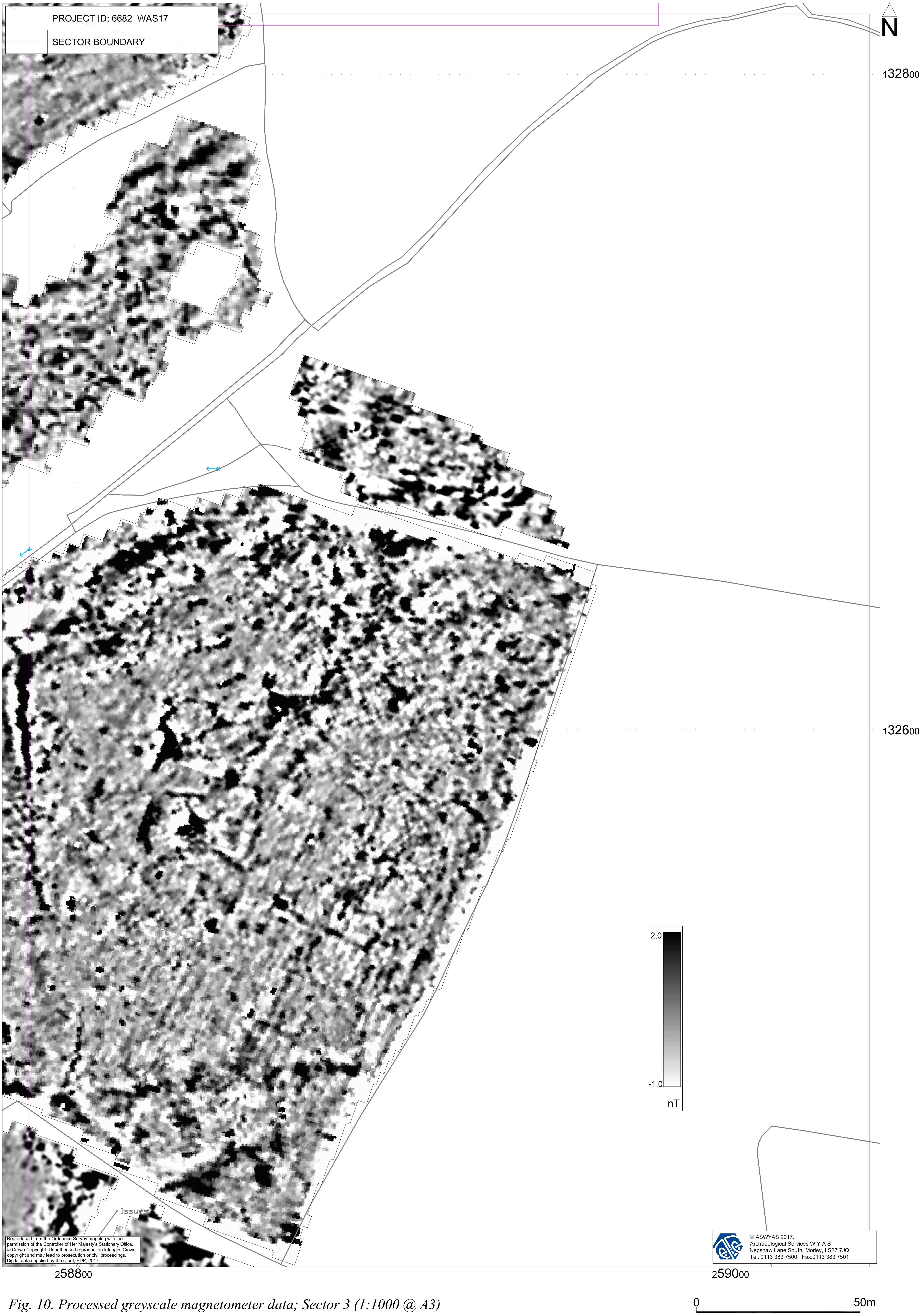

Fig. 10. Processed greyscale magnetometer data; Sector 3 (1:1000 @ A3)

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

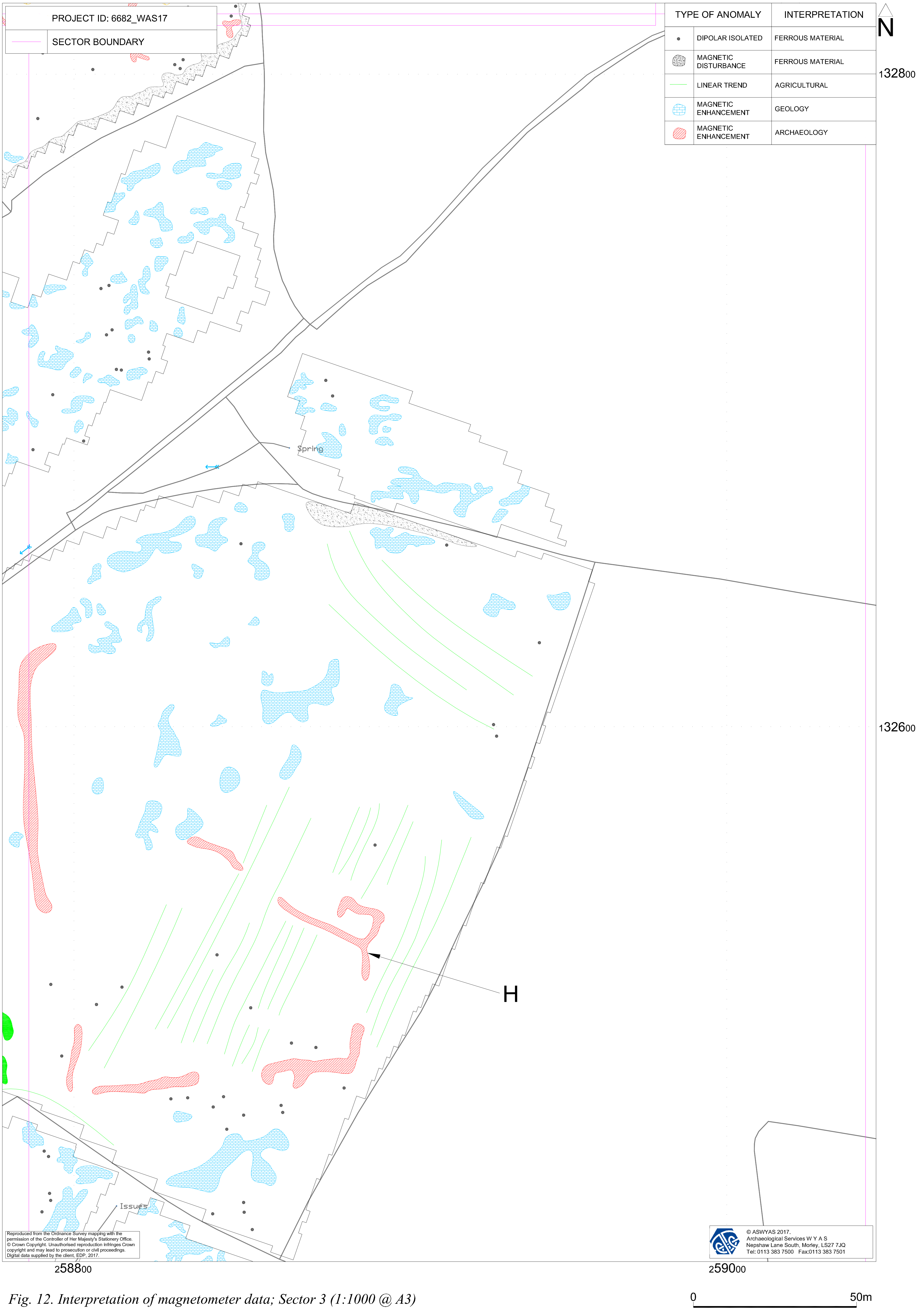

Fig. 12. Interpretation of magnetometer data; Sector 3 (1:1000 @ A3)

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)

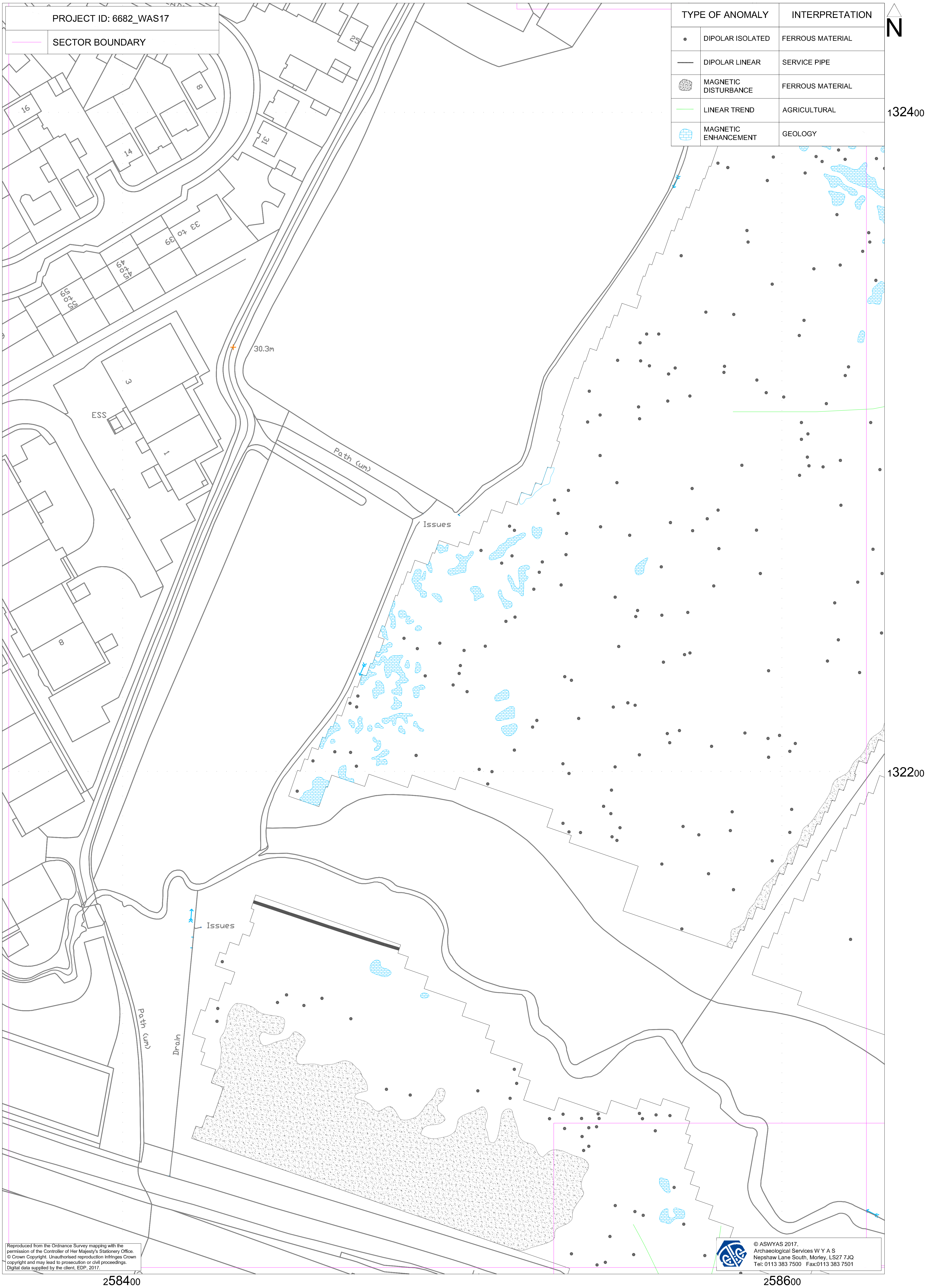

Fig. 15. Interpretation of magnetometer data; Sector 4 (1:1000 @ A3)

0 50m

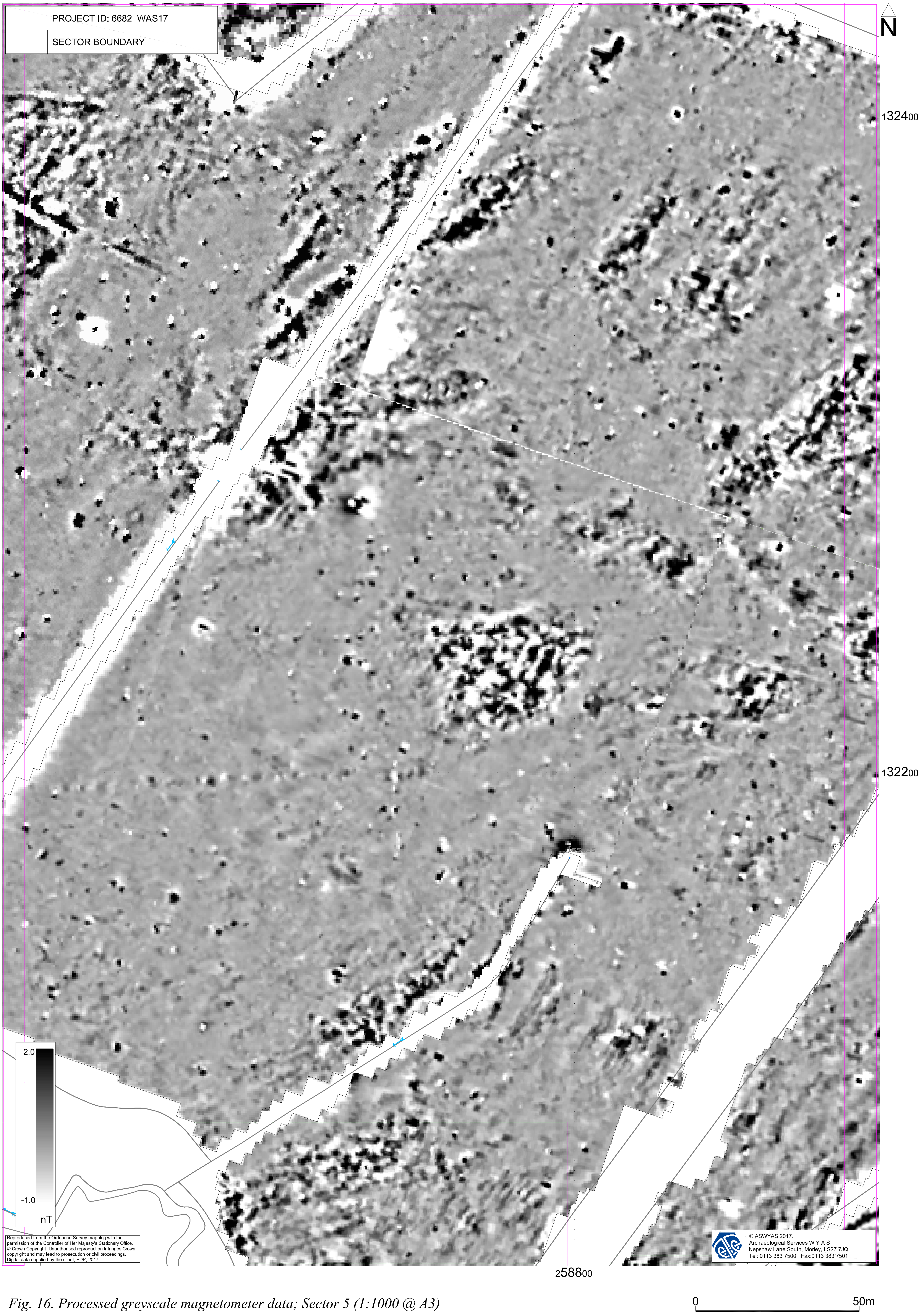

Fig. 16. Processed greyscale magnetometer data; Sector 5 (1:1000 @ A3)

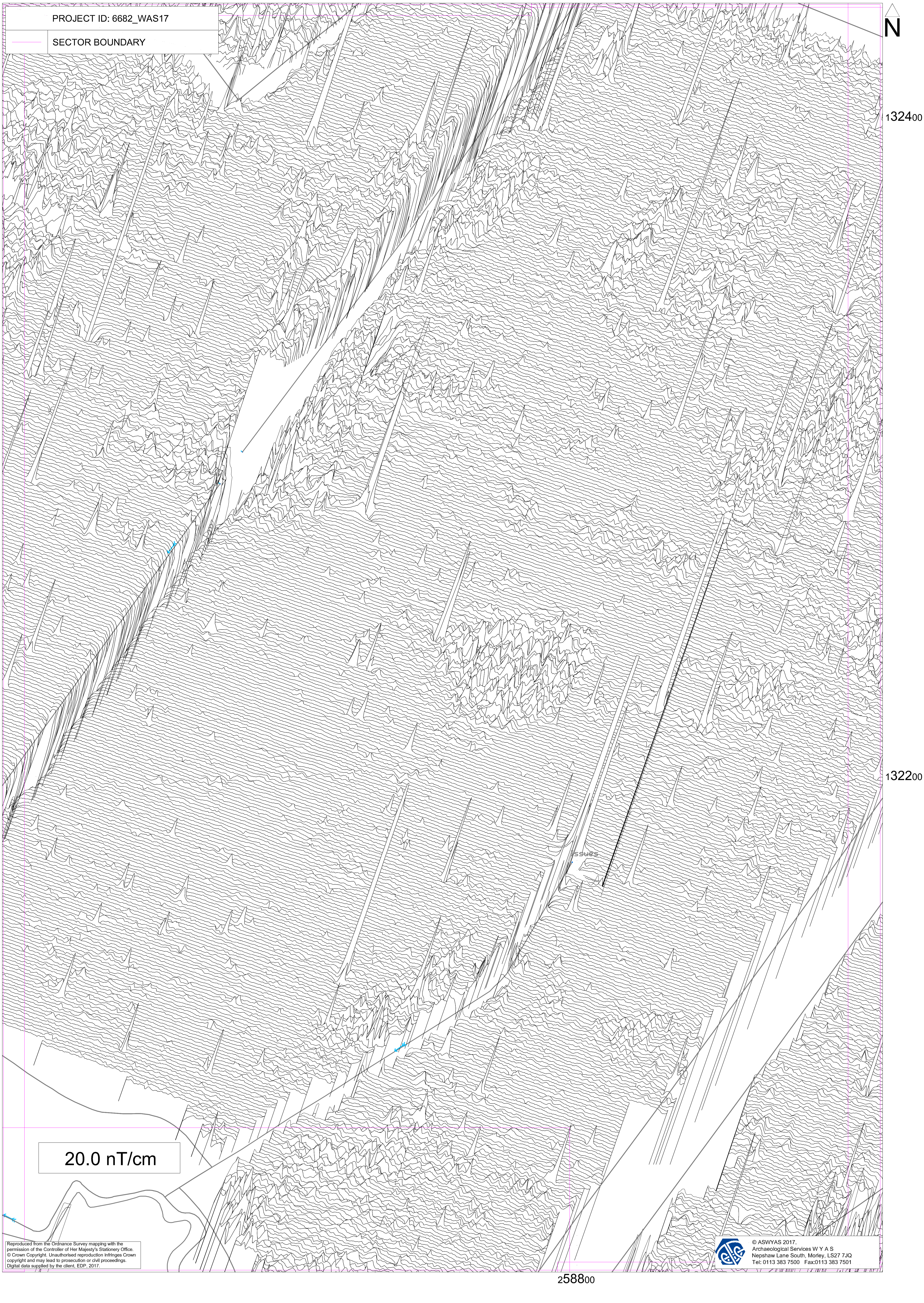

Fig. 17. XY trace plot of minimally processed magnetometer data; Sector 5 (1:1000 @ A3)

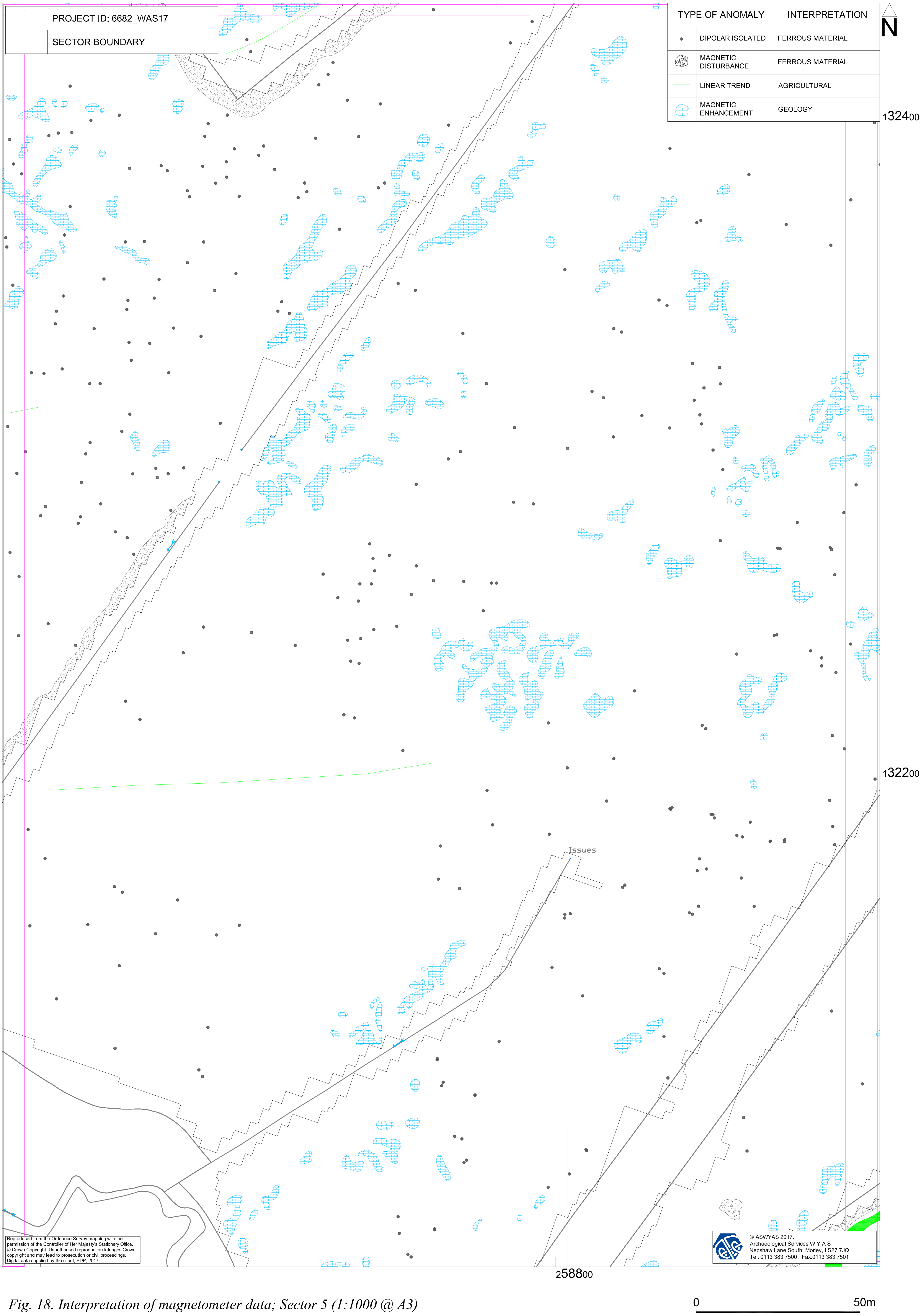

Fig. 18. Interpretation of magnetometer data; Sector 5 (1:1000 @ A3)

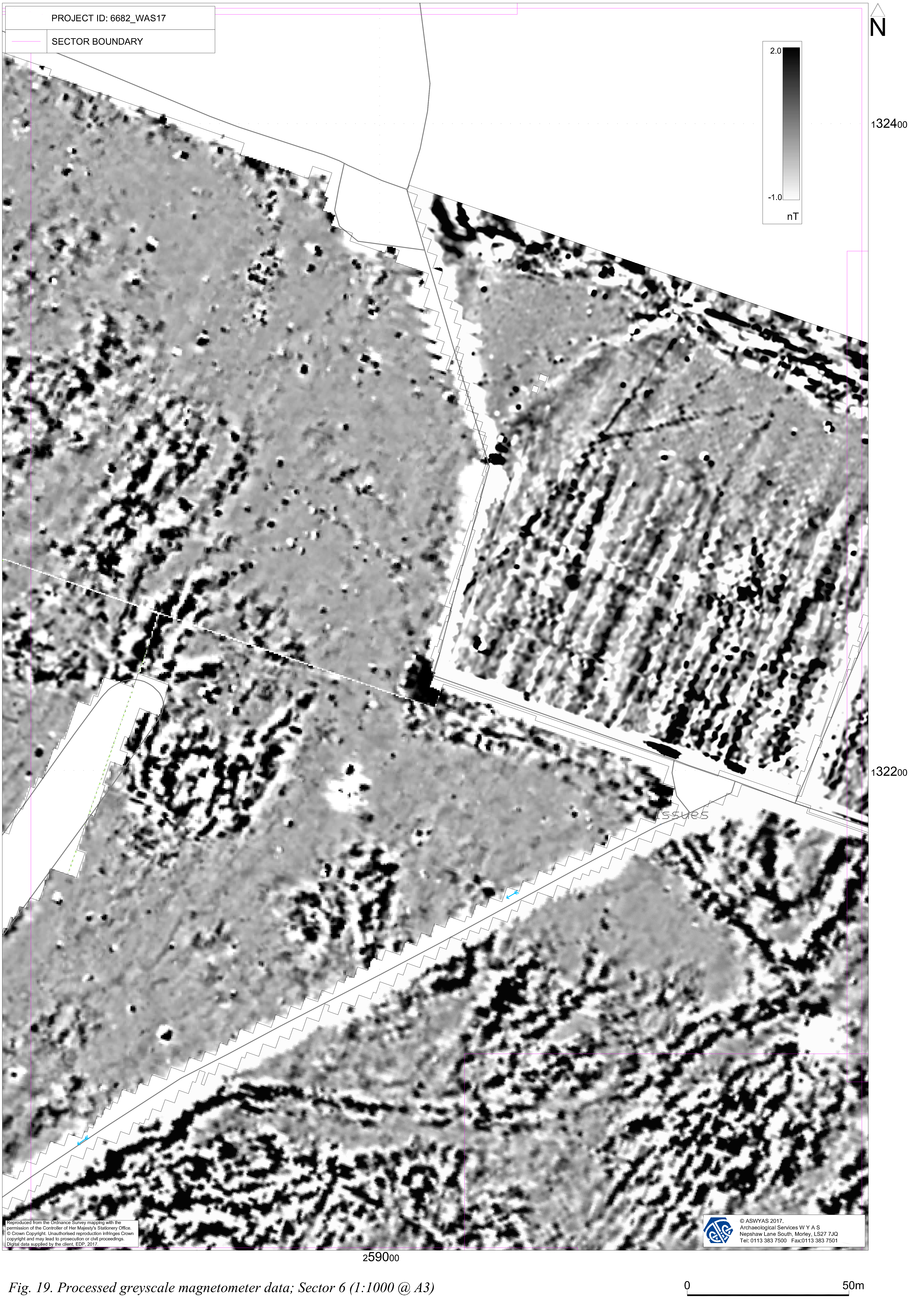

Fig. 19. Processed greyscale magnetometer data; Sector 6 (1:1000 @ A3)

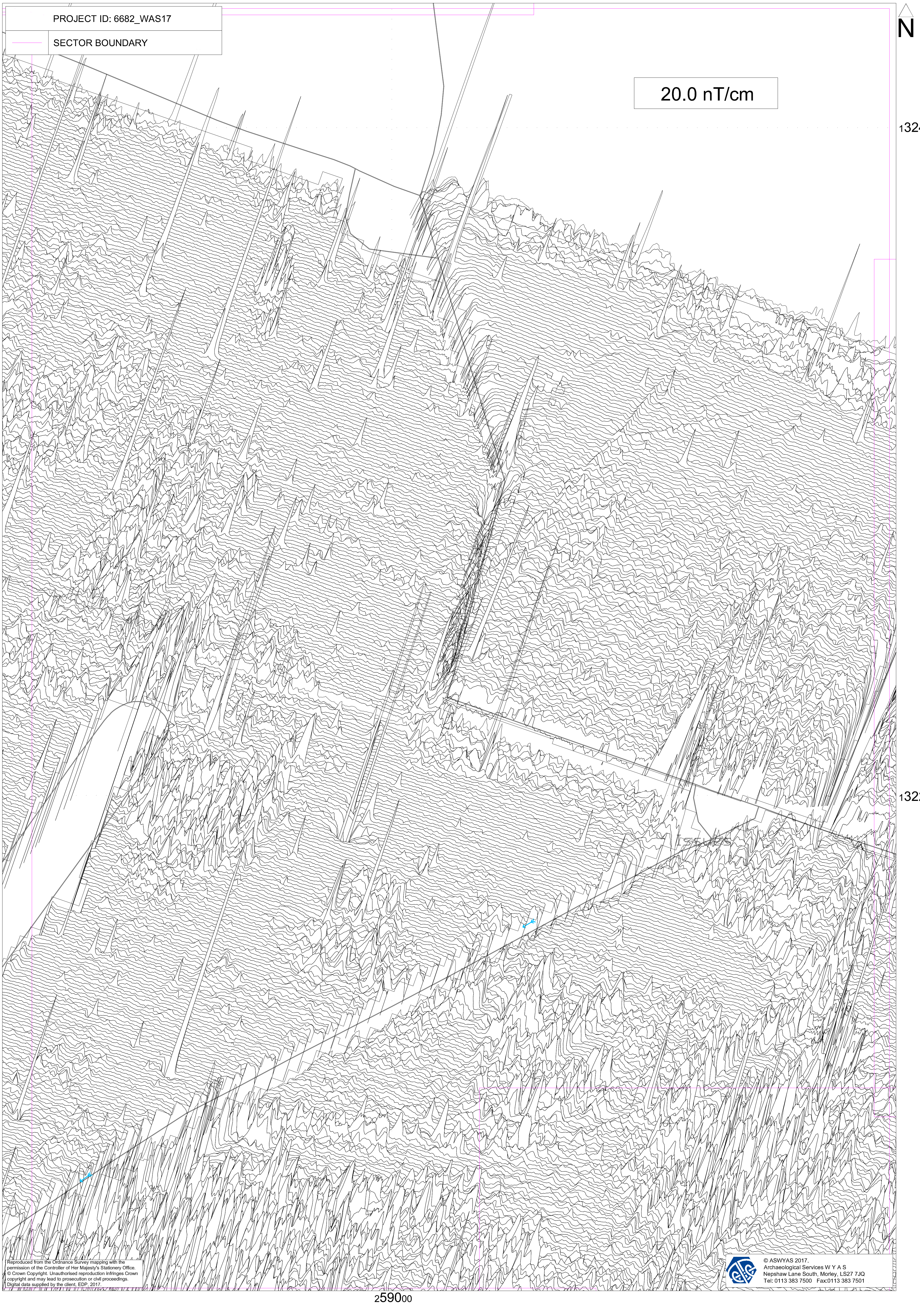

Fig. 20. XY trace plot of minimally processed magnetometer data; Sector 6 (1:1000 @ A3)

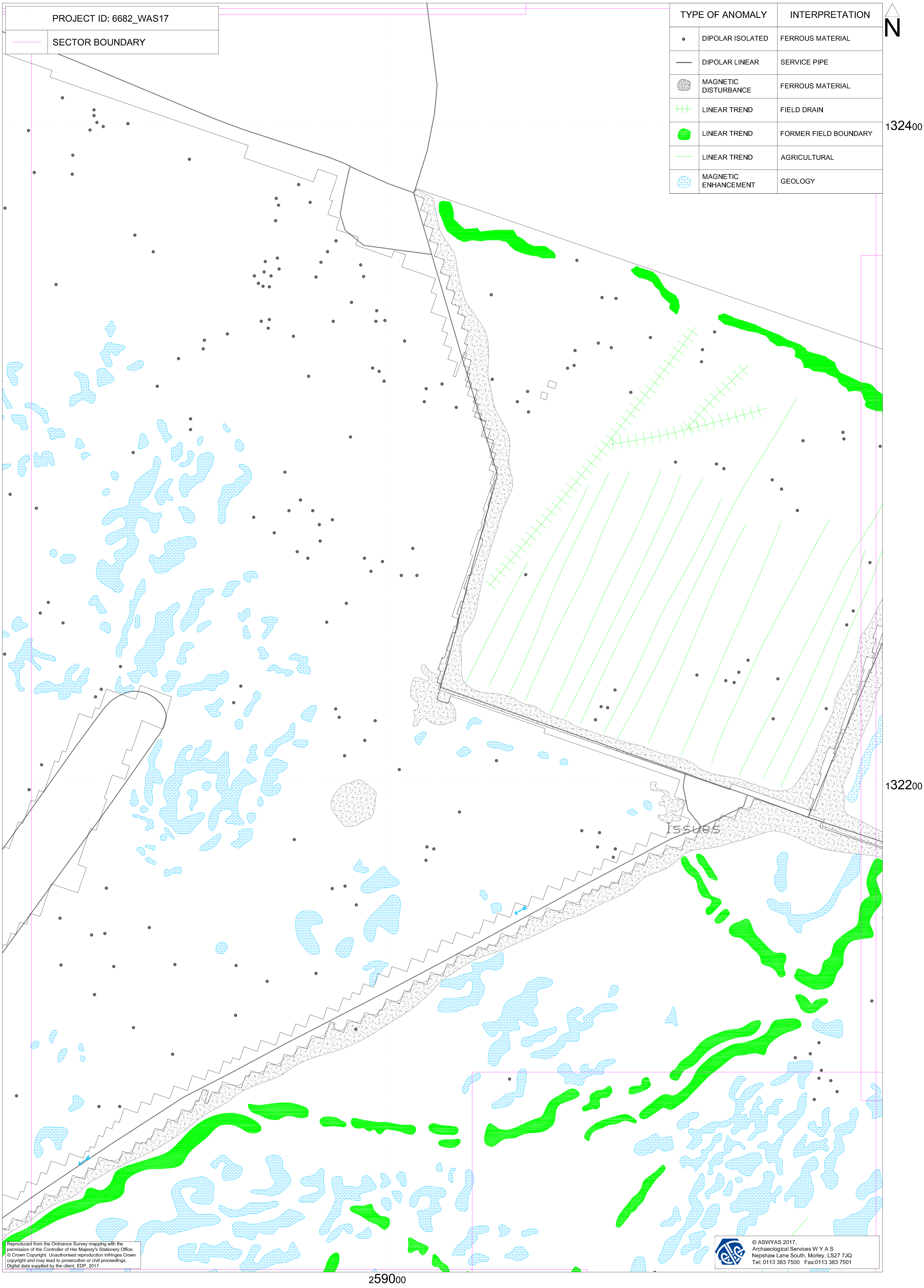

Fig. 21. Interpretation of magnetometer data; Sector 6 (1:1000 @ A3)

0 50m

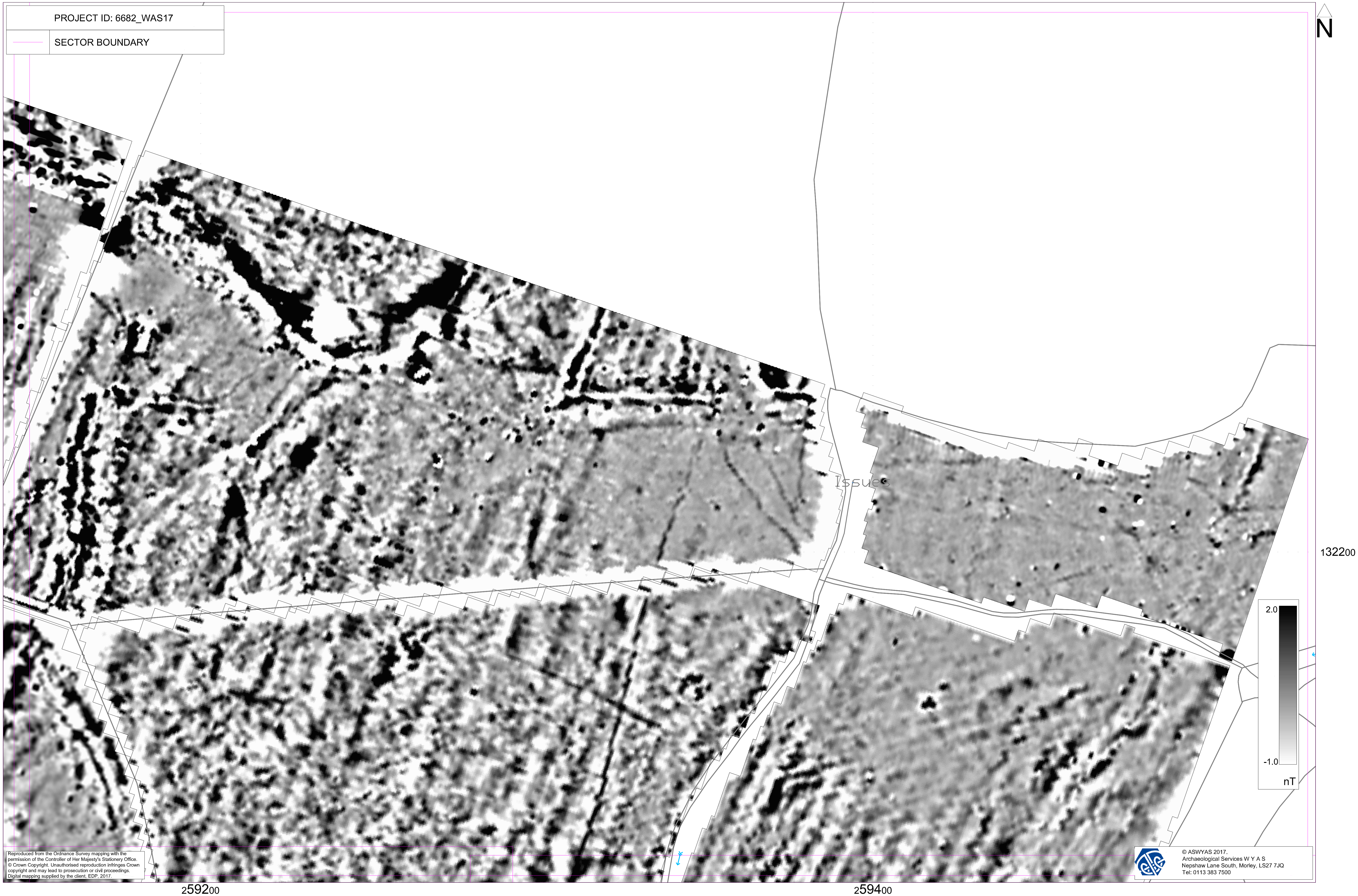

Fig. 22. Processed greyscale magnetometer data; Sector 7 (1:1000 @ A3)

Fig. 23. XY trace plot of minimally processed magnetometer data; Sector 7 (1:1000 @ A3)

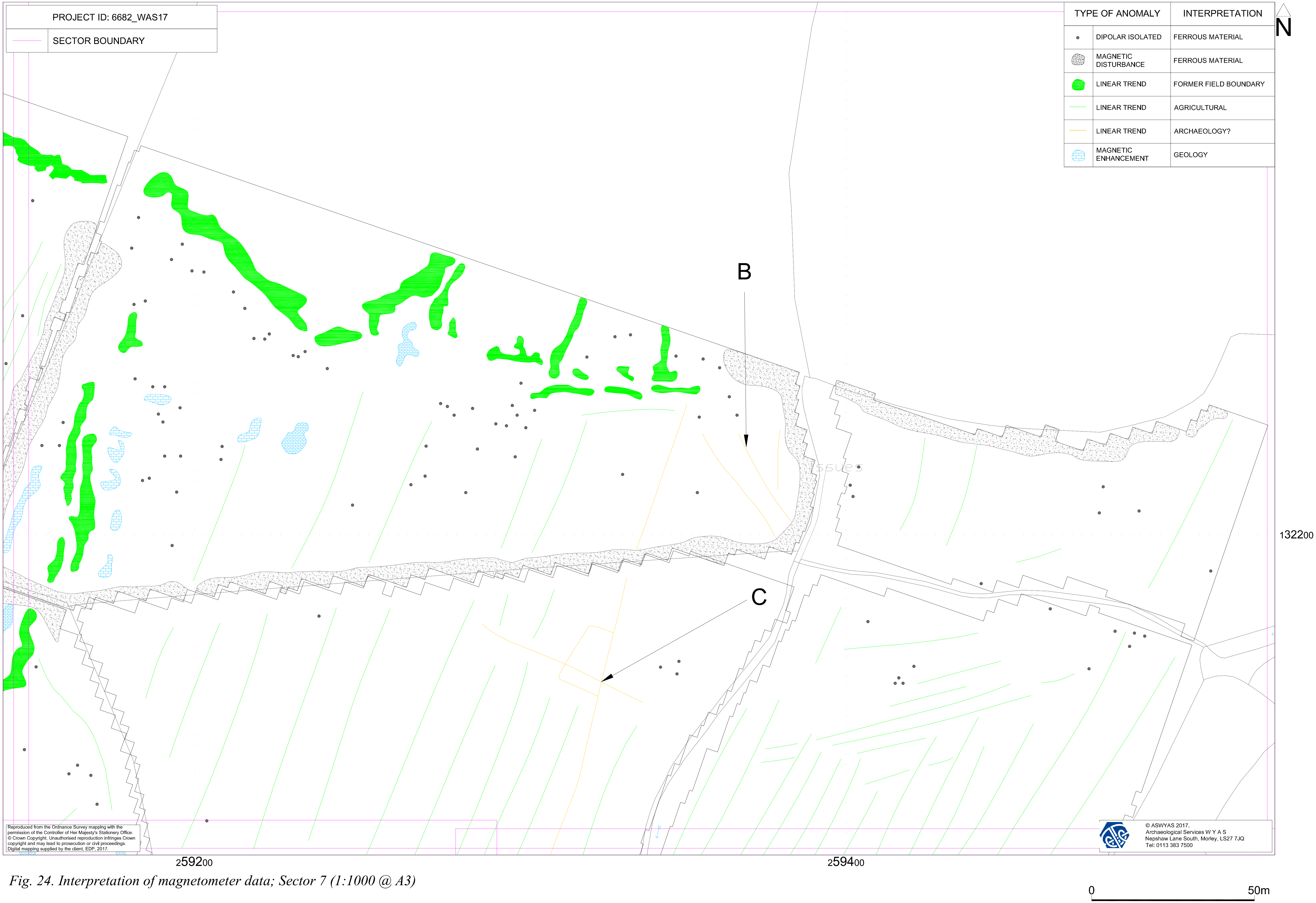

Fig. 24. Interpretation of magnetometer data; Sector 7 (1:1000 @ A3)

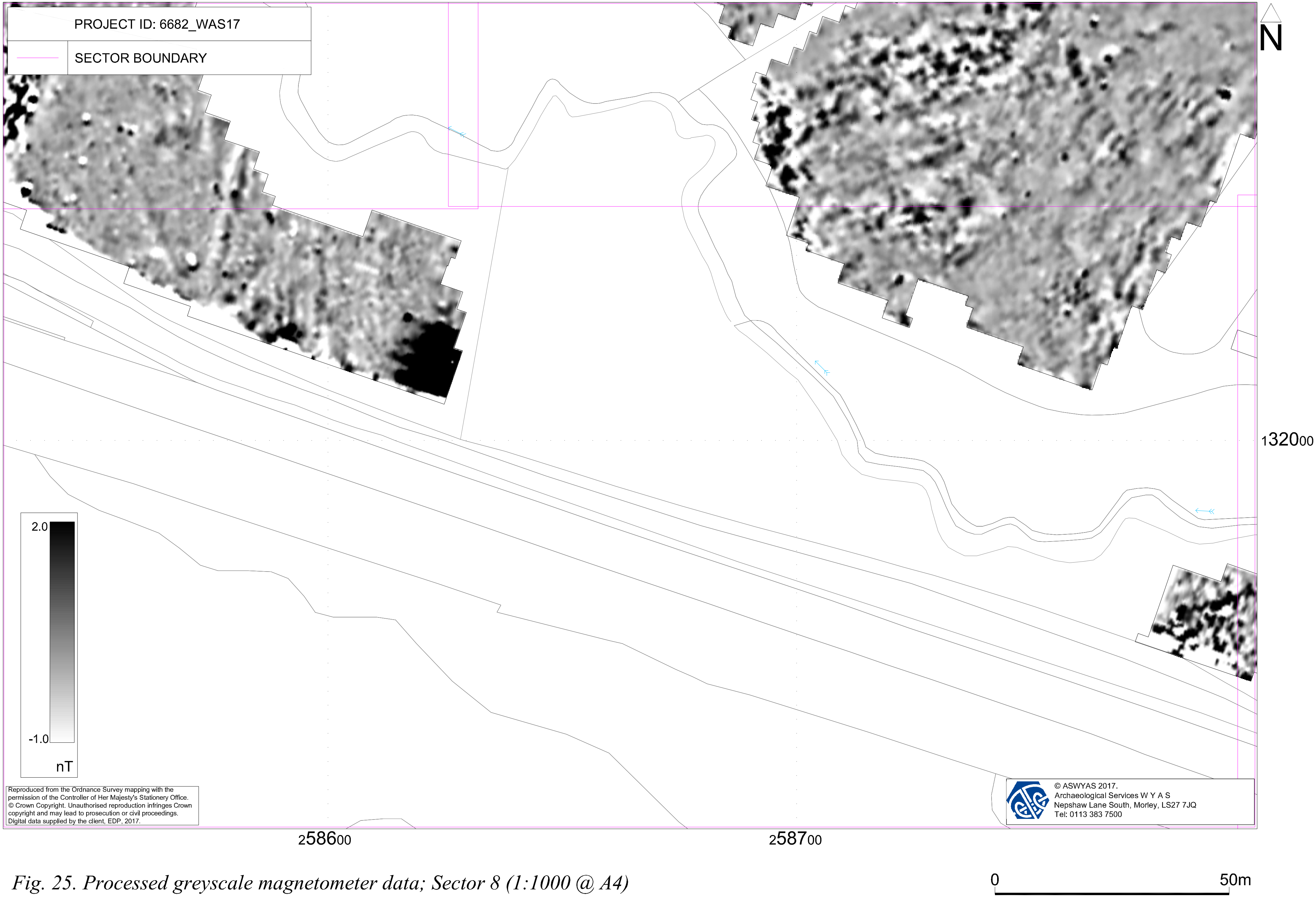

Fig. 25. Processed greyscale magnetometer data; Sector 8 (1:1000 @ A4)

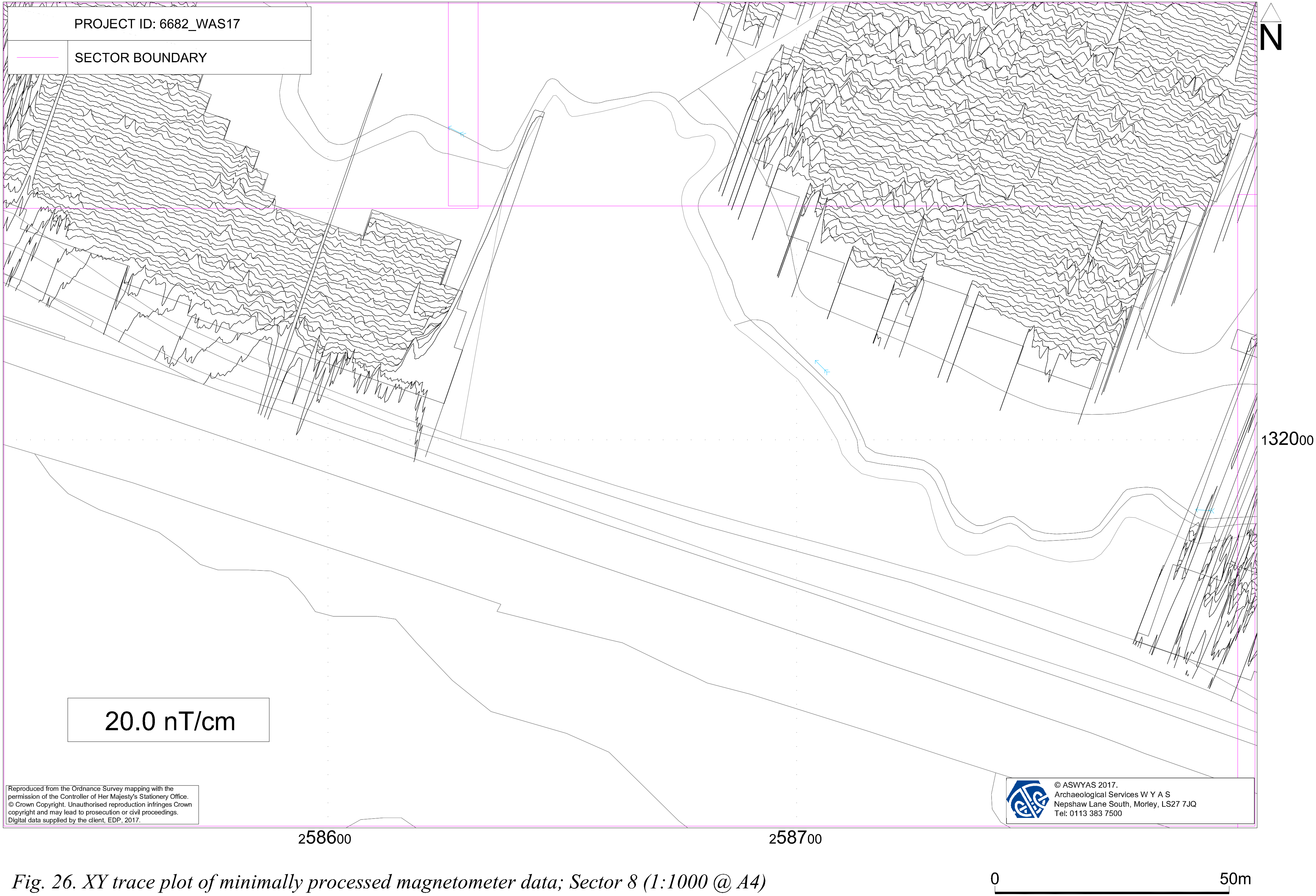

Fig. 26. XY trace plot of minimally processed magnetometer data; Sector 8 (1:1000 @ A4)

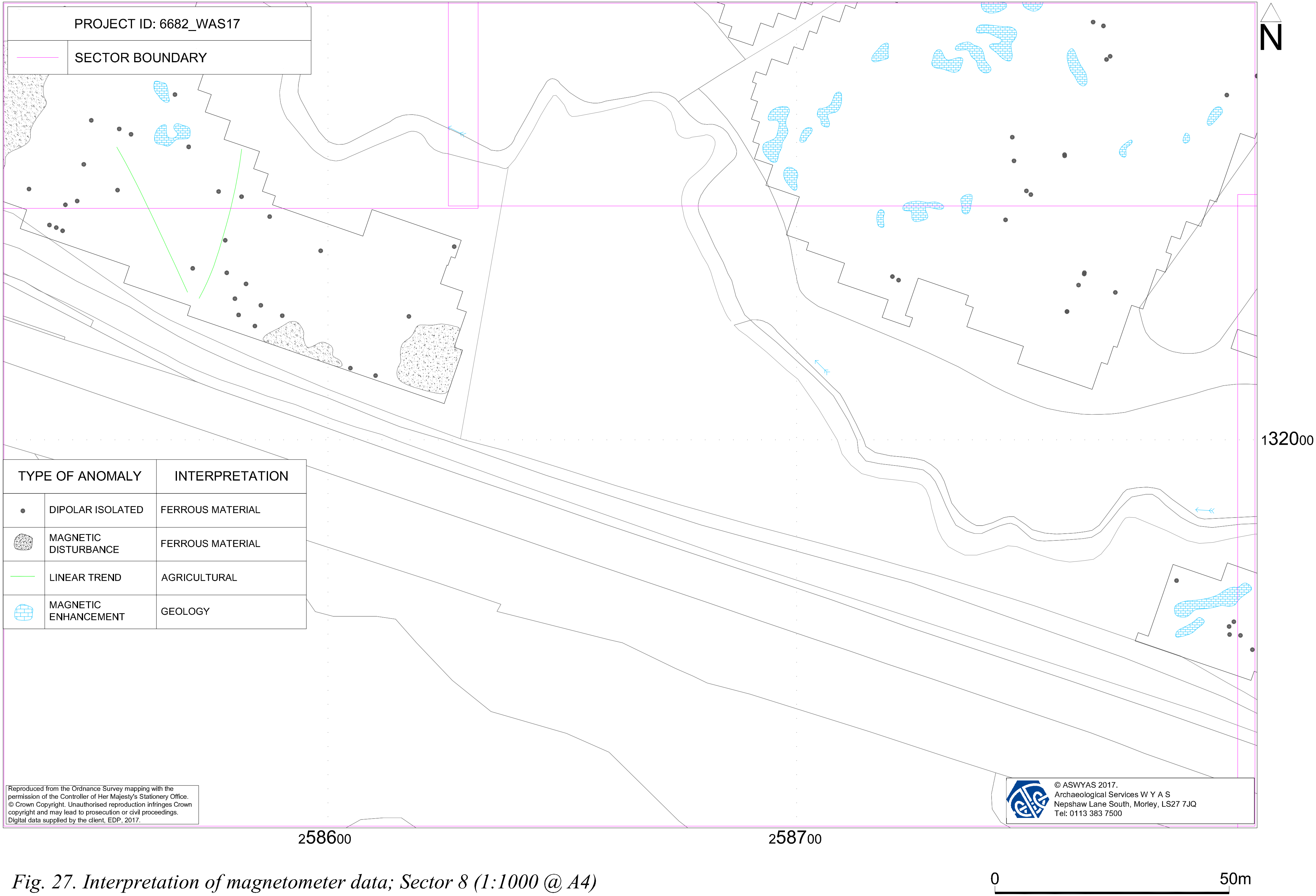

Fig. 27. Interpretation of magnetometer data; Sector 8 (1:1000 @ A4)

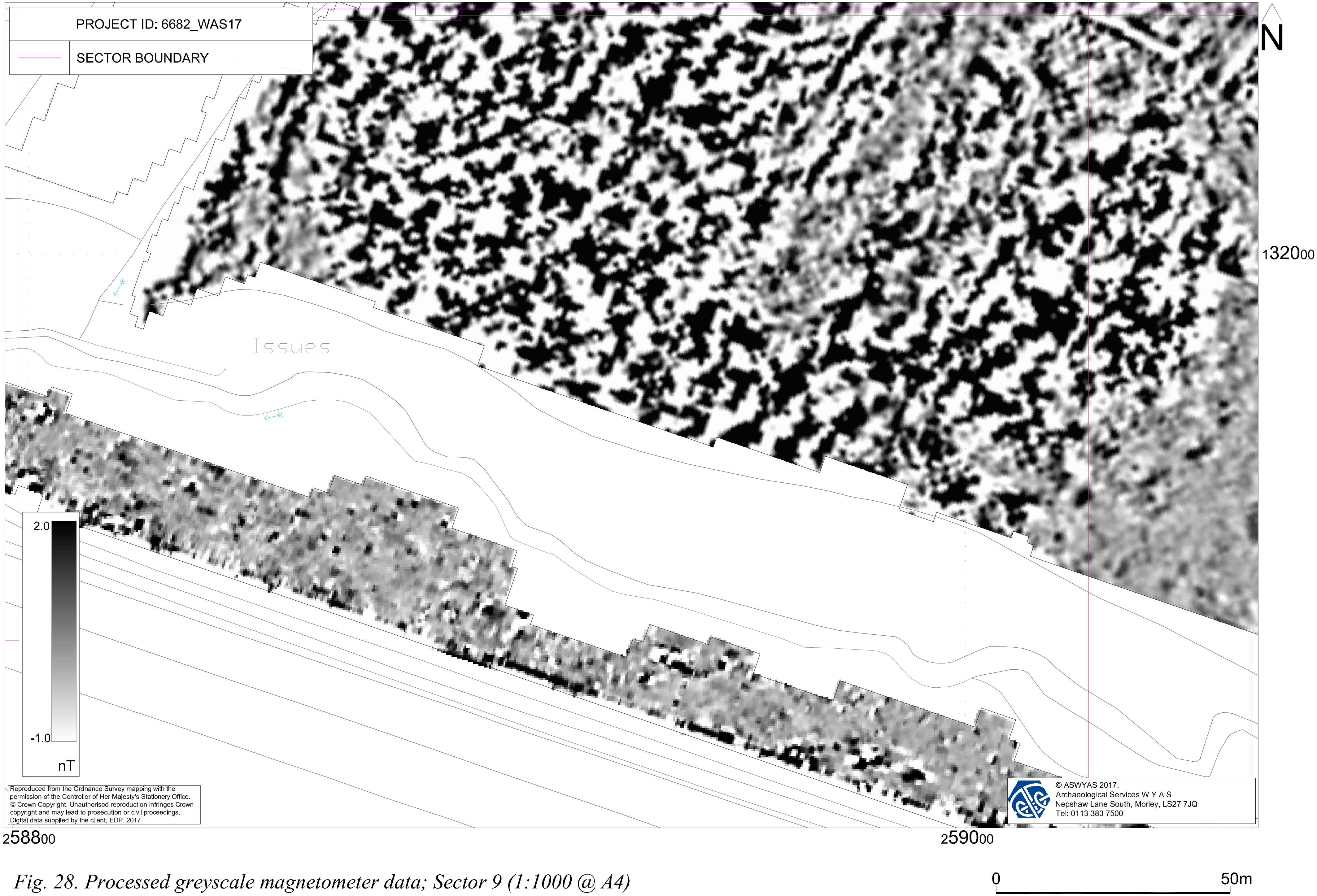

Fig. 28. Processed greyscale magnetometer data; Sector 9 (1:1000 @ A4)

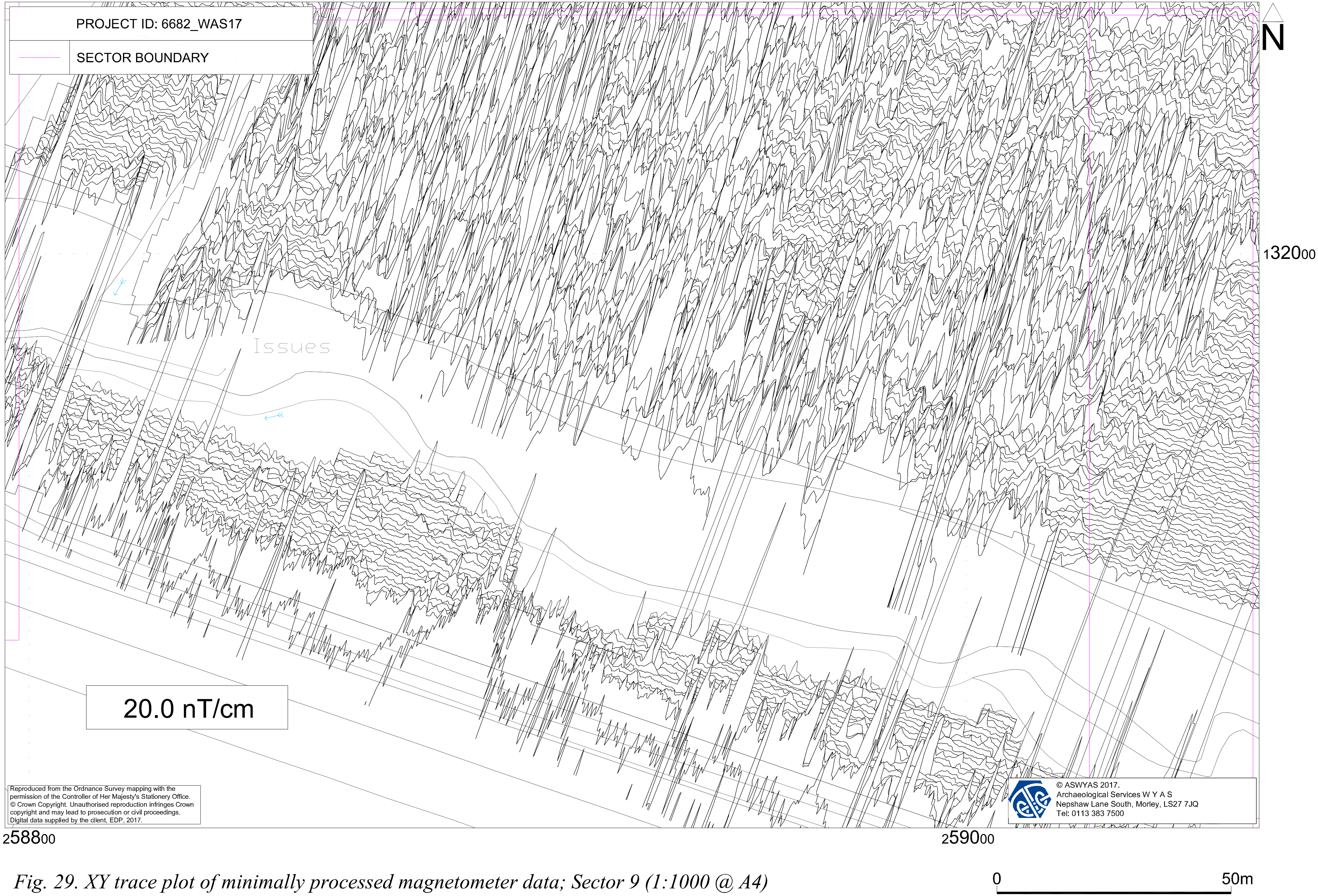

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Fig. 29. XY trace plot of minimally processed magnetometer data; Sector 9 (1:1000 @ A4)

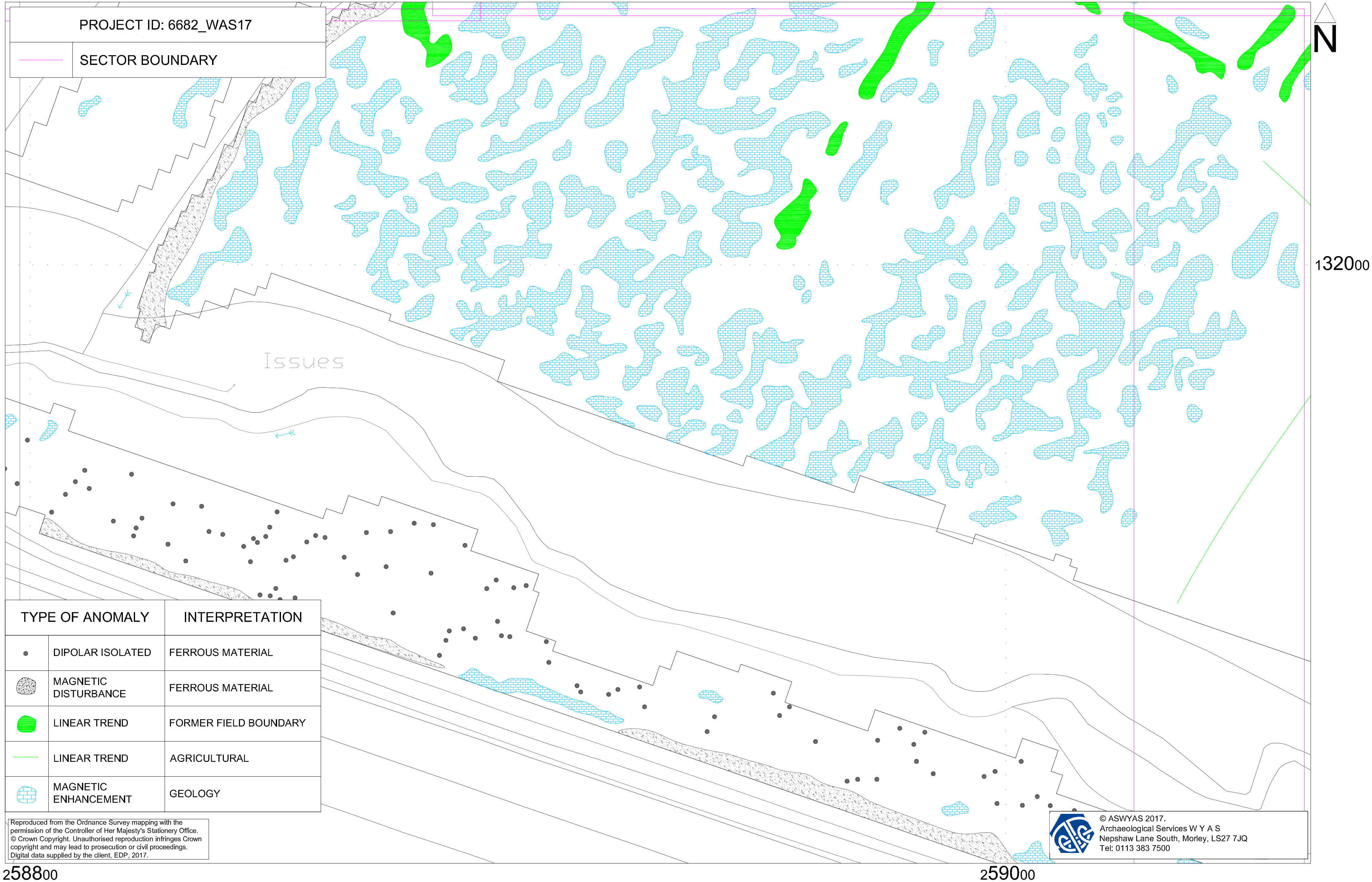

Fig. 30. Interpretation of magnetometer data; Sector 9 (1:1000 @ A4)

0 50m

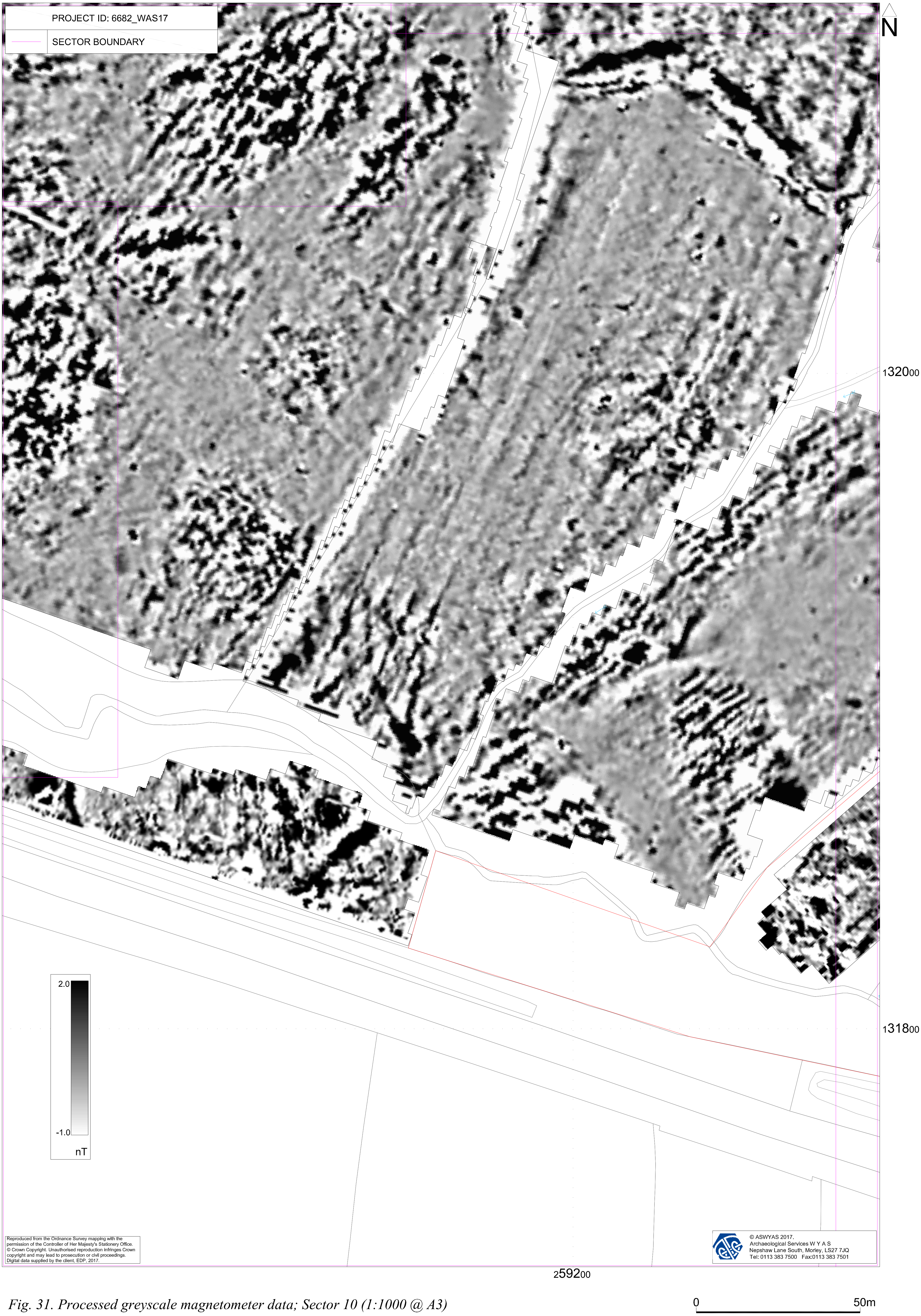

Fig. 31. Processed greyscale magnetometer data; Sector 10 (1:1000 @ A3)

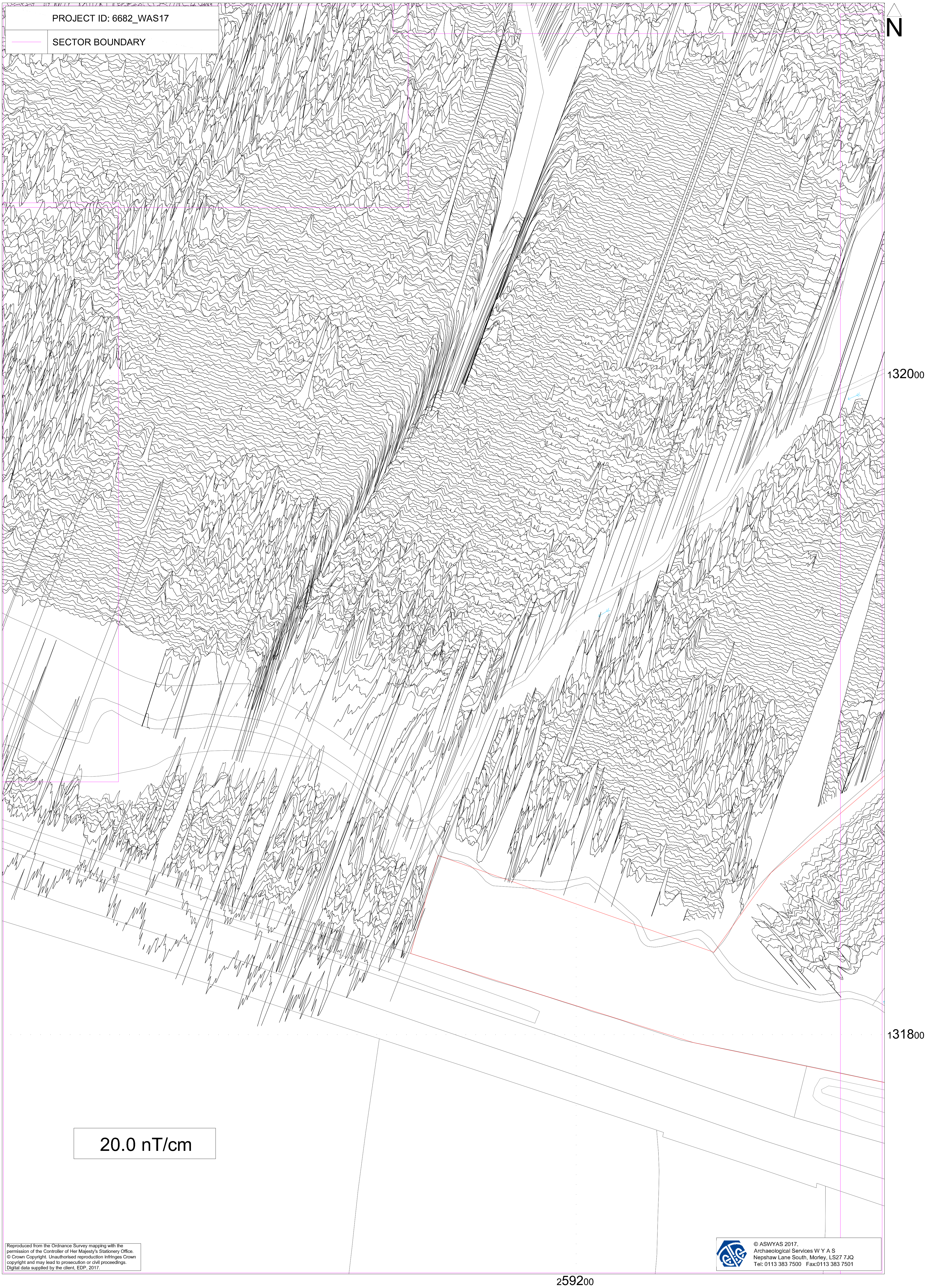

Fig. 32. XY trace plot of minimally processed magnetometer data; Sector 10 (1:1000 @ A3)

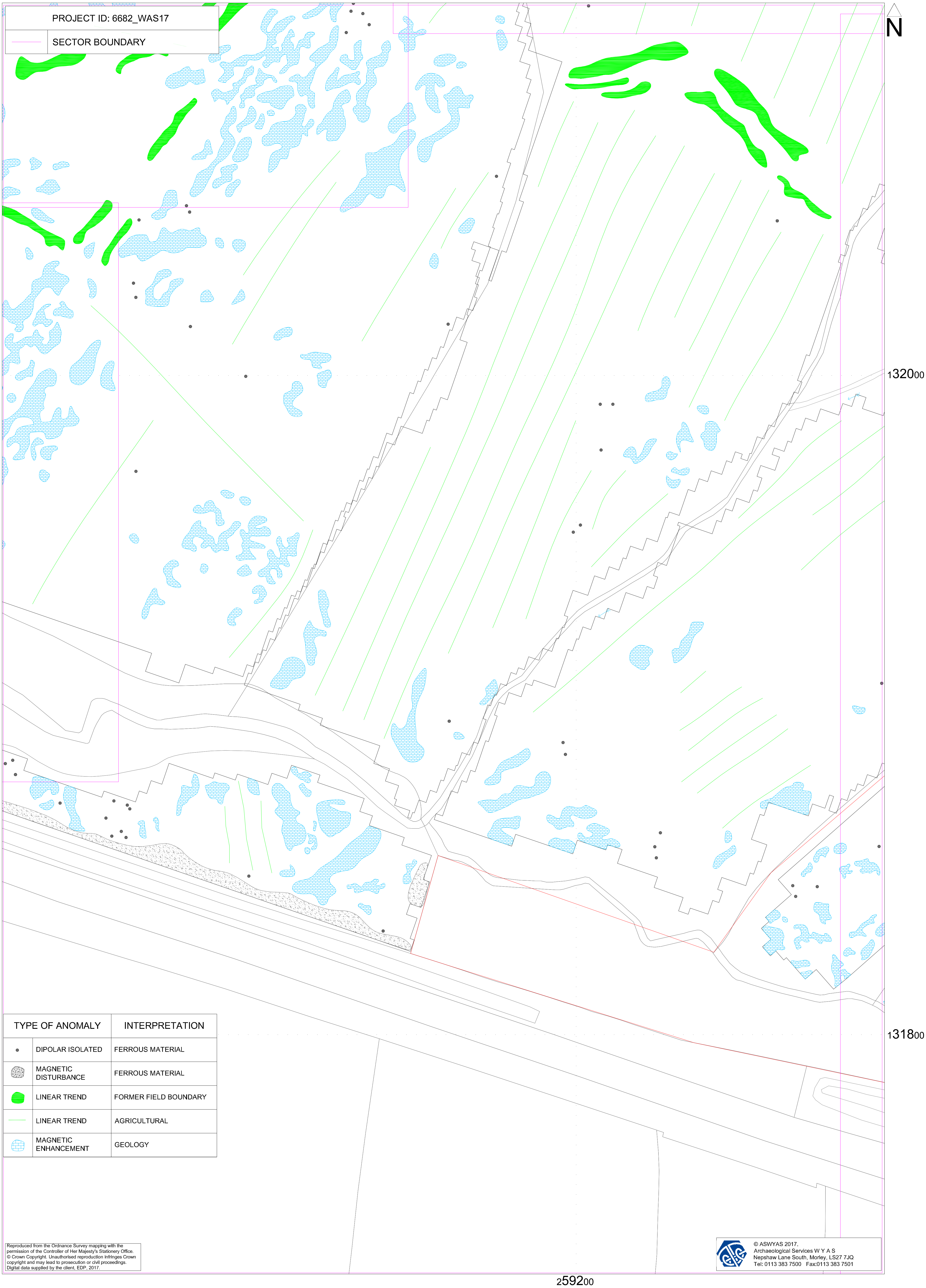

Fig. 33. Interpretation of magnetometer data; Sector 10 (1:1000 @ A3)

0 50m

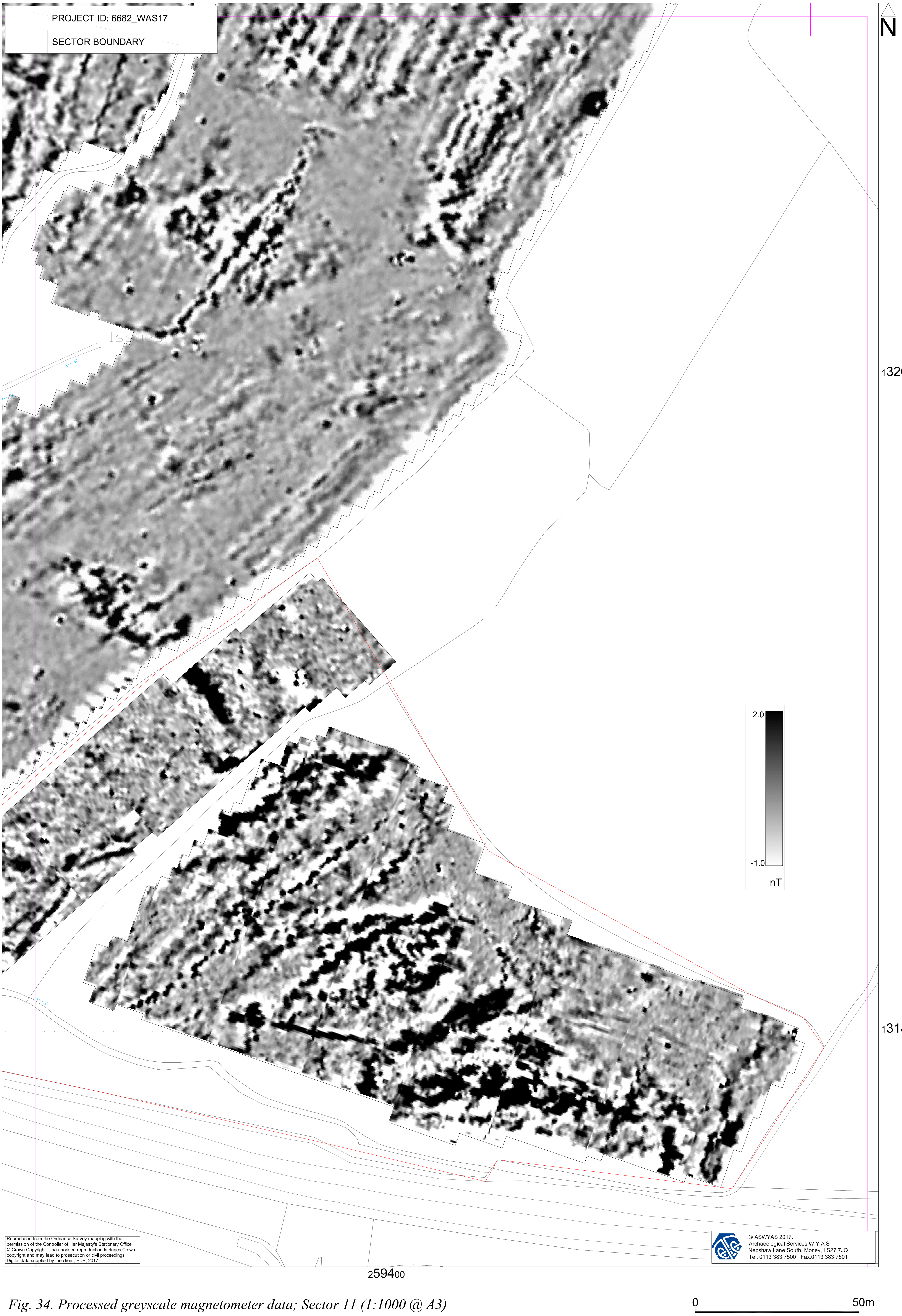

Fig. 34. Processed greyscale magnetometer data; Sector 11 (1:1000 @ A3)

Fig. 35. XY trace plot of minimally processed magnetometer data; Sector 11 (1:1000 @ A3)

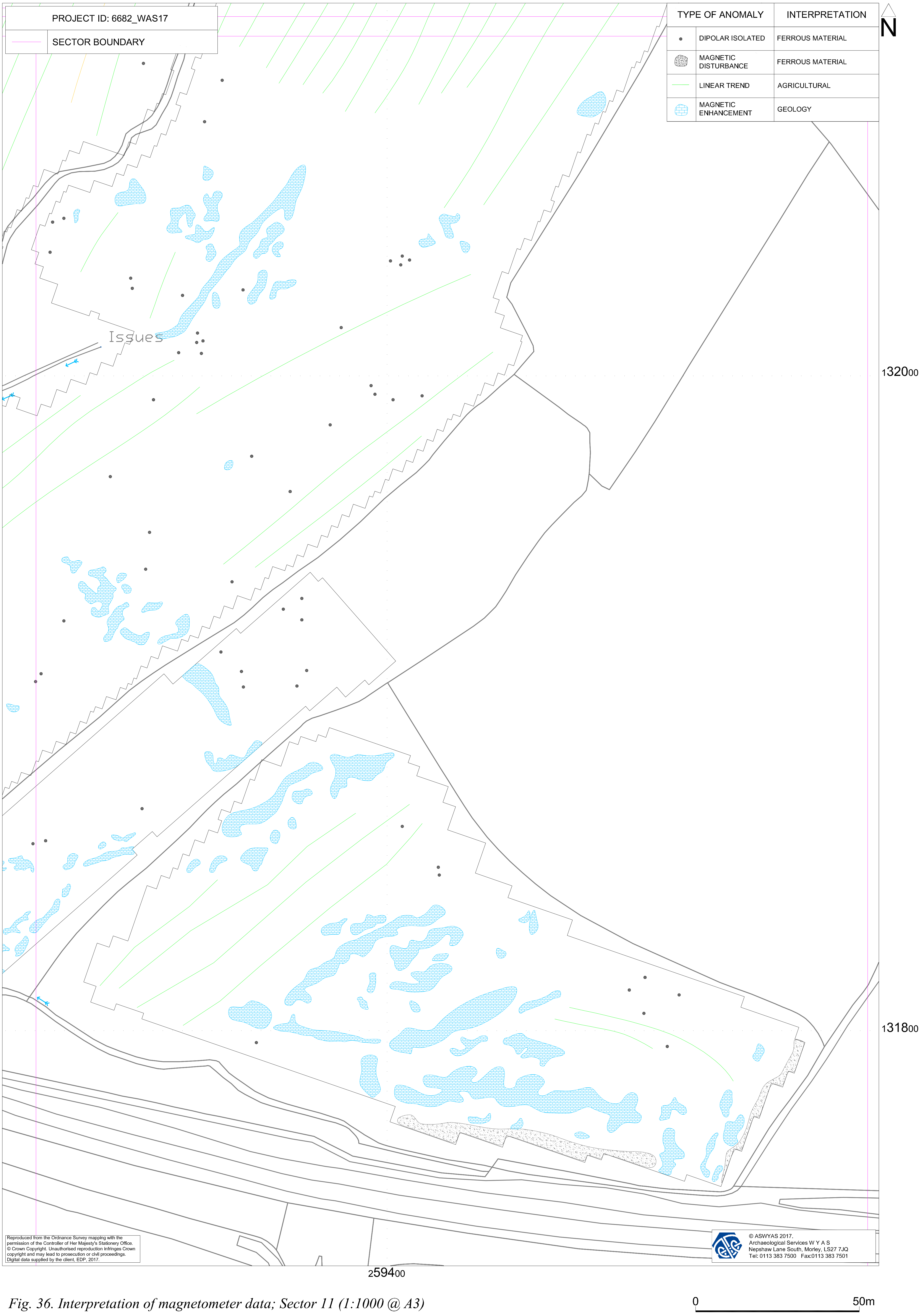

Fig. 36. Interpretation of magnetometer data; Sector 11 (1:1000 @ A3)


Plate 1. General overview of Area 1, facing south


Plate 2. General overview of Area 3, facing southwest


Plate 3. General overview of Area 5, facing southwest


Plate 4. General overview of Area 6, facing south

Plate 5. General overview of Areas 7 and 9, facing southwest

Plate 6. General overview of Areas 7, 8, 9 and 10, facing south

Plate 7. General overview of Areas 8, 10 and 14, facing southeast

Plate 8. General overview of Area 19, facing northeast

Plate 9. General overview of Area 20, facing east

Plate 10. General overview of Areas 11 and 12, facing east

Plate 11. General overview of Area 17, facing northeast

Plate 12. General overview of Area 18, facing 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. Areas of human occupation or settlement can then be identified by measuring the magnetic susceptibility of the topsoil because 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.

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 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: Gradiometer Survey

The main method of using the fluxgate gradiometer for commercial evaluations is referred to as ***detailed survey*** and requires the surveyor to walk at an even pace carrying the instrument within a grid system. A sample trigger automatically takes readings at predetermined points, typically at 0.25m intervals, on traverses 1m apart. These readings are stored in the memory of the instrument and are later dumped to computer for processing and interpretation.

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 0.5m 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.

The gradiometer data have been presented in this report in processed greyscale format. The data in the greyscale images have 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.

Appendix 2: Survey location information

An initial survey station was established using a Trimble VRS differential Global Positioning System (Trimble R6 model). The data was geo-referenced using the geo-referenced survey station with a Trimble RTK differential Global Positioning System (Trimble R6 model). The accuracy of this equipment is better than 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 Devon Historic Environment Record).

Appendix 4: Oasis form

OASIS DATA COLLECTION FORM: England

List of Projects | Manage Projects | Search Projects | New project | Change your details | HER coverage | Change country | Log out

Printable version

OASIS ID: archaeol11-295473

Project details

Project name	Westacott, Barnstaple, Devon
Short description of the project	A geophysical (magnetometer) survey, was undertaken on approximately 55 hectares of land located to the east of Westcott, Barnstaple, Devon. Archaeological responses have been detected predominantly in the northwest of the survey area. Most notably a rectilinear enclosures. Responses that have been interpreted as possible archaeology have also been detected in the northeast of the survey area. Agricultural trends can be seen throughout the survey area in the form of ploughing, field drains and former field boundaries. Heightened magnetic responses across the central portion of the survey area suggest disturbance to the geology resulting from the 20th century woodland clearance. Across the site ferrous anomalies have been identified. Therefore, based on the results and interpretation of the data, the archaeological potential lies predominantly in the northwest of the survey area, but low across the remainder of the site.
Project dates	Start: 01-06-2017 End: 07-07-2017
Previous/future work	Not known / Not known
Any associated project reference codes	WAC17 - Sitecode
Type of project	Field evaluation
Site status	None
Current Land use	Cultivated Land 4 - Character Undetermined
Monument type	ENCLOSURE Uncertain
Monument type	N/A None
Significant Finds	N/A None
Significant Finds	N/A None
Methods & techniques	"Geophysical Survey"
Development type	Not recorded
Prompt	Planning condition
Position in the planning process	Not known / Not recorded
Solid geology	TRIASSIC MUDSTONES

Drift geology	GLACIAL SAND AND GRAVEL
Techniques	Magnetometry

Project location

Country	England
Site location	DEVON NORTH DEVON BARNSTAPLE Westacott, Barnstaple
Postcode	EX32 0LD
Study area	55 Hectares
Site coordinates	SS 58995 32246 51.071645654209 -4.012870877556 51 04 17 N 004 00 46 W Point
Height OD / Depth	Min: 43m Max: 83m

Project creators

Name of Organisation	Archaeological Services WYAS
Project brief originator	Environmental Dimension Partnership
Project design originator	Environmental Dimension Partnership
Project director/manager	C. Sykes
Project supervisor	B Goulding
Type of sponsor/funding body	Developer

Project archives

Physical Archive Exists?	No
Digital Archive recipient	ASWYAS
Digital Contents	"none"
Digital Media available	"Geophysics","Images raster / digital photography","Text"
Paper Archive Exists?	No

Project bibliography 1

Publication type	Grey literature (unpublished document/manuscript)
Title	Westacott, Barnstaple, Devon
Author(s)/Editor(s)	Trace, A
Date	2017
Issuer or publisher	ASWYAS
	Leeds

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