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**Slyer's Lane Windfarm
Puddletown
Dorset**

Geophysical Survey

Report no. 2729

March 2015

Client: Headland Archaeology Ltd



Slyer's Lane Windfarm
Puddletown
Dorchester
Dorset

Geophysical Survey

Summary

A geophysical (magnetometer) survey covering approximately 14 hectares was carried out on land bordering Slyer's Lane, near Dorchester in advance of the proposed development of the site for a six turbine windfarm. Anomalies indicative of sub-surface archaeological remains have been identified although there is little obvious correlation between the previously identified cropmarks, which are mostly in areas where there are no superficial deposits, and the recorded magnetic anomalies. A small enclosure, possible round barrow and at least two linear ditch type features have been identified. Throughout the site the data is dominated by anomalies due to variation in the superficial deposits. On the basis of the survey the archaeological potential of the overall scheme is assessed as low but locally moderate to high.



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Report Information

Client: Headland Archaeology
 Address: Unit 1, Premier Business Park, Faraday Road, Hereford, HR4 9NZ
 Report Type: Geophysical Survey
 Location: Slyer's Lane
 County: Dorset
 Grid Reference: SY 705 935 centred
 Period(s) of activity: prehistoric?
 Report Number: 2729
 Project Number: 4375
 Site Code: SLD15
 OASIS ID: archaeol11- 205578
 Planning Application No.: pre-application
 Museum Accession No.: n/a
 Date of fieldwork: February - March 2015
 Date of report: March 2015
 Project Management: Sam Harrison BSc MSc MCIfA
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 Research: n/a

Authorisation for distribution: -----



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1 Introduction

Archaeological Services WYAS (ASWYAS) were commissioned by Mike Kimber of Headland Archaeology (the Client), to undertake a geophysical (magnetometer) survey on land to the west of Slyer's Lane, Dorset (see Fig. 1), prior to the submission of a planning application for the proposed development of the site for a six turbine windfarm. The work was undertaken in accordance with a Project Design (Harrison 2015) agreed with the Client and with Dorset County Council, with guidance within the National Planning Policy Framework (DCLG 2012) and in line with current best practice (David *et al.* 2008). The survey was carried out between February 24th and March 4th 2015 in order to provide additional information on the archaeological potential of the site.

Site location, topography and land-use

The Proposed Development Area (PDA), extends 1.5 km from SY 706 929, on Slyer's Lane to the south, to SY 699 944 at Three Cornered Coppice in the north. The survey areas covered approximately 14 hectares of arable farmland (see plates) comprising 30m wide linear corridors which will be used for access trackways and cabling, and rectilinear blocks that will be used as lay-down and crane hard standing areas and the turbine locations (see Fig. 2).

The PDA is undulating (see plates) ranging from approximately 80m above Ordnance Datum (aOD), at Slyer's Lane, to about 100m aOD at Three Cornered Coppice.

Soils and geology

The underlying bedrock comprises chalk of the Tarrant, Spetisbury and Portsdown Chalk Formations which are overlain by superficial deposits of Clay with Flints Formation (clay, silt, sand and gravel) over much of the site (see Fig. 3). Three narrow bands of Head (clay, silt, sand and gravel) are also recorded.

The soils are classified in the Charity 1 association, described as well-drained fine silts over clayey soils, locally very flinty (Soil Survey of England and Wales 1983).

2 Archaeological Background

The PDA is located within a landscape of high archaeological potential as evidenced by the cropmark data (see Figs. 2 and 3) recorded both within the site boundary and the wider search area included for the brief for the desk-based assessment (Headland 2015). There is a noticeable reduction in cropmarks in the southern half of the application area which may be due to the presence of superficial deposits.

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 any proposed 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 available parts of the PDA was carried out.

The general archaeological 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 (1:7500) location plan displaying the processed greyscale magnetometer data and Figure 3 shows an overall interpretation of the data at the a scale of 1:4000. Detailed data plots ('raw' and processed) and an interpretative figures are presented at a scale of 1:1000 in Figures 4 to 24 inclusive.

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

The survey methodology, report and any recommendations comply with the Project Design (Harrison 2015) and guidelines outlined by English Heritage (David *et al.* 2008) and by the Chartered Institute for Archaeologists (CIfA 2013). 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 (Figs 4 to 24 inclusive)

Overview

The magnetic background varies enormously across the site and a large number of geological anomalies have been identified. These are due to the presence of superficial deposits of Head and Clay with Flints over large parts of the survey area (see Fig. 2). Where there are no overlying deposits the magnetic background is relatively quiet. Even against this variable background a few non-geological anomalies stand out, including some of archaeological potential, and these are described by category below.

Ferrous/Modern Anomalies

Ferrous anomalies, as individual 'spikes', are typically caused by ferrous (magnetic) material, either on the ground surface or in the plough-soil. Little importance is normally given to such anomalies, unless there is any supporting evidence for an archaeological interpretation, as modern ferrous debris or material is common on most sites, often being present as a consequence of manuring or tipping/infilling. There is no obvious pattern or clustering to their distribution to suggest anything other than a random background scatter of ferrous debris in the plough-soil.

Four linear dipolar anomalies, **A**, **B**, **C**, and **D** are identified across the site. These anomalies are due to sub-surface pipes and drains.

Agricultural Anomalies

A former field boundary is identified as a linear anomaly, **E**, aligned north-west/south-east just to the north of T3. Parallel linear anomalies immediately north of the former boundary on the same alignment reflect the direction of recent ploughing/cultivation.

To the south in T3 east/west aligned linear trends also reflect recent agricultural activity.

Geological Anomalies

Throughout the site numerous broad, low magnitude, amorphous anomalies have been identified. These anomalies reflect variation within the Clay with Flints Formation superficial deposits of clay, silt, sand and gravel which are present across the majority of the survey areas (see Fig. 2). Three narrow bands of Head, also comprised of clay, silt, sand and gravel, underlie parts of the survey area but it is less easy to discern any variation in the magnetic background at these locations. The areas surveyed around T3, T4 and T5 are almost wholly

over the Clay with Flints deposits and no anomalies other than those due to the geology are recorded at these locations. It is uncertain whether the geological responses are sufficiently extensive and/or of such magnitude that they would mask any weaker responses from sub-surface archaeological features, if present. It is worth noting that the majority of the cropmarks are recorded where there are no superficial deposits and virtually none in the southern half of the site.

Archaeological Anomalies/Possible Archaeological Anomalies

At least three anomalies of archaeological potential have been recorded by the survey. At the T2 site linear anomalies forming three sides of small rectangular enclosure, **F**, are identified. A single linear anomaly, **G**, running north from the enclosure is also probably a soil-filled archaeological ditch. This latter feature correlates with a linear cropmark although the enclosure has not been recorded previously and several other cropmarks do not manifest as magnetic anomalies in the area around T2.

A linear anomalies, **H**, aligned south-west/north-east, just to the south-east of the T1 location does correspond with a recorded cropmark (see Fig. 3) and is probably also of archaeological potential.

Three other anomalies of possible archaeological potential are also identified. In the trackway to the north of T4 an L-shaped anomaly, **I**, may locate two sides of a second enclosure.

In the trackway to the north of T2 a clear circular anomaly, **J**, is recorded. This may locate the ploughed down remains of a burial mound; several circular cropmarks are also recorded to the east of the site. However, a small circular pond is located immediately to the north of T5 and so a more recent origin cannot be dismissed. Two discrete anomalies immediately to the east, **K**, may also be of archaeological potential.

A single discrete anomaly, **L**, has been interpreted as of possible archaeological potential based on its rectilinearity.

5 Conclusions

Although the data set is dominated by anomalies clearly due to variation in the superficial deposits which cover large parts of the survey area, anomalies of probable and possible archaeological potential have been identified in the northern part of the site, including at least one enclosure and a probable ditch running north from it. The remaining anomalies interpreted as of archaeological potential are less confidently interpreted as alternative causes may be equally plausible.

There does appear to be a poor correlation between the recorded cropmarks and the magnetic anomalies, even when there are no superficial deposits, and there is also no indication in the magnetic data of a former field boundary in the T1 area. These observations raise the

possibility that there may, in places, be underlying features which may not be easily identifiable by magnetometry under the prevailing pedological conditions. Nevertheless, whilst the geological anomalies are in places extensive and of relatively high magnitude it is considered unlikely that they will have masked the presence of any significant archaeological remains. Consequently, based solely on the results of the survey, the archaeological potential of the site is considered to be generally low and moderate to high locally.

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.

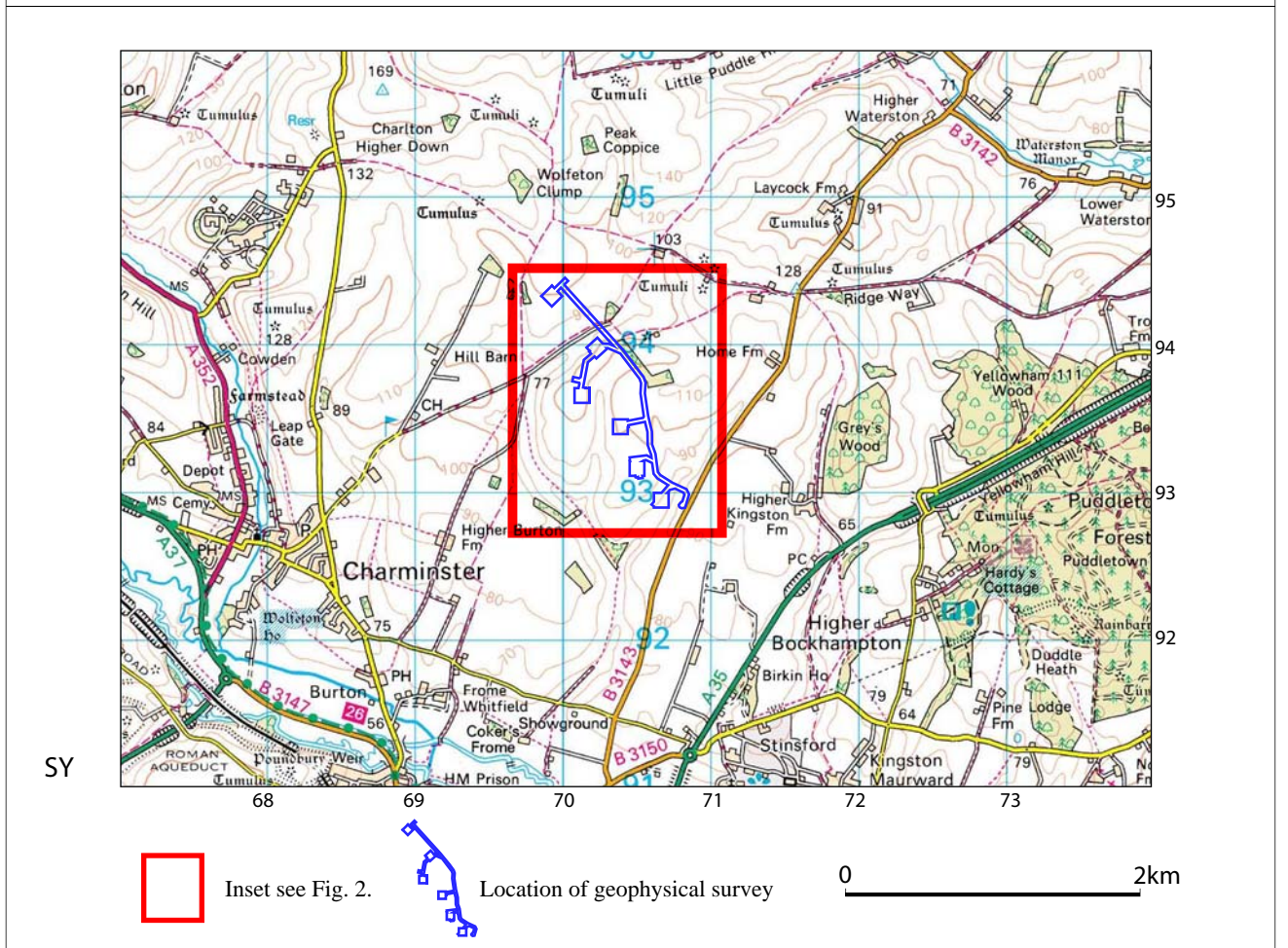
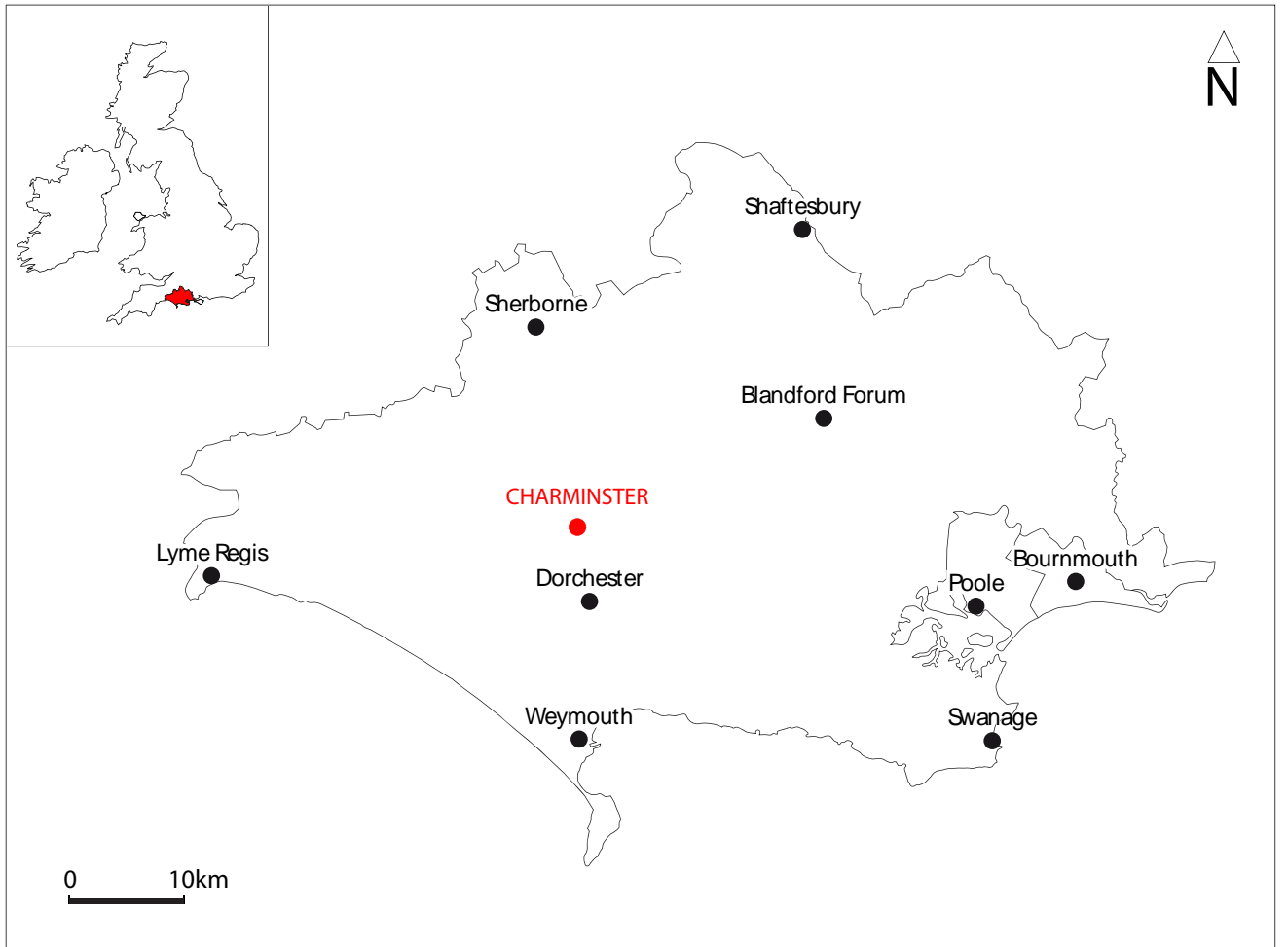


Fig. 1. Site location

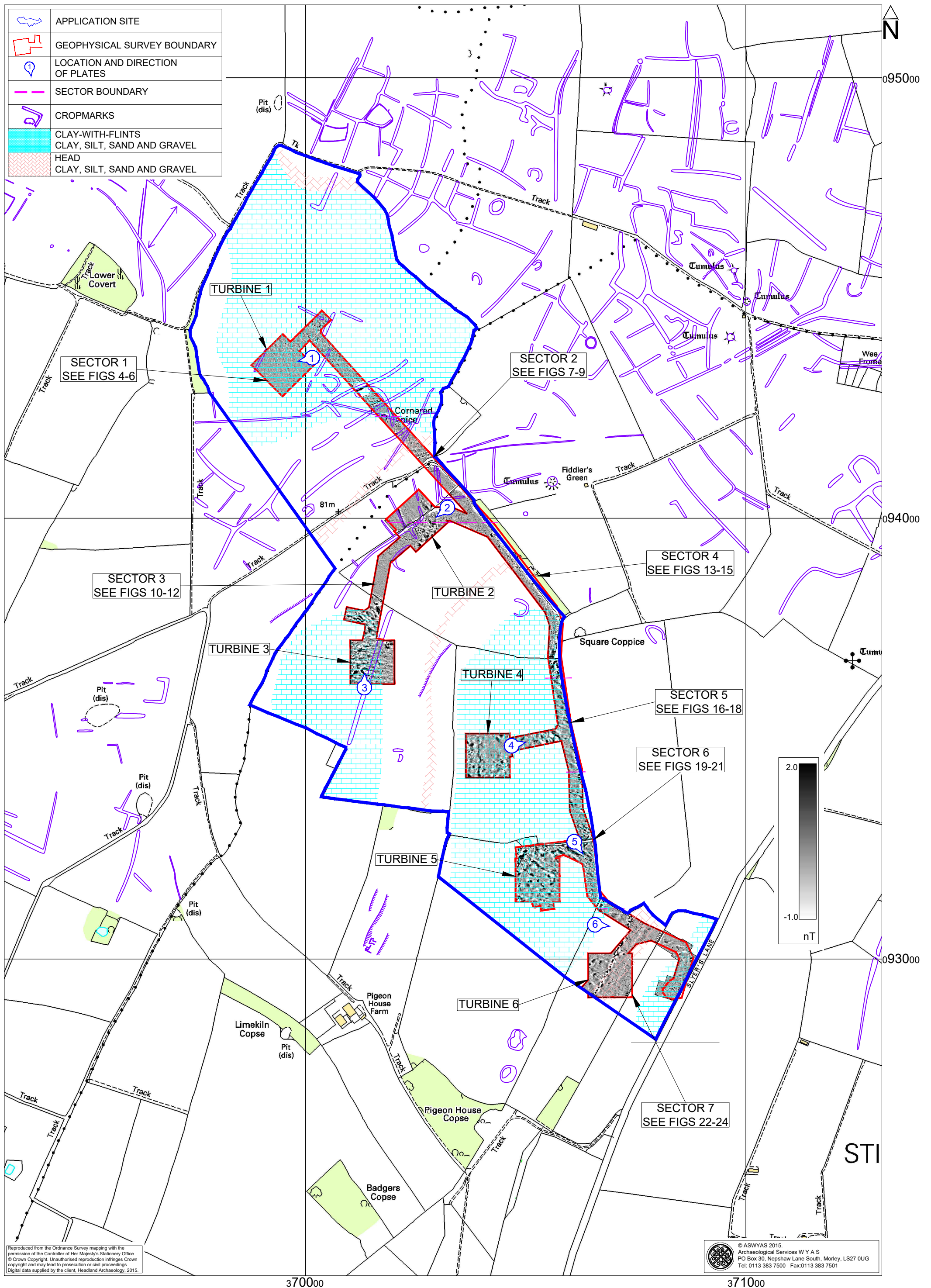


Fig. 2. Survey location showing superficial geology (after BGS 2015) and greyscale magnetometer data (1:7500 @ A3)

0 200m

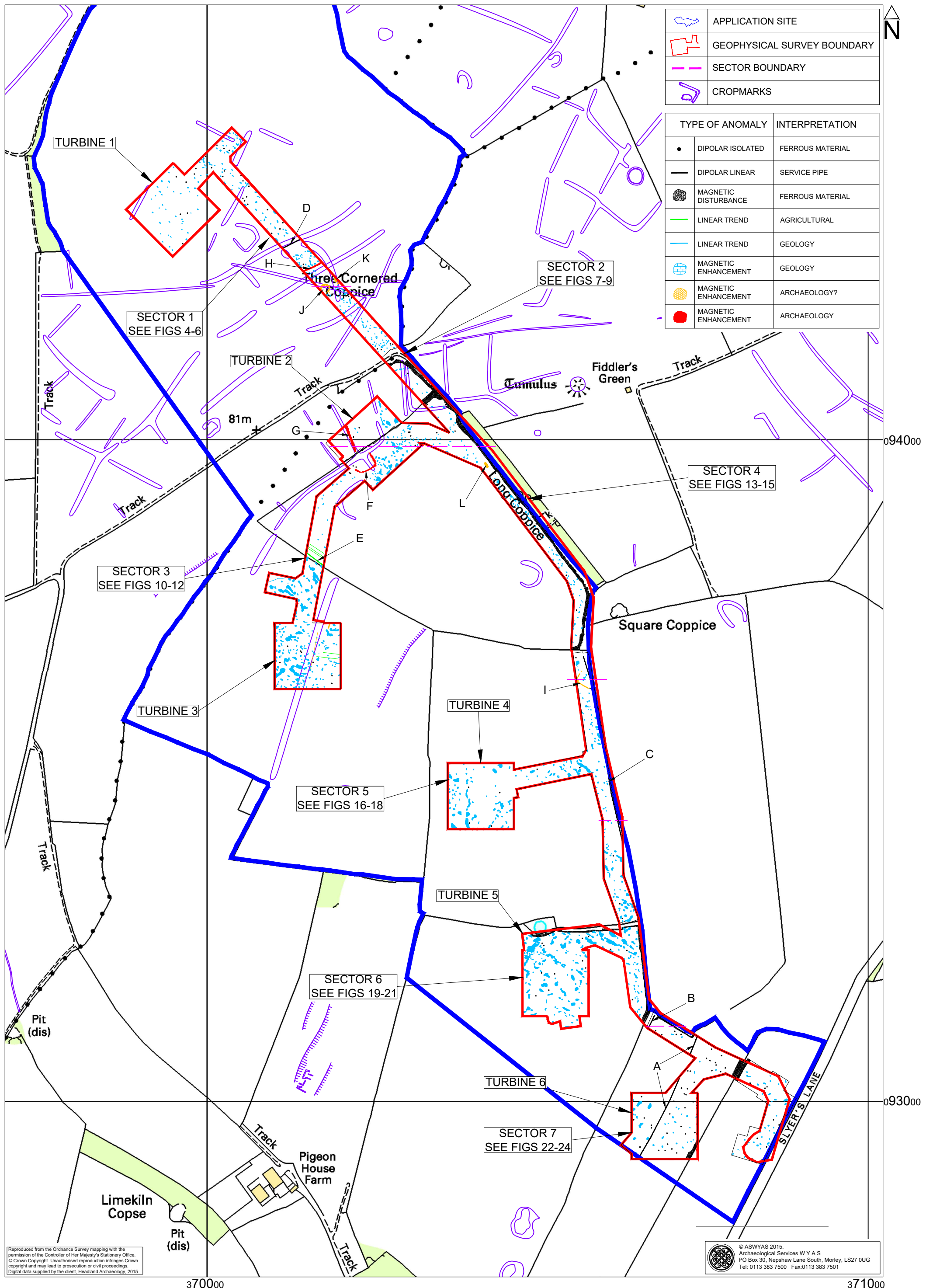


Fig. 3. Overall interpretation of magnetometer data (1:4000 @ A3)

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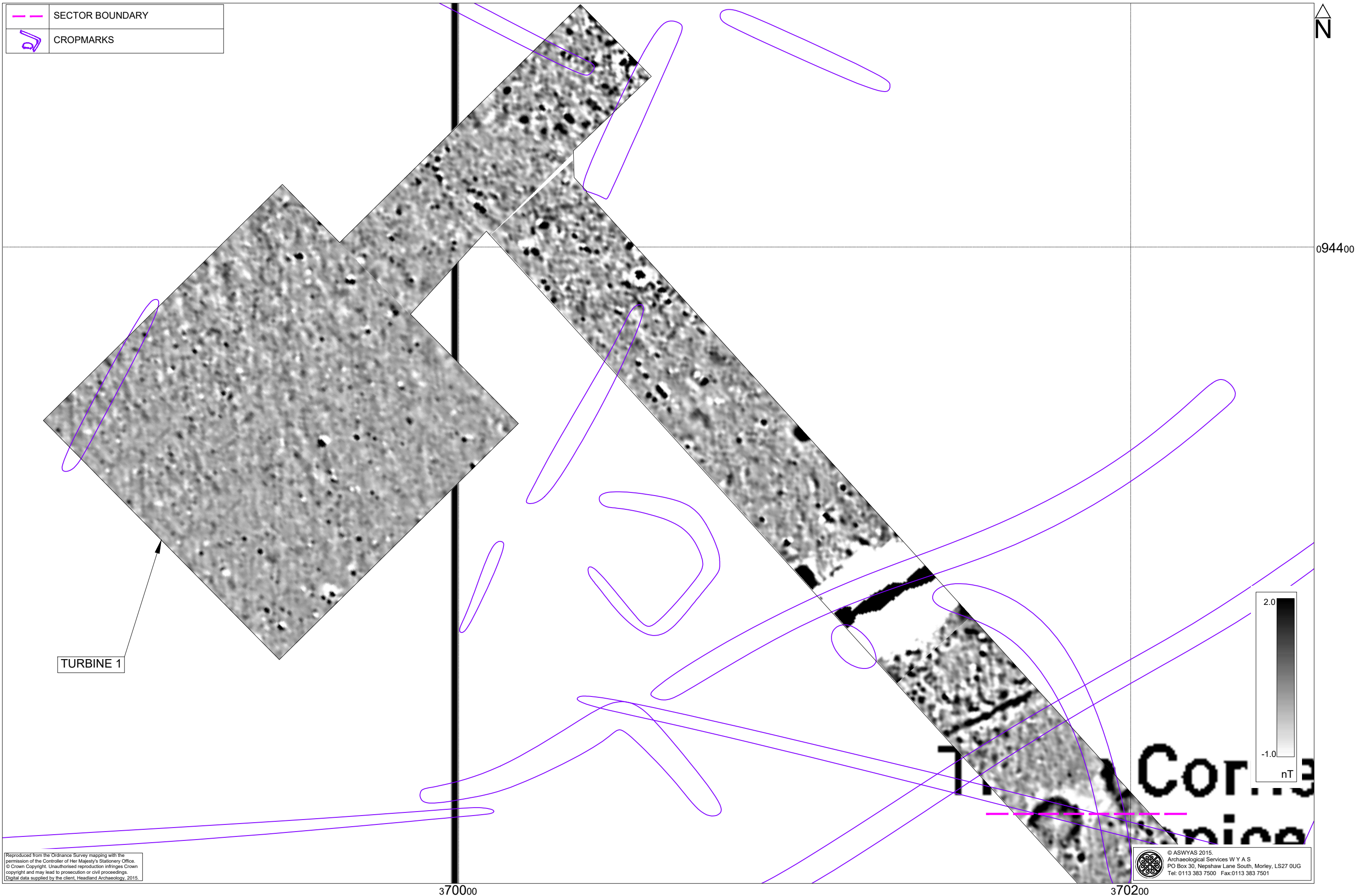


Fig. 4. Processed greyscale magnetometer data; Sector 1 (1:1000 @ A3)



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

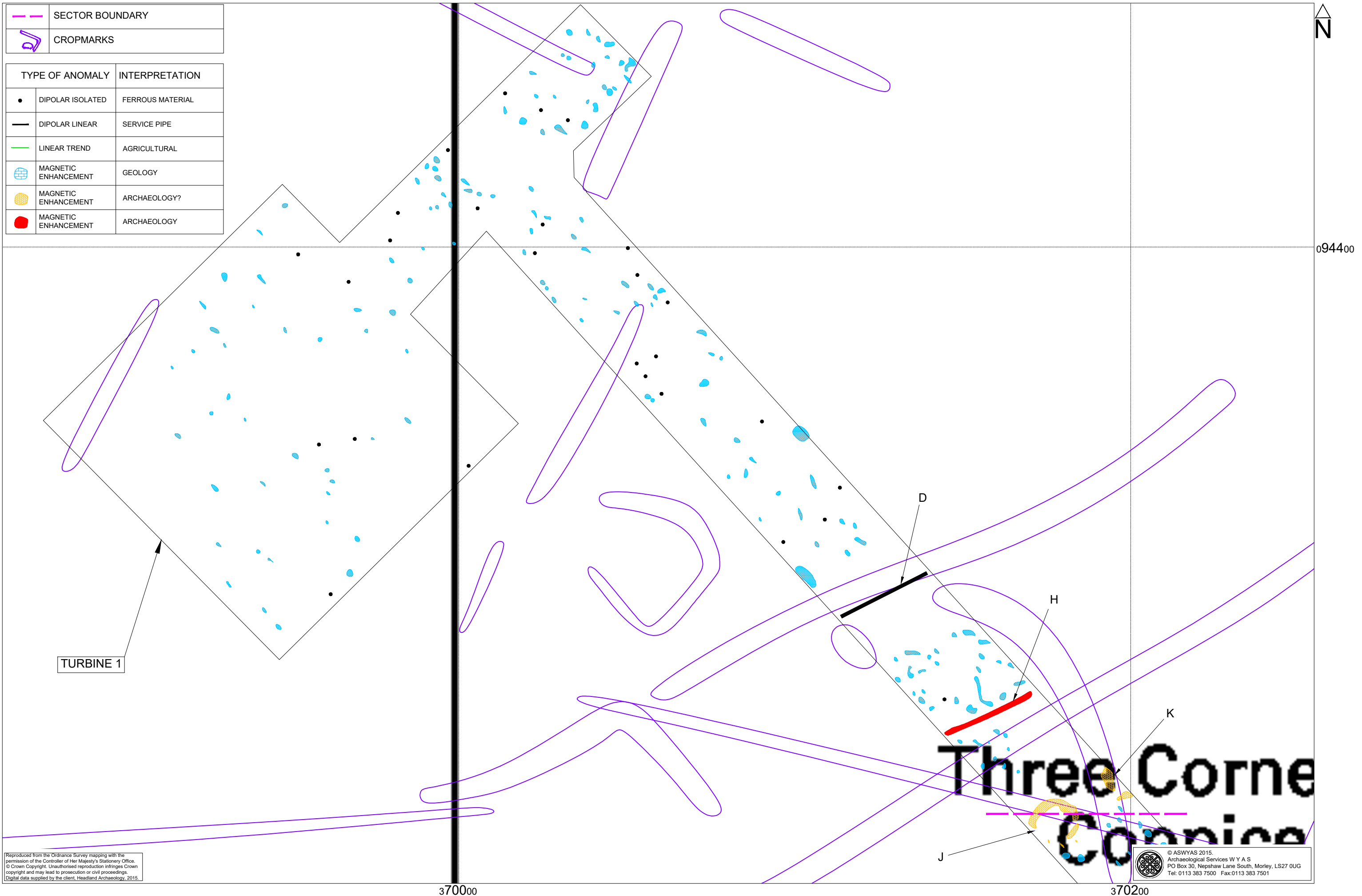




Fig. 6. Interpretation of magnetometer data; Sector 1 (1:1000 @ A3)

0 30m

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	SECTOR BOUNDARY
	CROPMARKS

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

0 30m

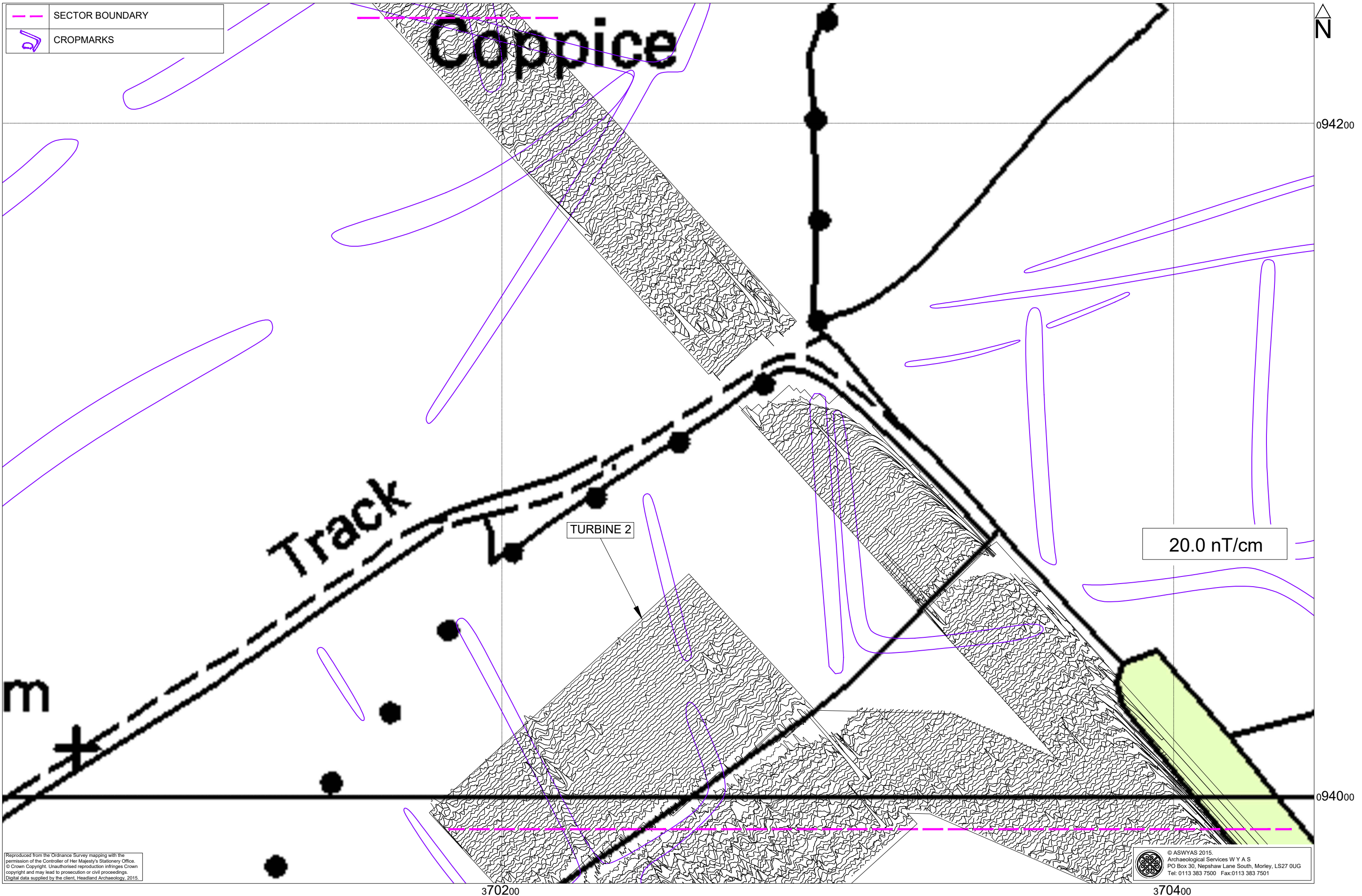


Fig. 8. XY trace plot of minimally processed magnetometer data; Sector 2 (1:1000 @ A3)

0 30m

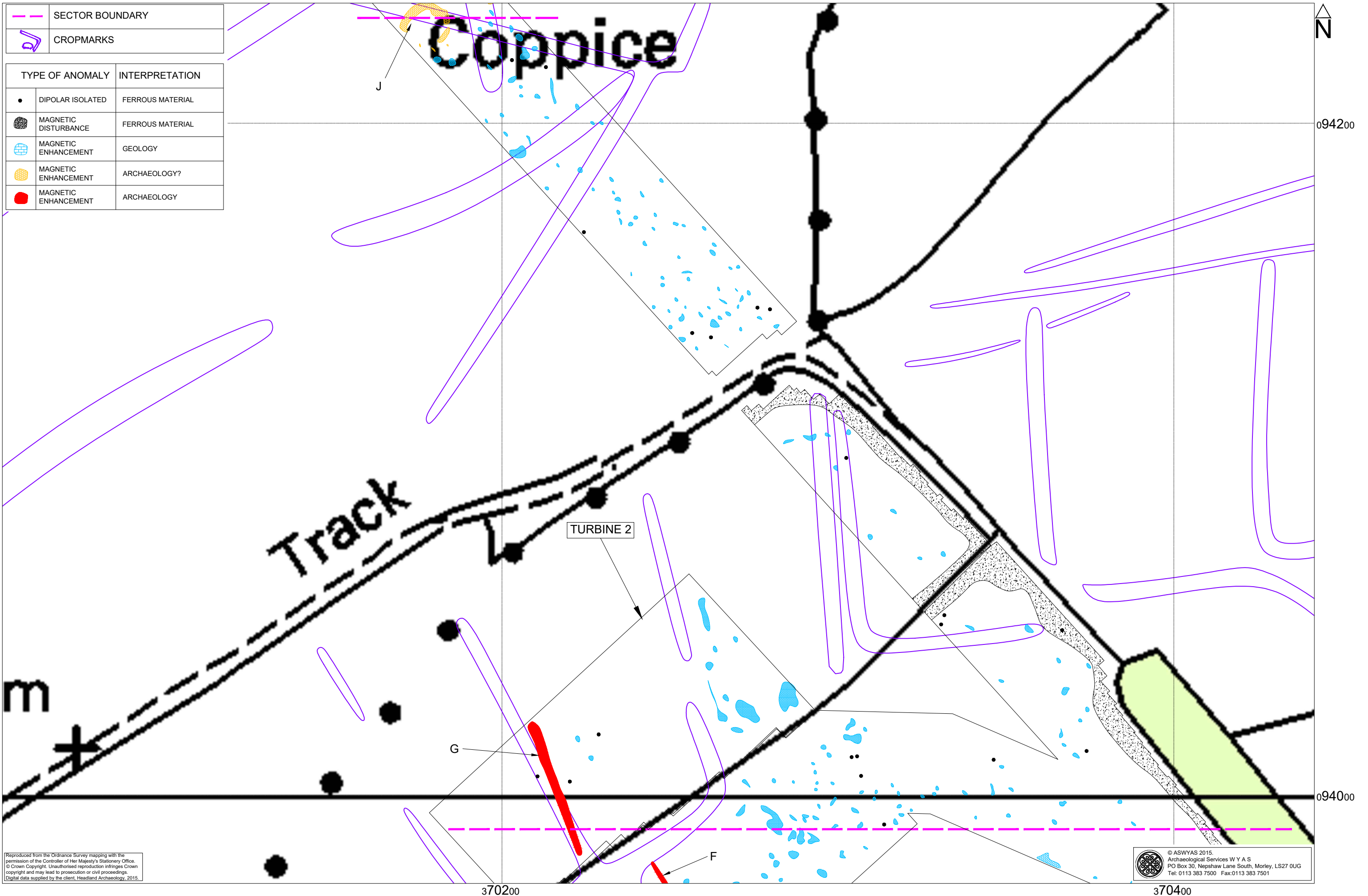


Fig. 9. Interpretation of magnetometer data; Sector 2 (1:1000 @ A3)

0 30m

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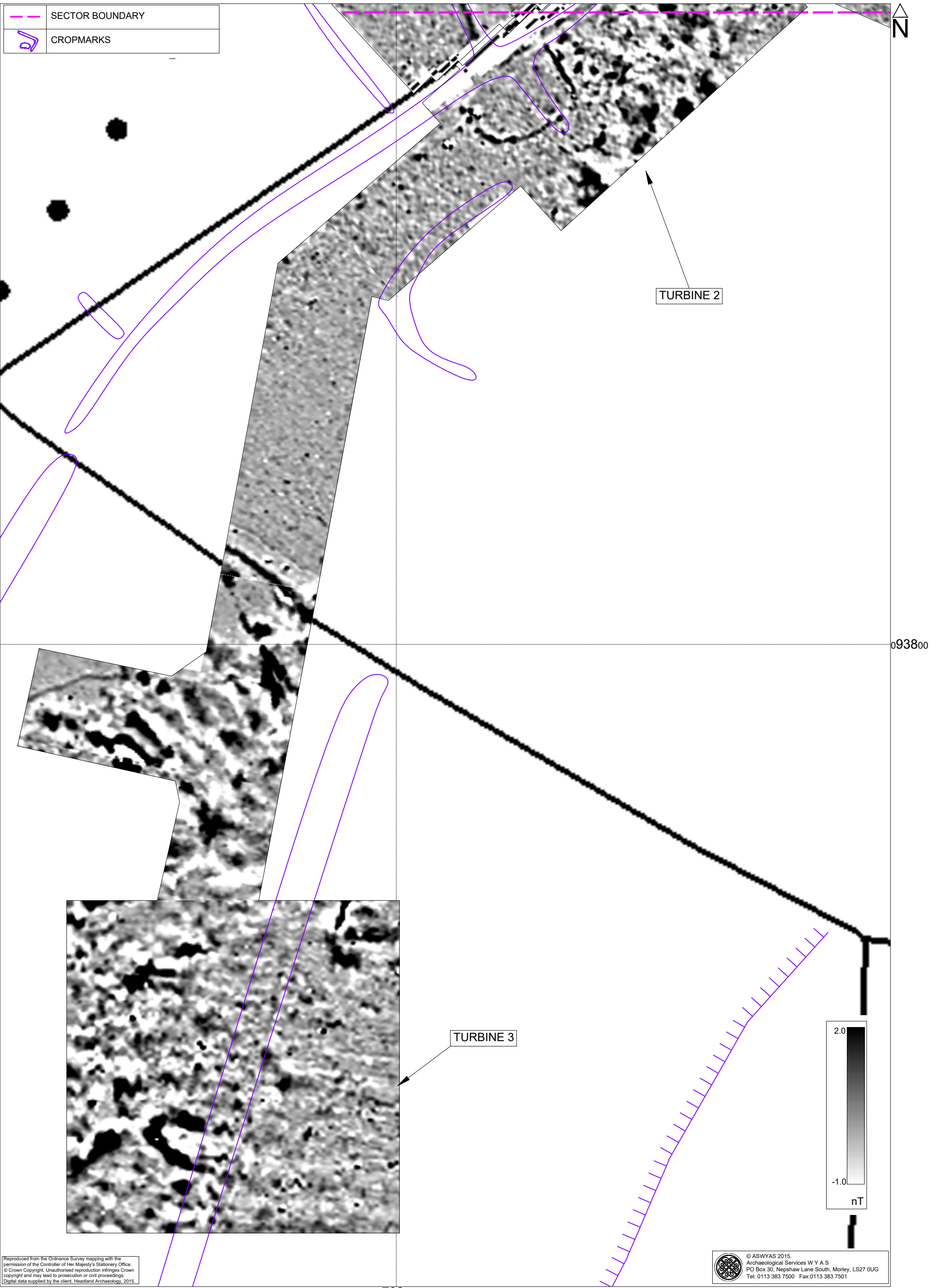


Fig. 10. Processed greyscale magnetometer data; Sector 3 (1:1000 @ A3)

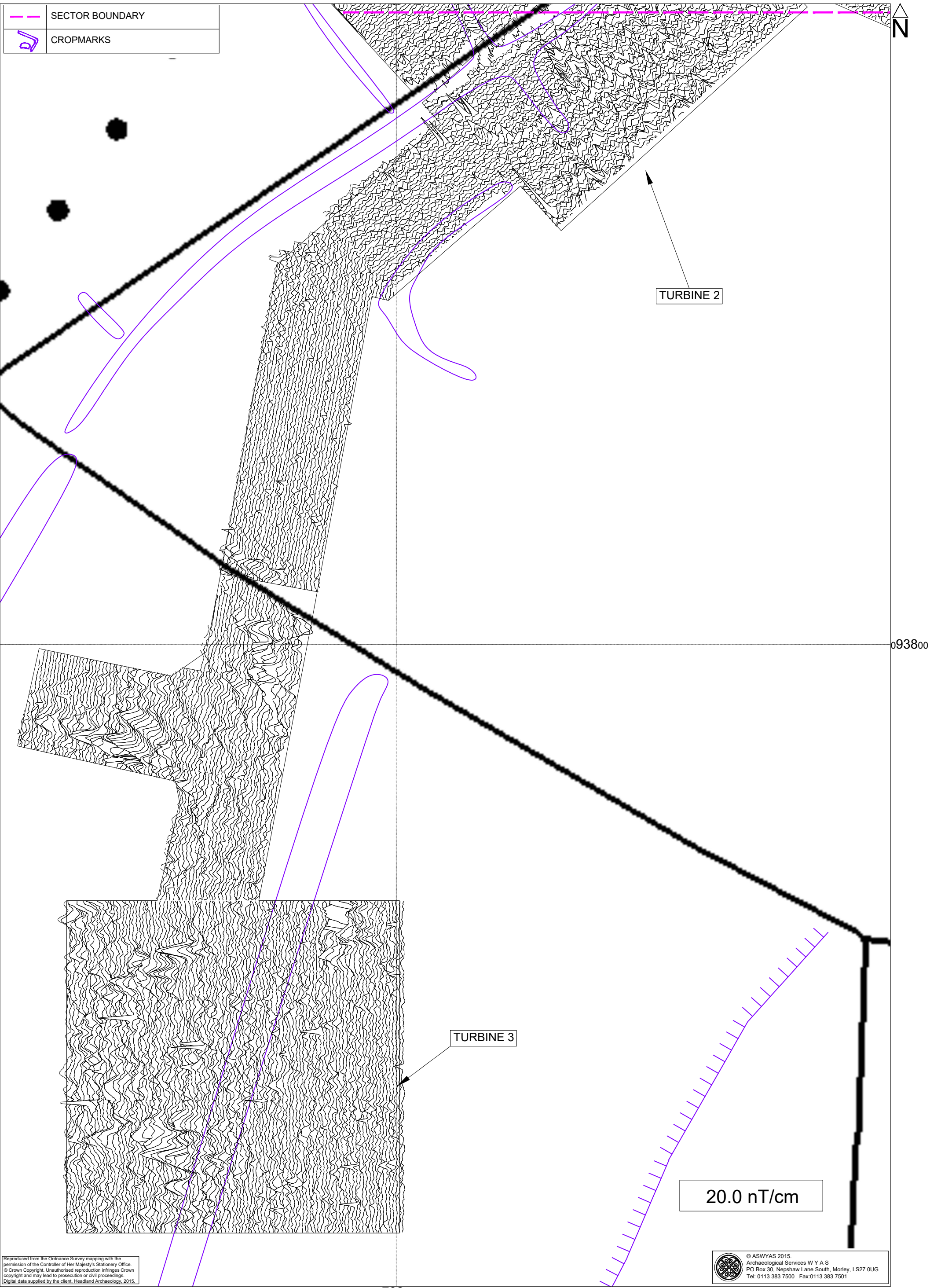


Fig. 11. XY trace plot of minimally processed magnetometer data; Sector 3 (1:1000 @ A3)

0 30m

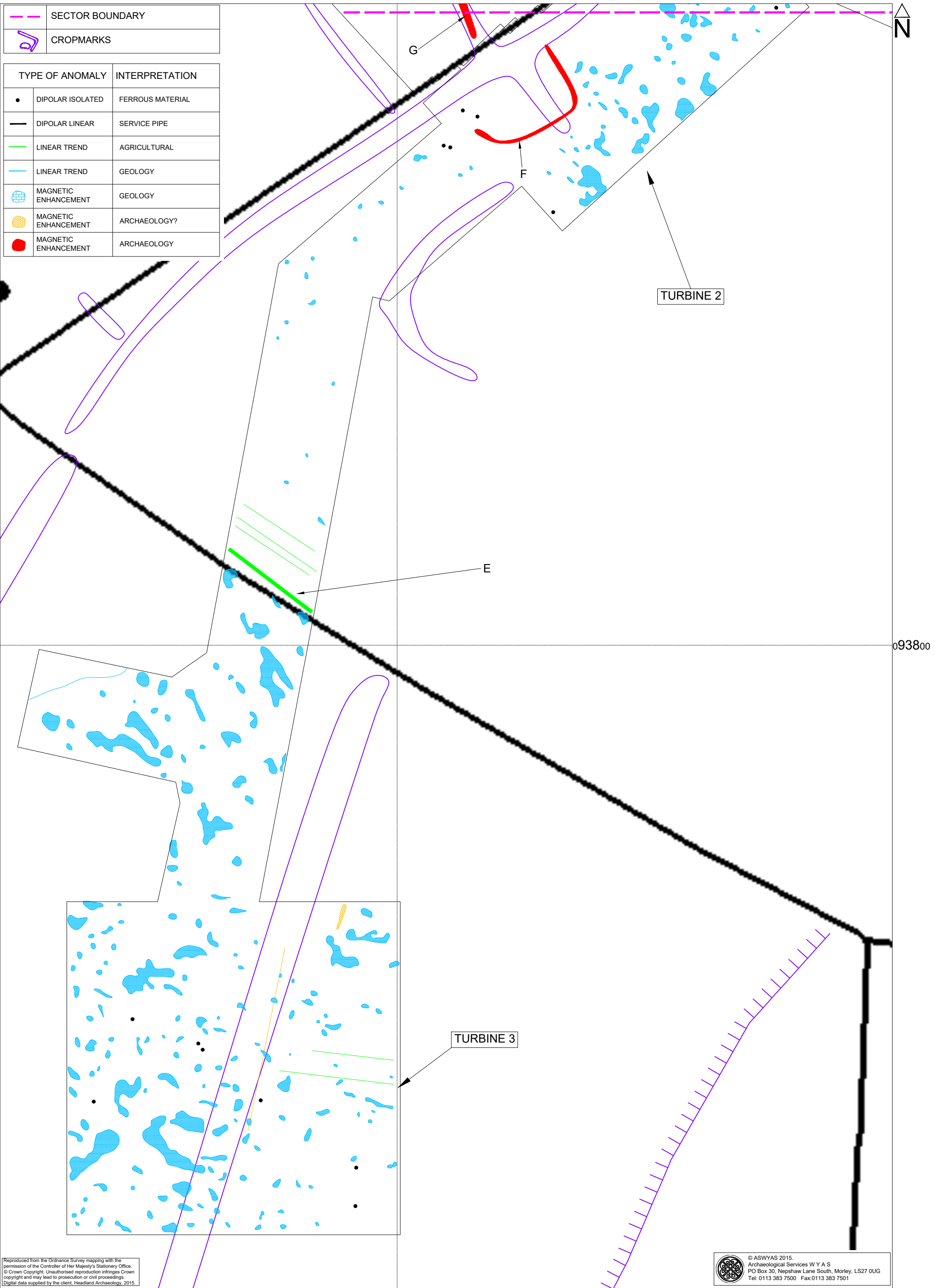


Fig. 12. Interpretation of magnetometer data; Sector 3 (1:1000 @ A3)

0 30m

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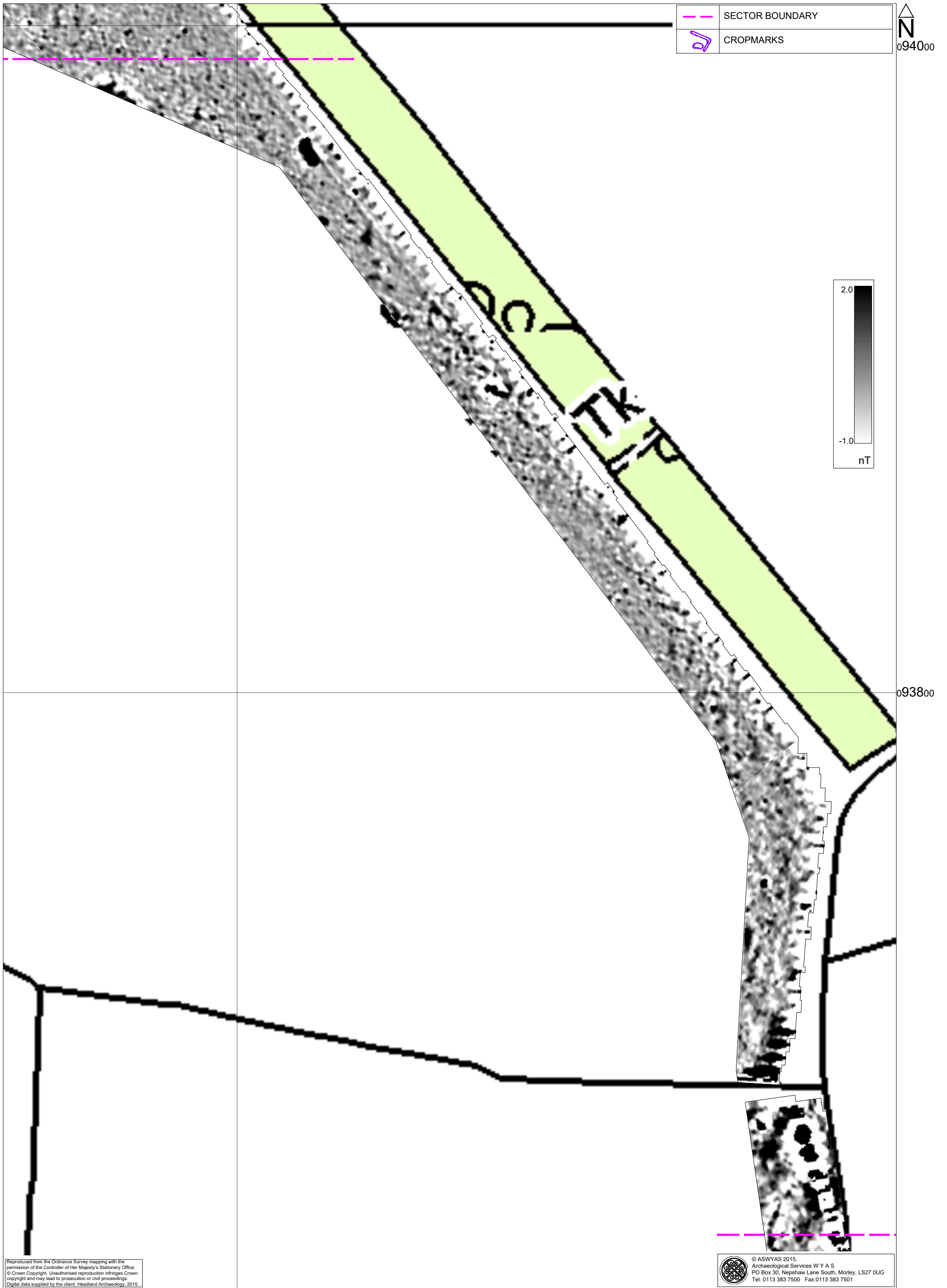


Fig. 13. Processed greyscale magnetometer data; Sector 4 (1:1000 @ A3)

0 30m

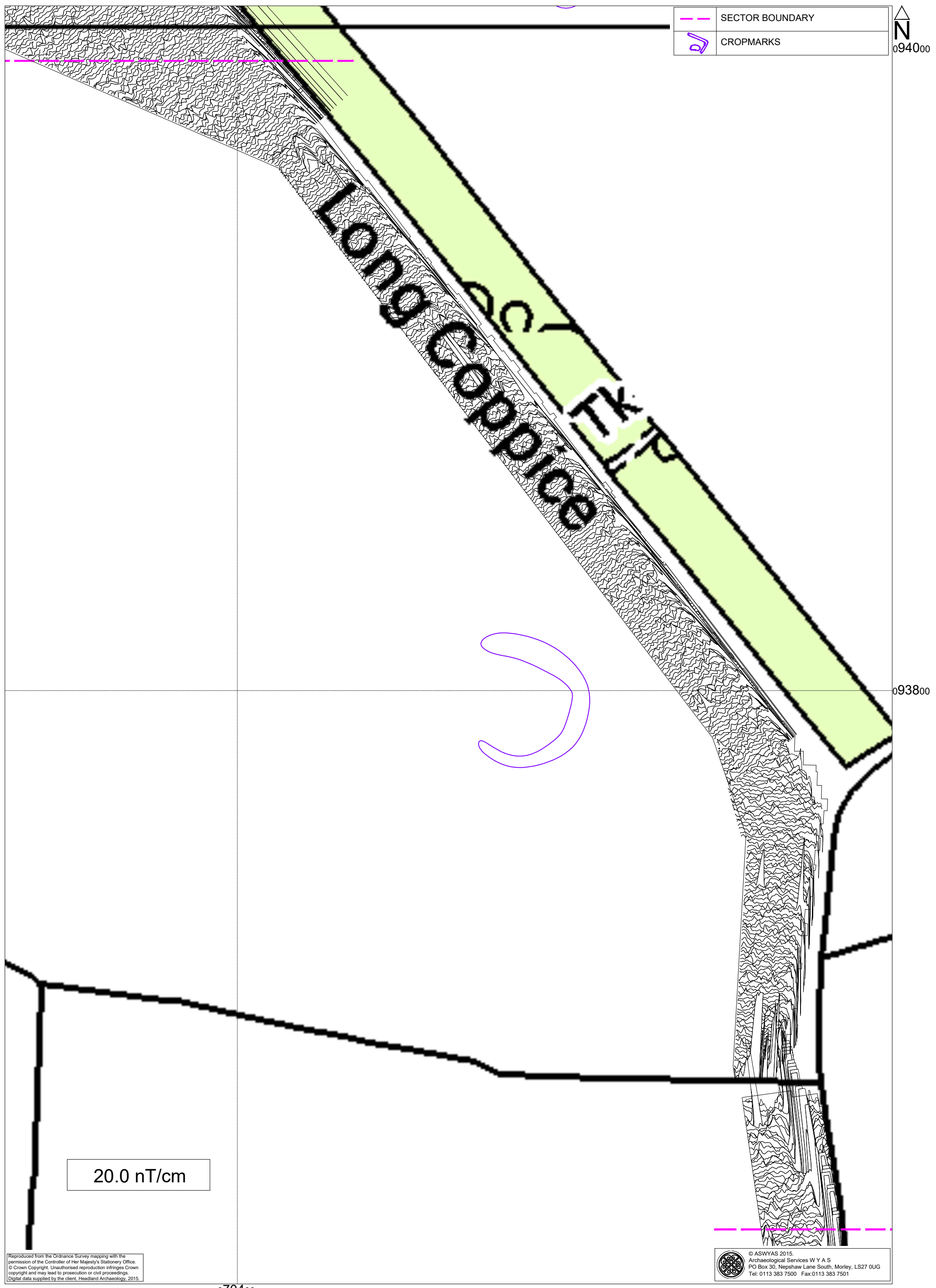


Fig. 14. XY trace plot of minimally processed magnetometer data; Sector 4 (1:1000 @ A3)

0 30m

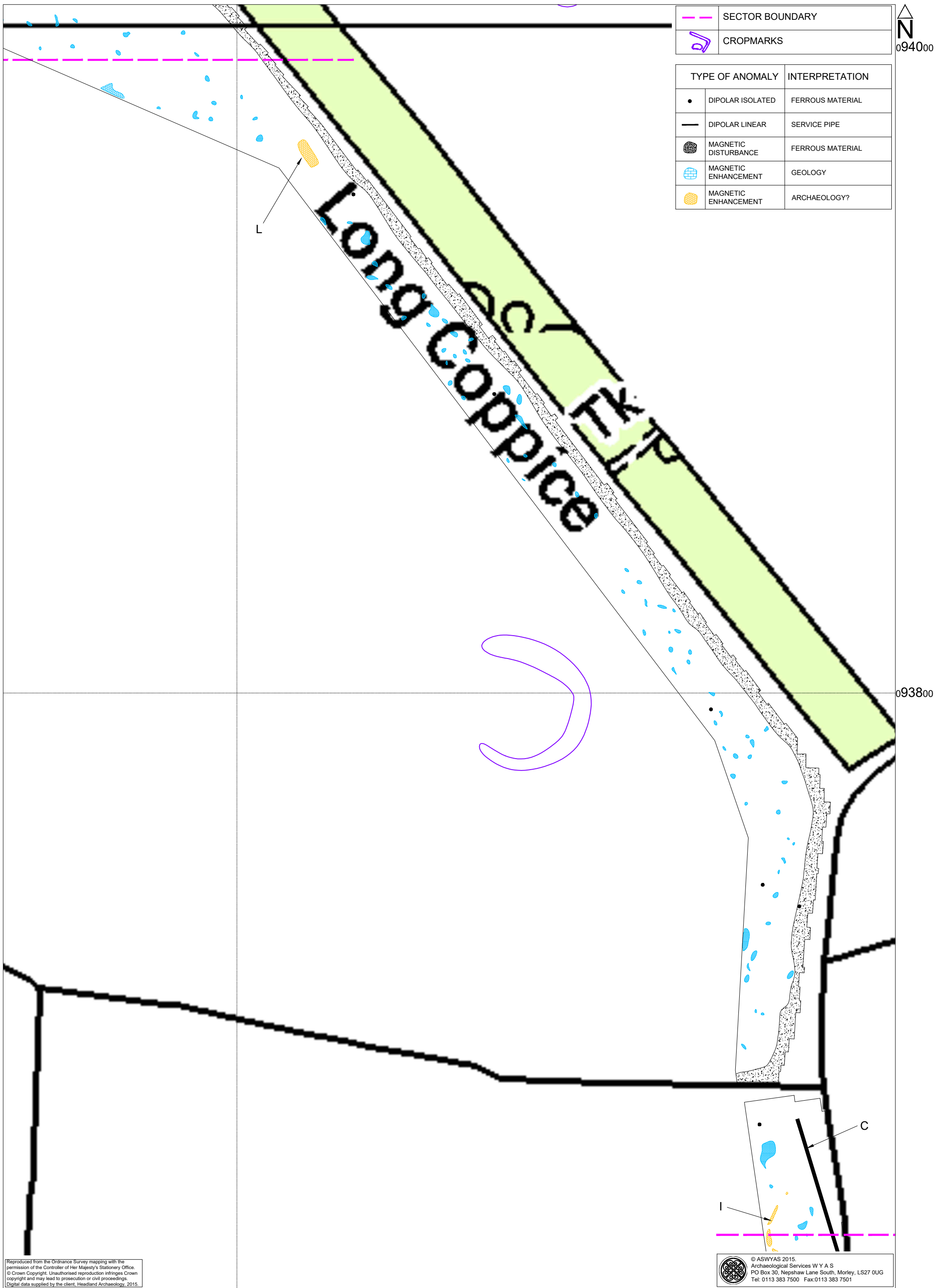


Fig. 15. Interpretation of magnetometer data; Sector 4 (1:1000 @ A3)

0 30m

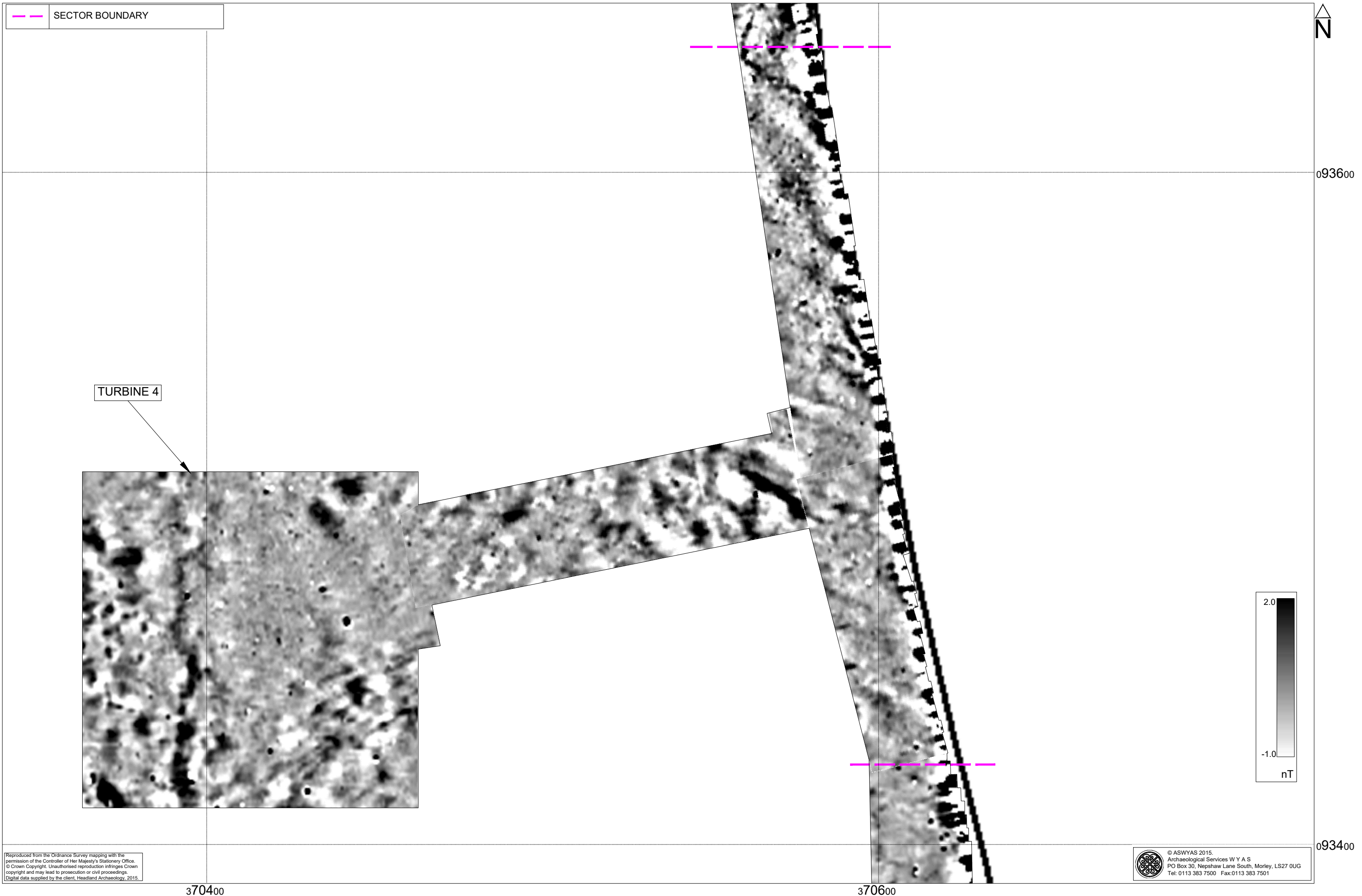


Fig. 16. Processed greyscale magnetometer data; Sector 5 (1:1000 @ A3)

0 30m

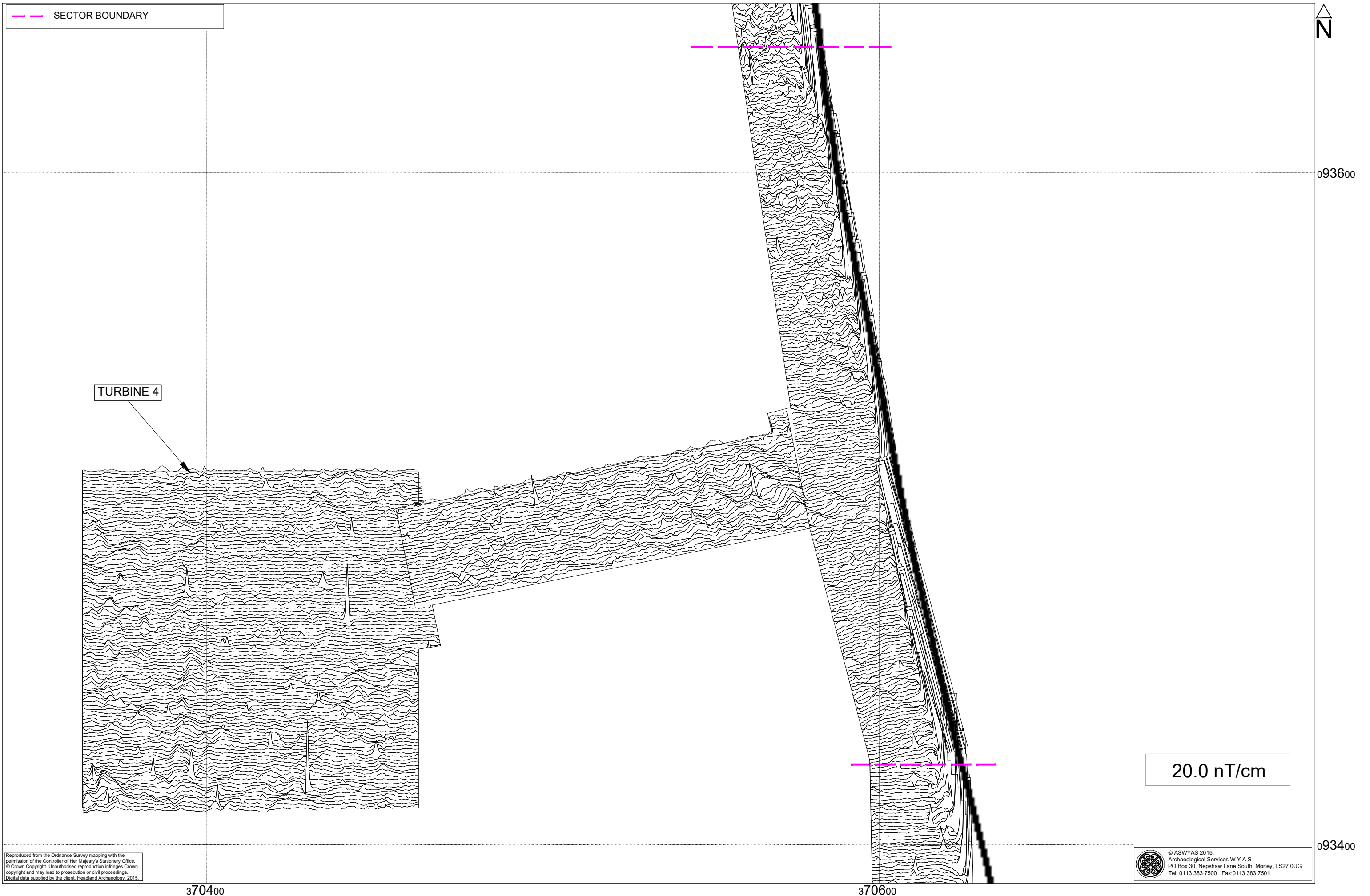
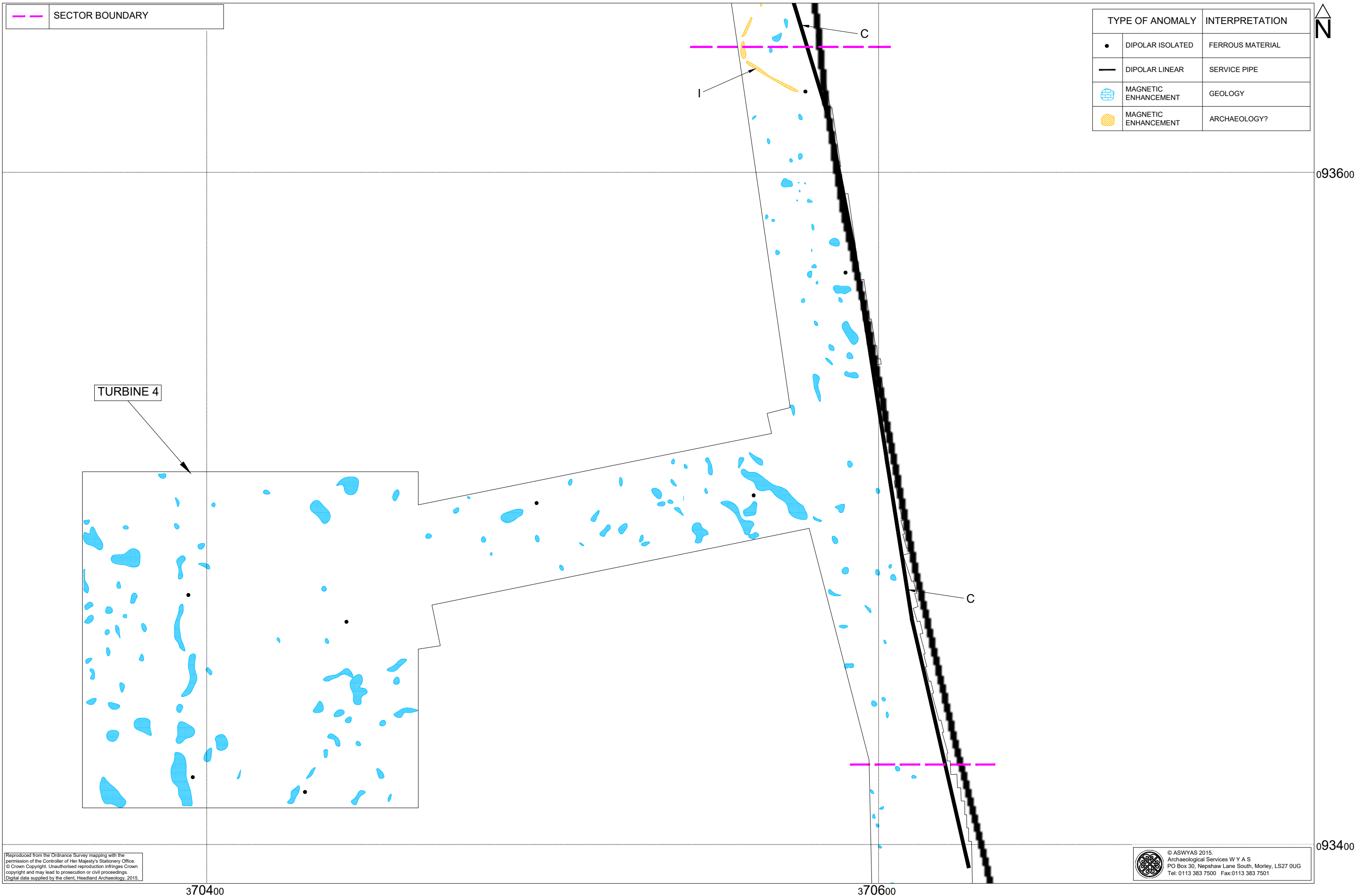


Fig. 17. XY trace plot of minimally processed magnetometer data; Sector 5 (1:1000 @ A3)

0 30m



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





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

0 30m

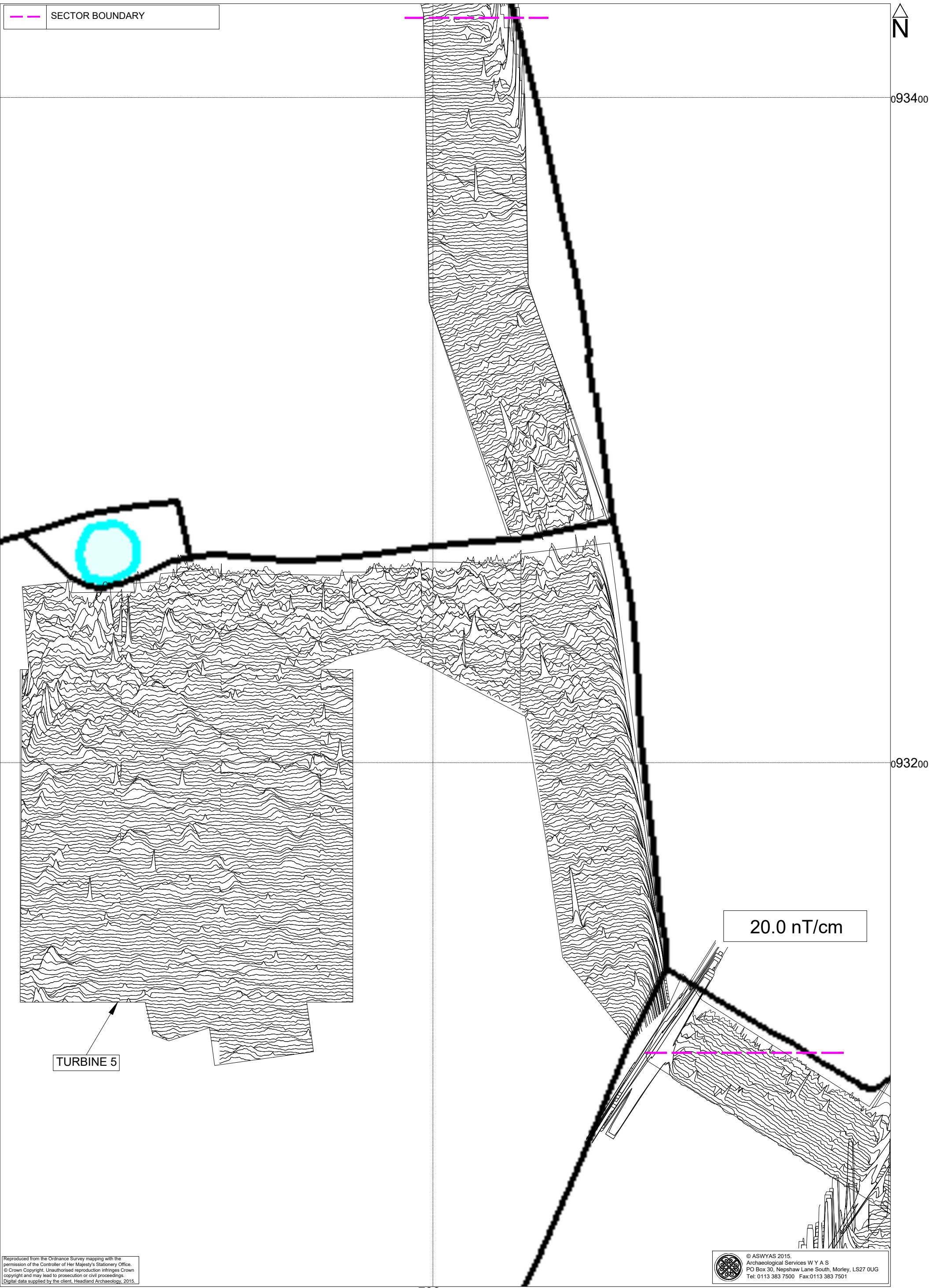


Fig. 20. XY trace plot of minimally processed magnetometer data; Sector 6 (1:1000 @ A3)

0 30m

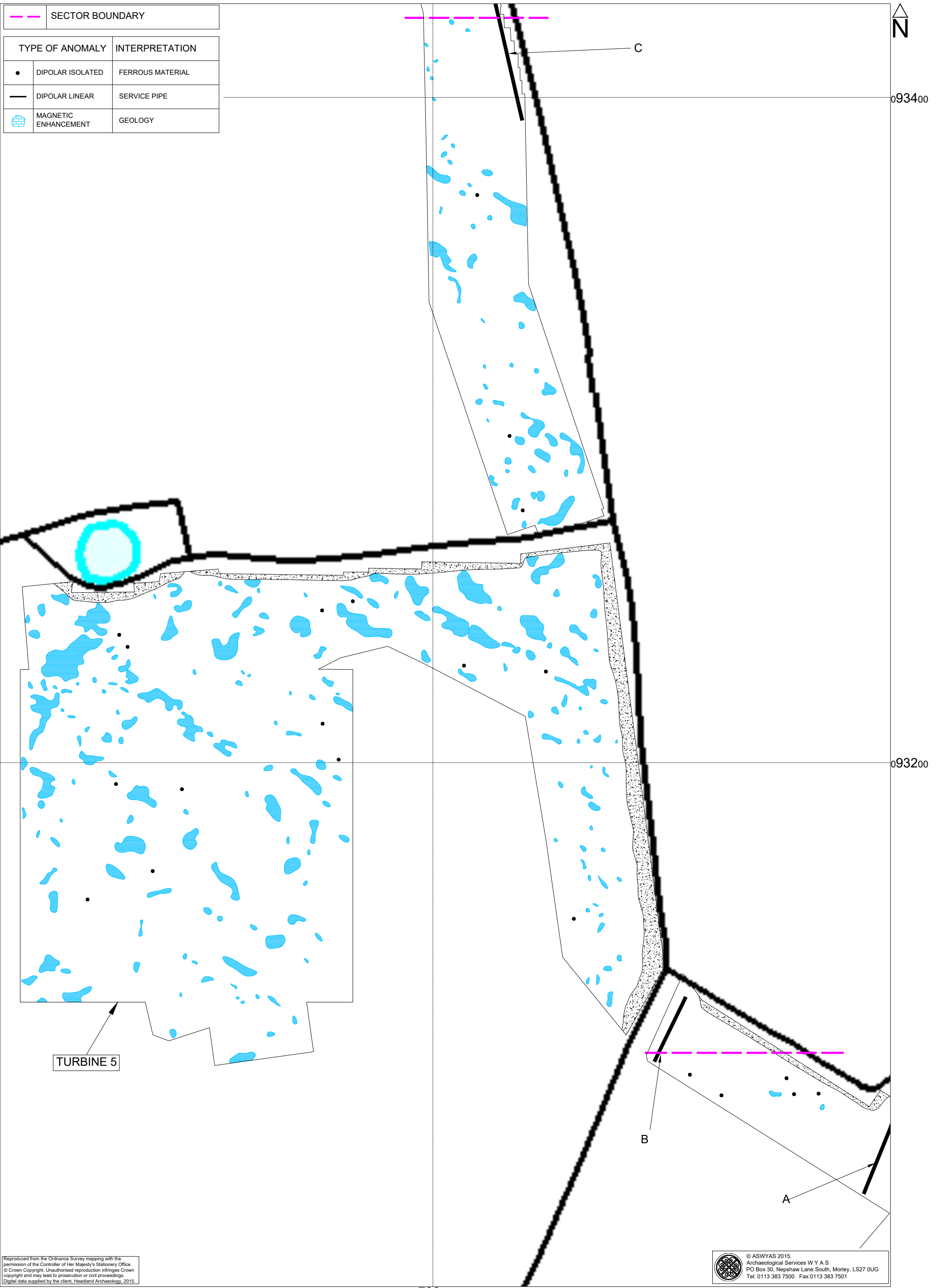


Fig. 21. Interpretation of magnetometer data; Sector 6 (1:1000 @ A3)

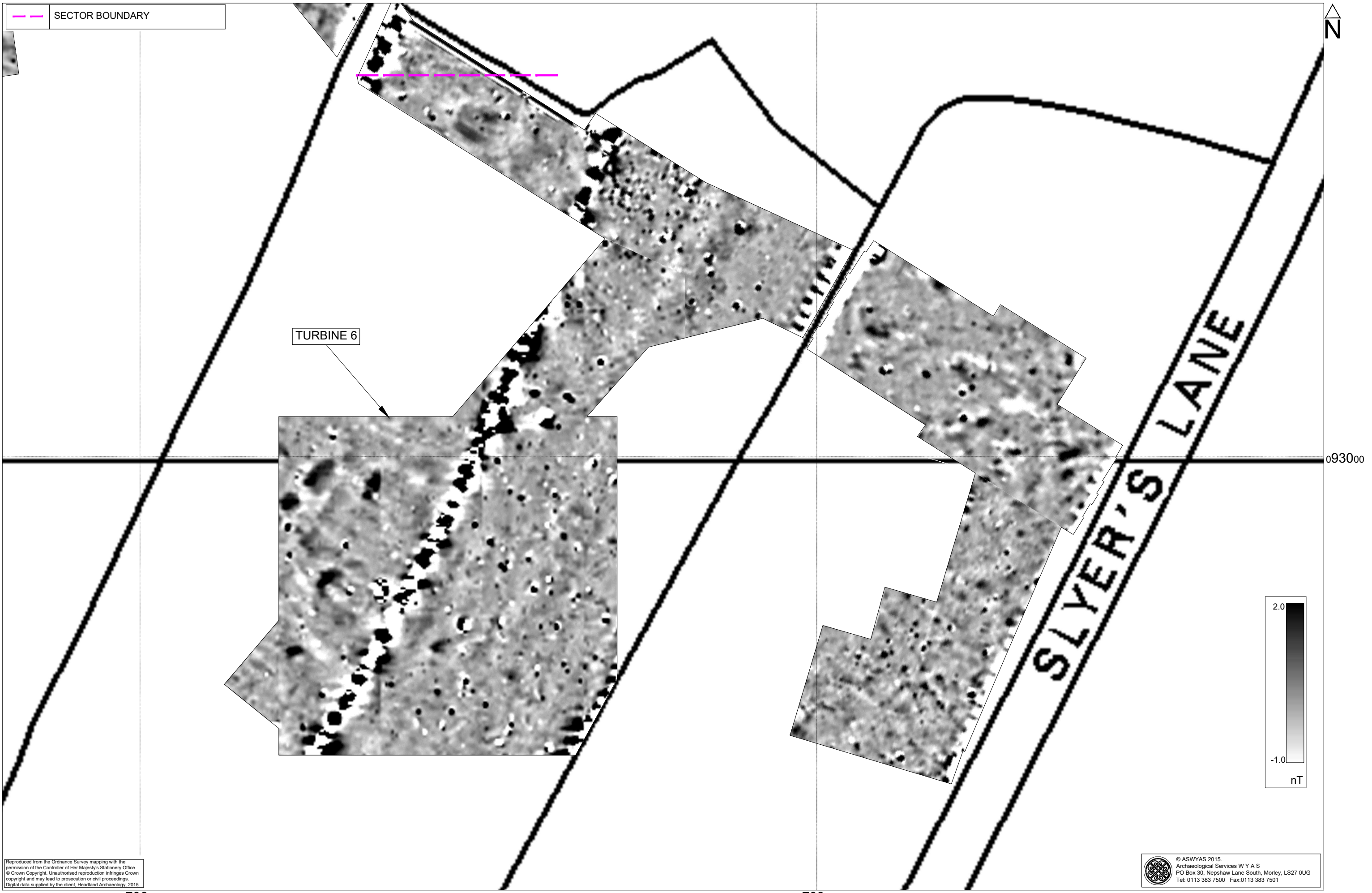
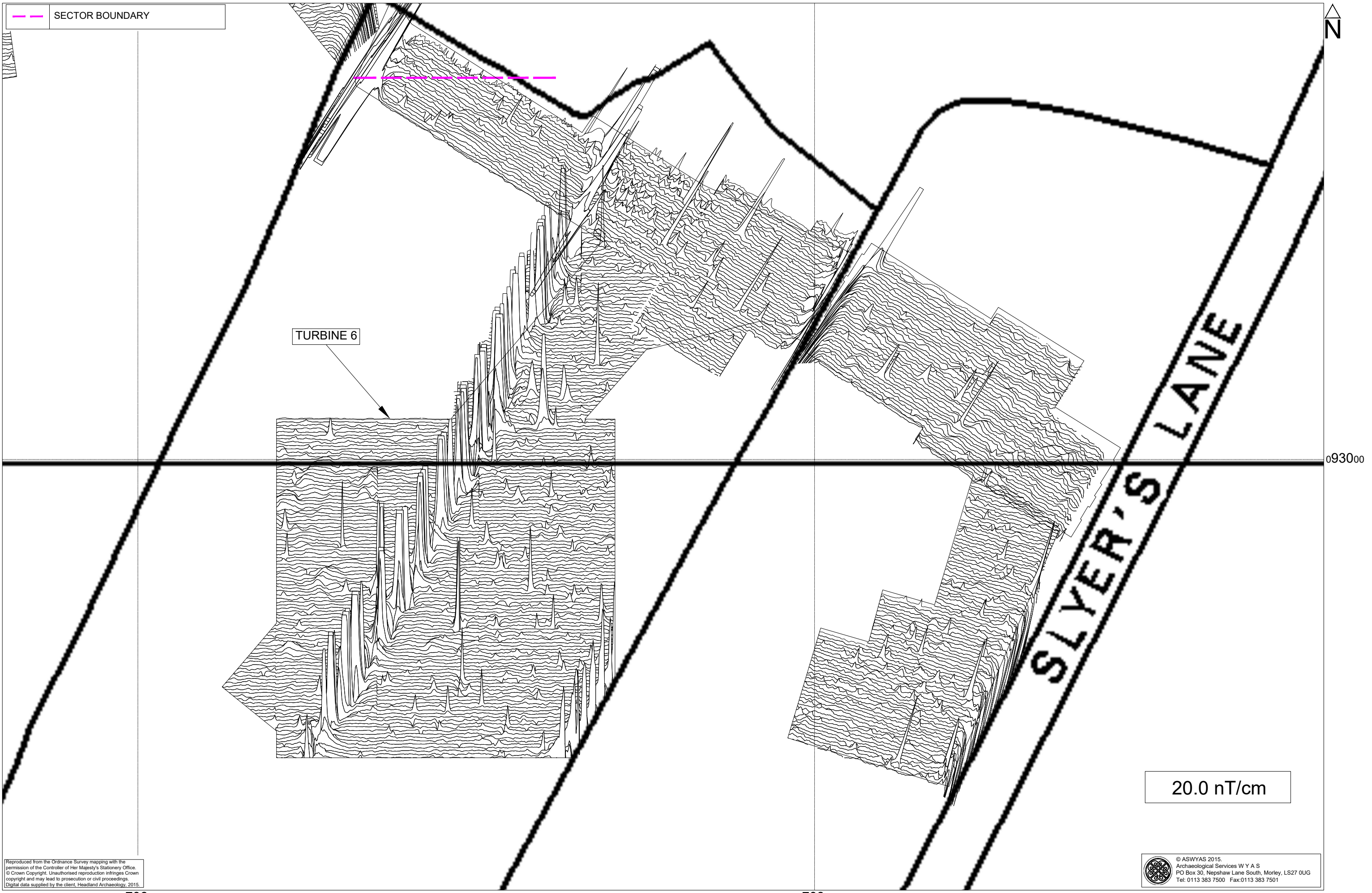


Fig. 22. Processed greyscale magnetometer data; Sector 7 (1:1000 @ A3)

0 30m



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

0 30m



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

0 30m



Plate 1. General view of Turbine 1, looking west



Plate 2. General view of Turbine 2, looking south-west



Plate 3. General view of Turbine 3, looking north



Plate 4. General view of Sector 5, looking east



Plate 5. General view of Sector 6, looking south-east



Plate 6. General view of Sector 7, looking east

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 is 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

Conventional gradiometer survey, using hand-held magnetometers, 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 within grids sometimes 20m by 20m but now more usually 30m by 30m. These readings are stored in the memory of the instrument and are later downloaded 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 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 Trimble VRS differential Global Positioning System (Trimble 5800 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). The report will be made available for consultation in the Dorset 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: archaeol11-205578

Project details

Project name	Slyer's Lane Windfarm, Puddletown
Short description of the project	A geophysical (magnetometer) survey covering approximately 14 hectares was carried out on land bordering Slyer's Lane, near Dorchester in advance of the proposed development of the site for a six turbine windfarm. Anomalies indicative of sub-surface archaeological remains have been identified although there is little obvious correlation between the previously identified cropmarks, which are mostly in areas where there are no superficial deposits, and the recorded magnetic anomalies. A small enclosure, possible round barrow and at least two linear ditch type features have been identified. Throughout the site the data is dominated by anomalies due to variation in the superficial deposits. On the basis of the survey the archaeological potential of the overall scheme is assessed as low but locally moderate to high.
Project dates	Start: 24-02-2015 End: 04-03-2015
Previous/future work	Not known / Not known
Any associated project reference codes	2729 - Contracting Unit No.
Any associated project reference codes	SLD15 - 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	Wind farm developments
Prompt	National Planning Policy Framework - NPPF
Position in the	Not known / Not recorded

planning process	
Solid geology (other)	chalk of the Tarrant, Spetisbury and Portsdown Chalk Formations
Drift geology (other)	Clay with Flints Formation
Techniques	Magnetometry

Project location

Country	England
Site location	DORSET WEST DORSET PUDDLETOWN Slyer's Lane, Windfarm, Dorchester
Study area	14.00 Hectares
Site coordinates	SY 705 935 50.7397881976 -2.41811668355 50 44 23 N 002 25 05 W Point

Project creators

Name of Organisation	Archaeological Services WYAS
Project brief originator	Headland Archaeology
Project design originator	Archaeological Services WYAS
Project director/manager	Harrison, S.
Project supervisor	Schmidt, A.
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 Exists?	No

Project bibliography 1

Publication type	Grey literature (unpublished document/manuscript)
Title	Slyer's Lane Windfarm, Puddletown, Dorchester
Author(s)/Editor(s)	Webb, A.
Other bibliographic details	Report No. 2729

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