N

1668$_{00}$

1666$_{00}$

1664$_{00}$

5570$_{00}$

5572$_{00}$

Area 5

Archaeological Services W Y A S,
Nepshaw Lane South, Morley, LS27 7JQ

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Project ID: XJ72_SFG

XY trace plot of minimally processed magnetometer data; Sector 6

Fig. 20

Title

SECTOR BOUNDARY

15.0 nT/cm

0 50m

1:1500 @ A3

FB8

N

1668 00

1666 00

1664 00

5570 00

5572 00

Area 5

Archaeological Services W Y A S,
Nepshaw Lane South, Morley, LS27 7JQ

Tel: 0113 535 0163 Email: archaeology@wyjs.org.uk www.aswyas.com

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Interpretation of magnetometer data; Sector 6

Fig. 21

Interpretation

- FERROUS
- SERVICE PIPE
- MAGNETIC DISTURBANCE
- GREEN WASTE?
- AGRICULTURAL
- FORMER FIELD BOUNDARY
- GEOLOGY
- UNCERTAIN
- ARCHAEOLOGY?

0 50m

1:1500 @ A3

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Processed greyscale magnetometer data; Sector 7

Fig. 22

Title

SECTOR BOUNDARY

-1.0 2.0
nT

0 50m

1:1500 @ A3

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Project ID: XJ72_SFG

XY trace plot of minimally processed magnetometer data; Sector 7

Fig. 23

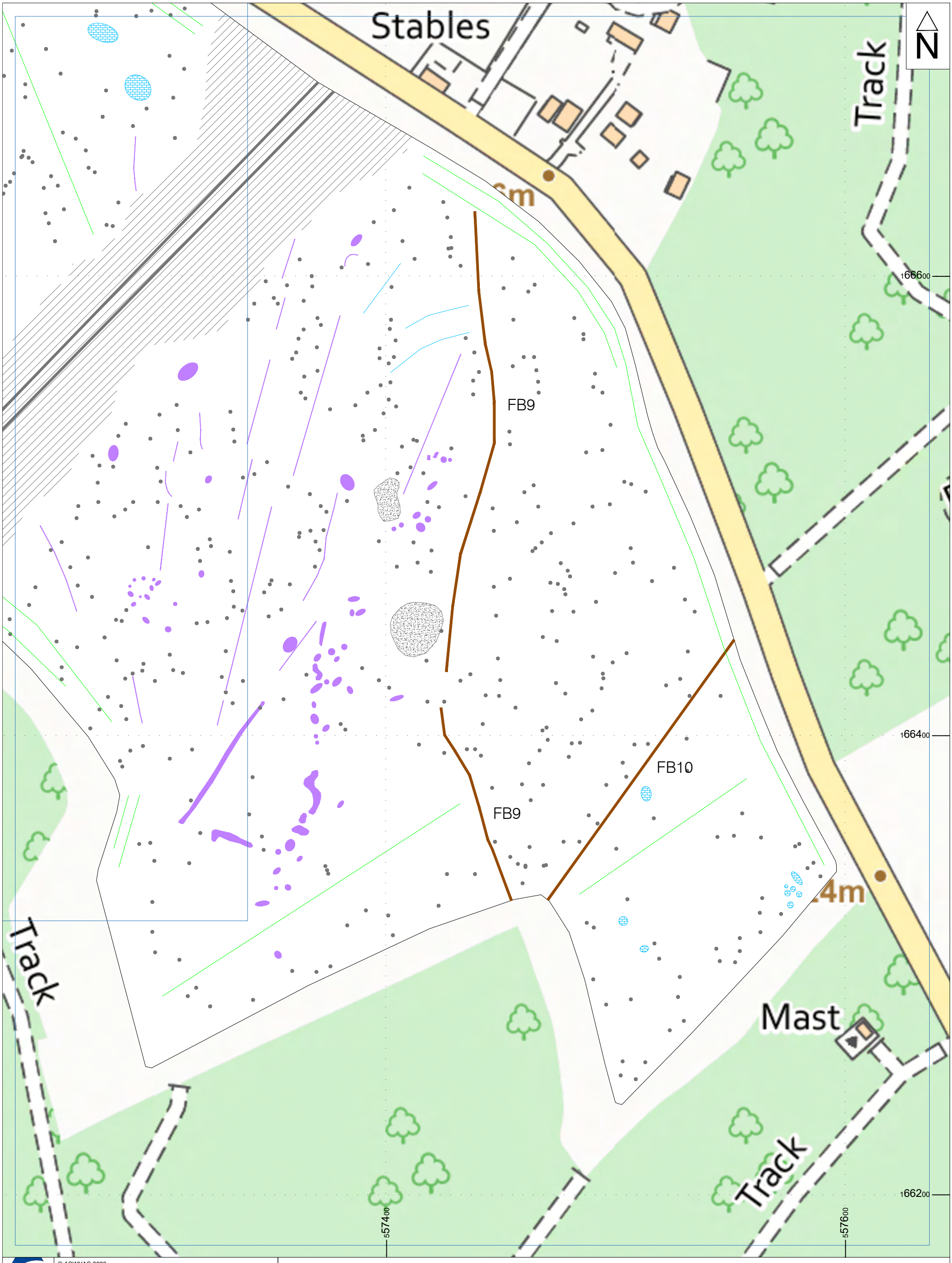
Title

SECTOR BOUNDARY

15.0 nT/cm

0 50m

1:1500 @ A3



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Interpretation of magnetometer data; Sector 7

Fig. 24

Interpretation

- FERROUS
- AGRICULTURAL
- UNCERTAIN
- SERVICE PIPE
- FORMER FIELD BOUNDARY
- MAGNETIC DISTURBANCE
- GEOLOGY

0 50m

1:1500 @ A3

N

Area 5

Area 6

Rookery Farm

M20

Mast

1664 00

1662 00

1660 00

5568 00

5570 00

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Project ID: XJ72_SFG

Processed greyscale magnetometer data; Sector 8

Fig. 25

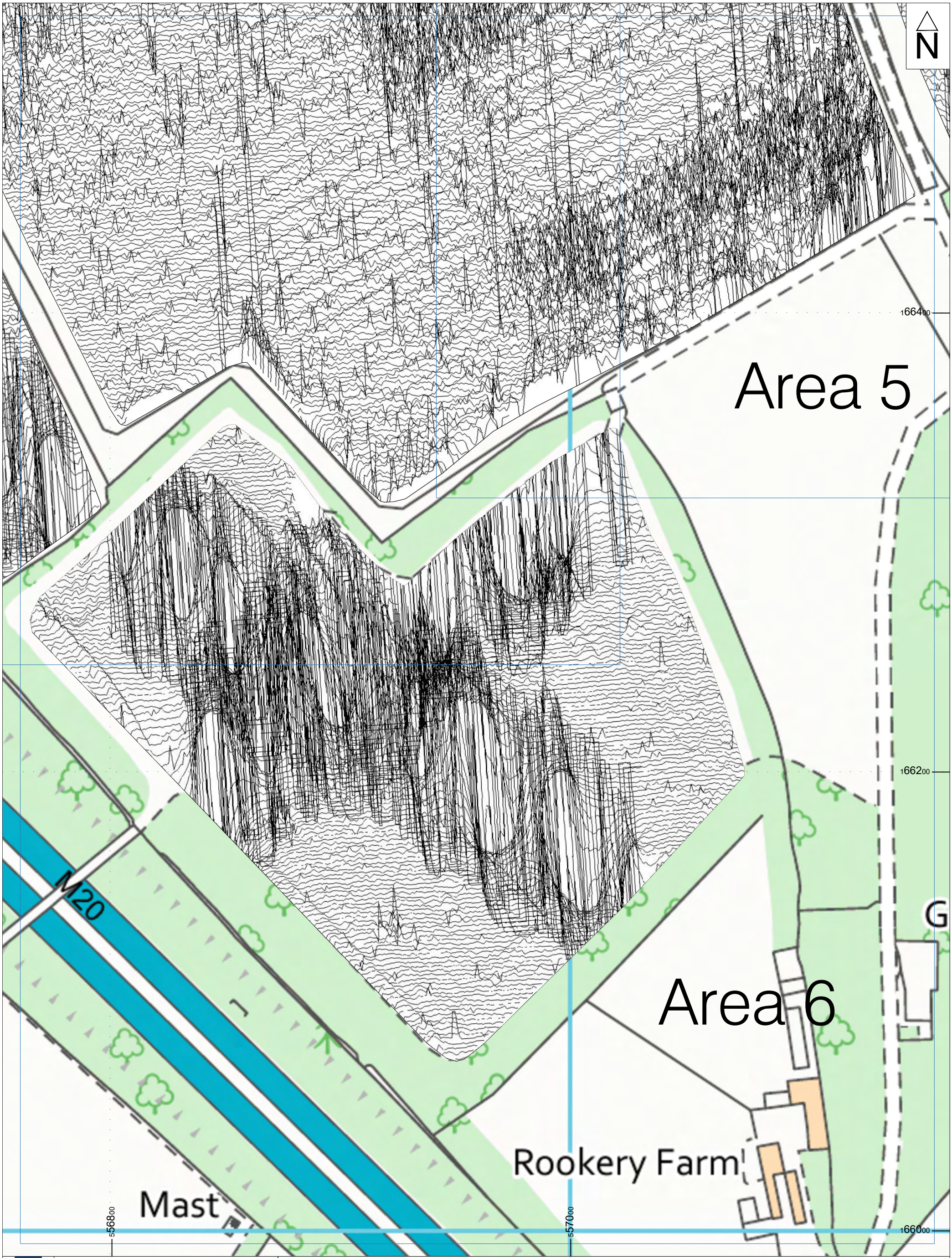
Title

SECTOR BOUNDARY

-1.0 2.0
nT

0 50m

1:1500 @ A3



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Project ID: XJ72_SFG

XY trace plot of minimally processed magnetometer data; Sector 8

Fig. 26

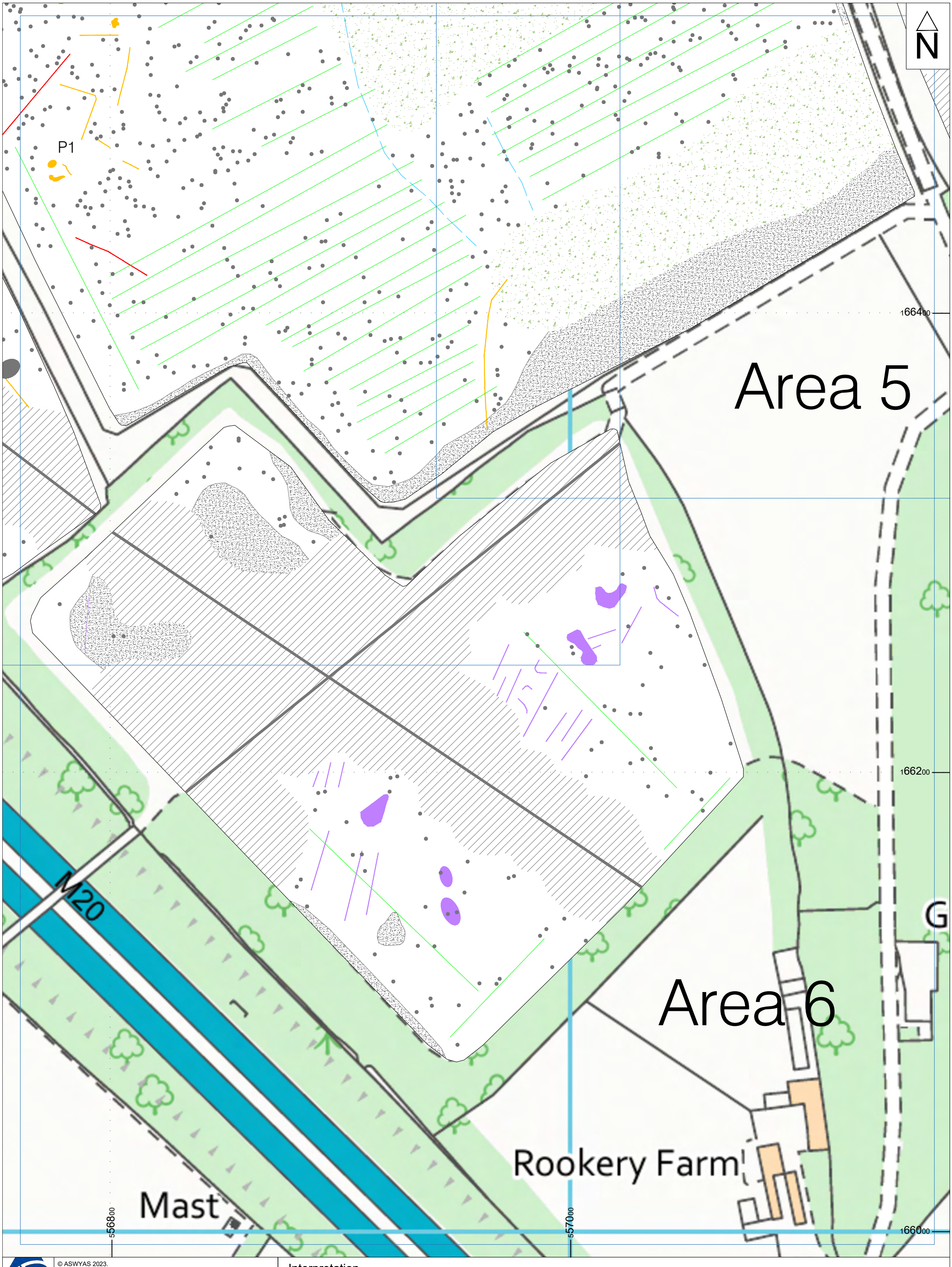
Title

SECTOR BOUNDARY

15.0 nT/cm

0 50m

1:1500 @ A3



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Project ID: XJ72_SFG

Interpretation of magnetometer data; Sector 8

Fig. 27

Interpretation

- FERROUS
- SERVICE PIPE
- MAGNETIC DISTURBANCE
- GREEN WASTE?
- AGRICULTURAL
- GEOLOGY
- UNCERTAIN
- ARCHAEOLOGY?
- ARCHAEOLOGY

0 50m

1:1500 @ A3

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Project ID: XJ72_SFG

Processed greyscale magnetometer data; Sector 9

Fig. 28

Title

SECTOR BOUNDARY

-1.0 2.0
nT

0 50m
1:1500 @ A3

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Project ID: XJ72_SFG

XY trace plot of minimally processed magnetometer data; Sector 9

Fig. 29

Title

SECTOR BOUNDARY

15.0 nT/cm

0 50m

1:1500 @ A3

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Project ID: XJ72_SFG

Interpretation of magnetometer data; Sector 9

Fig. 30

Title

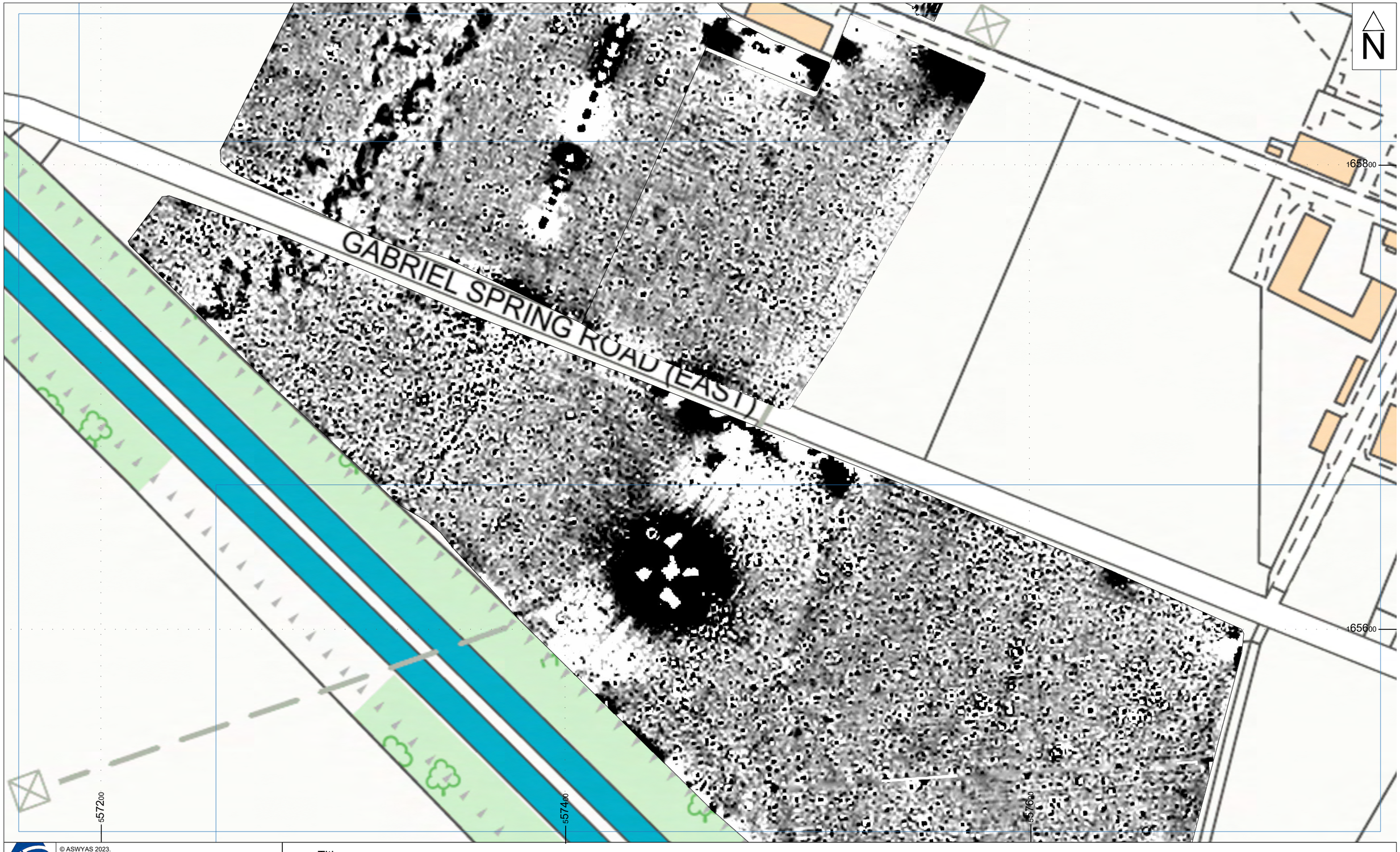
- SECTOR BOUNDARY

Interpretation

- FERROUS
- SERVICE PIPE
- MAGNETIC DISTURBANCE
- OVERHEAD CABLES
- AGRICULTURAL
- GEOLOGY

0 50m

1:1500 @ A3



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Project ID: XJ72_SFG

Processed greyscale magnetometer data; Sector 10

Fig. 31

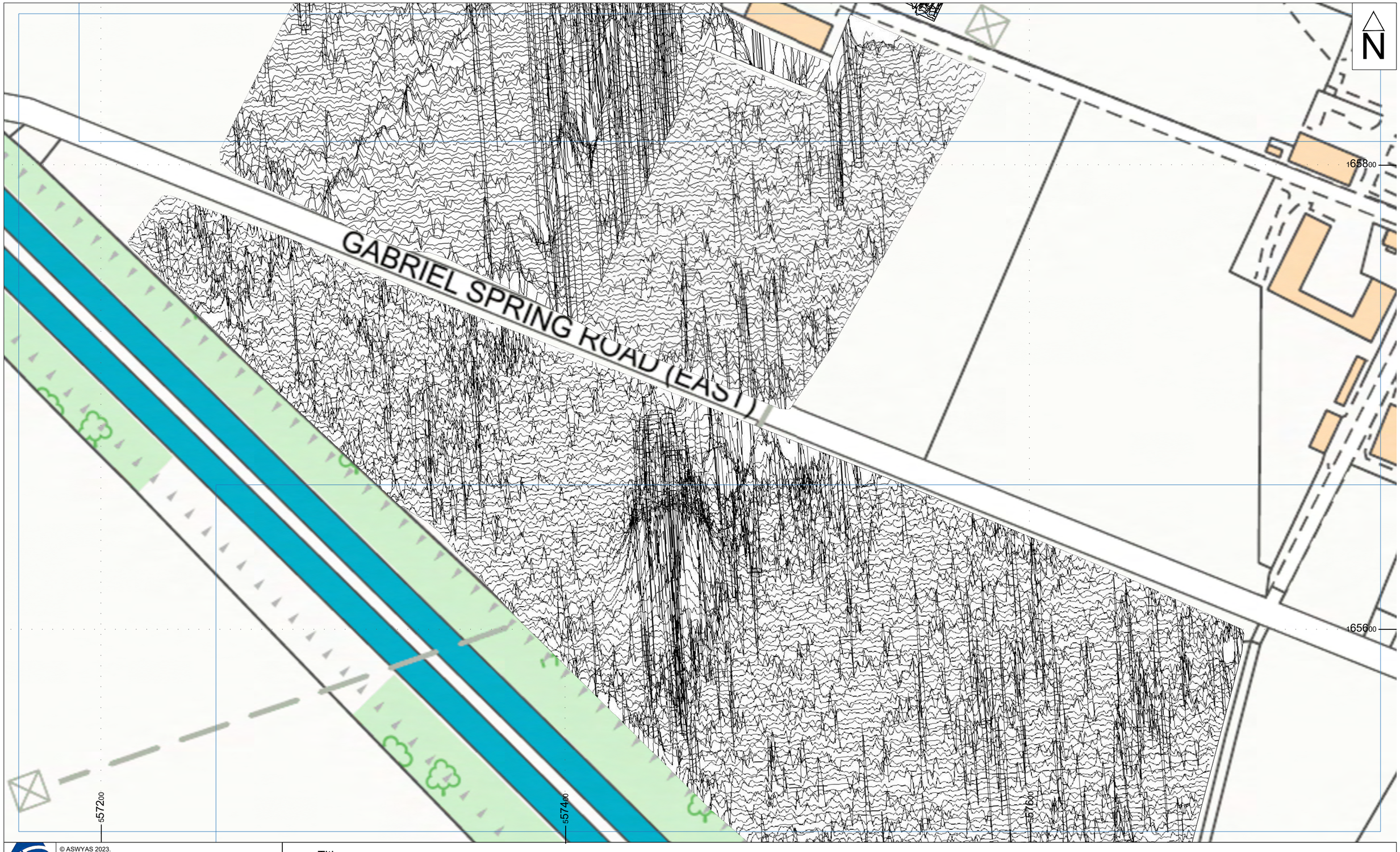
Title

SECTOR BOUNDARY

nT -1.0 2.0

0 50m

1:1500 @ A3



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Project ID: XJ72_SFG

XY trace plot of minimally processed magnetometer data; Sector 10

Fig. 32

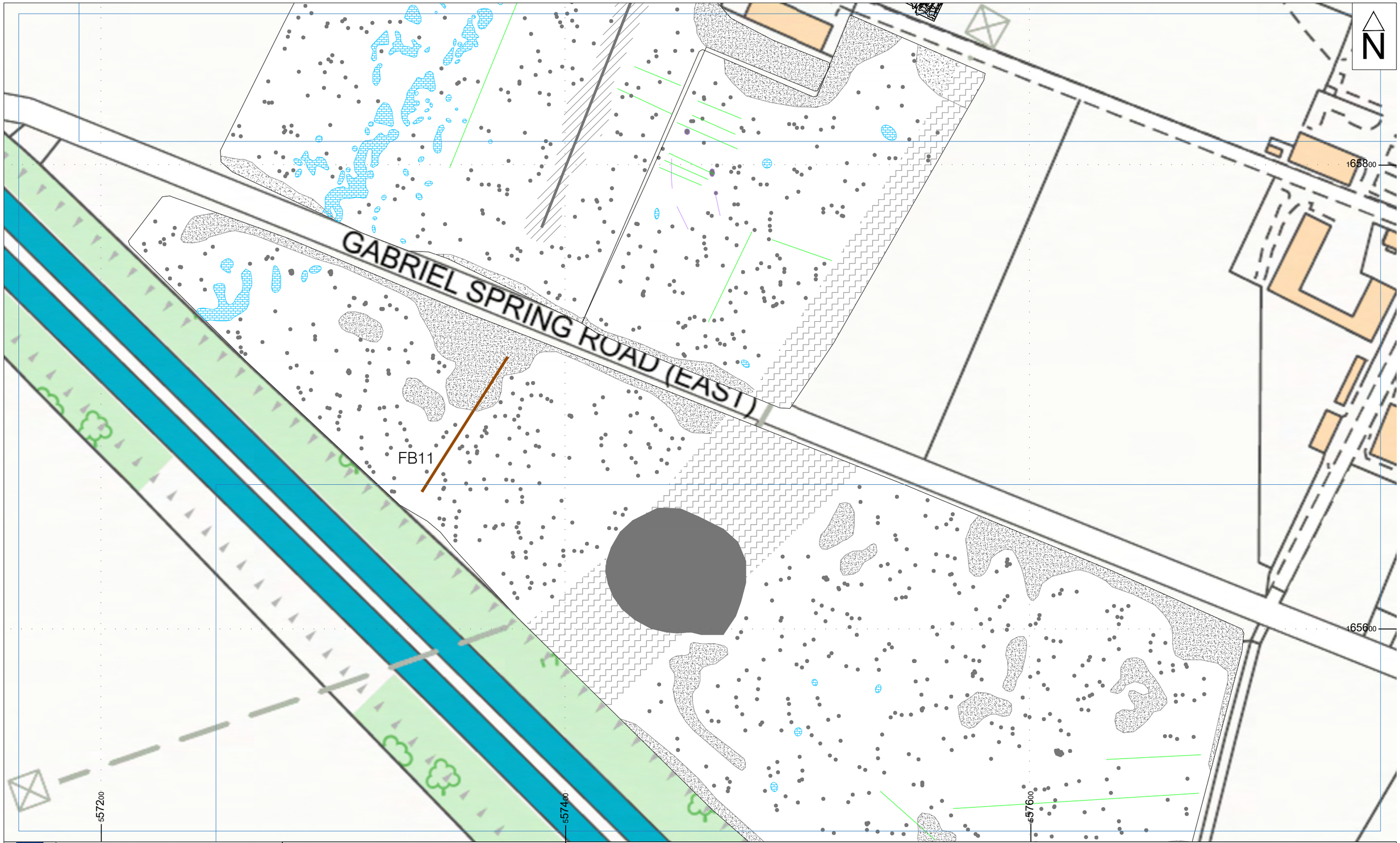
Title

SECTOR BOUNDARY

15.0 nT/cm

0 50m

1:1500 @ A3



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Project ID: XJ72_SFG

Interpretation of magnetometer data; Sector 10

Fig. 33

Title

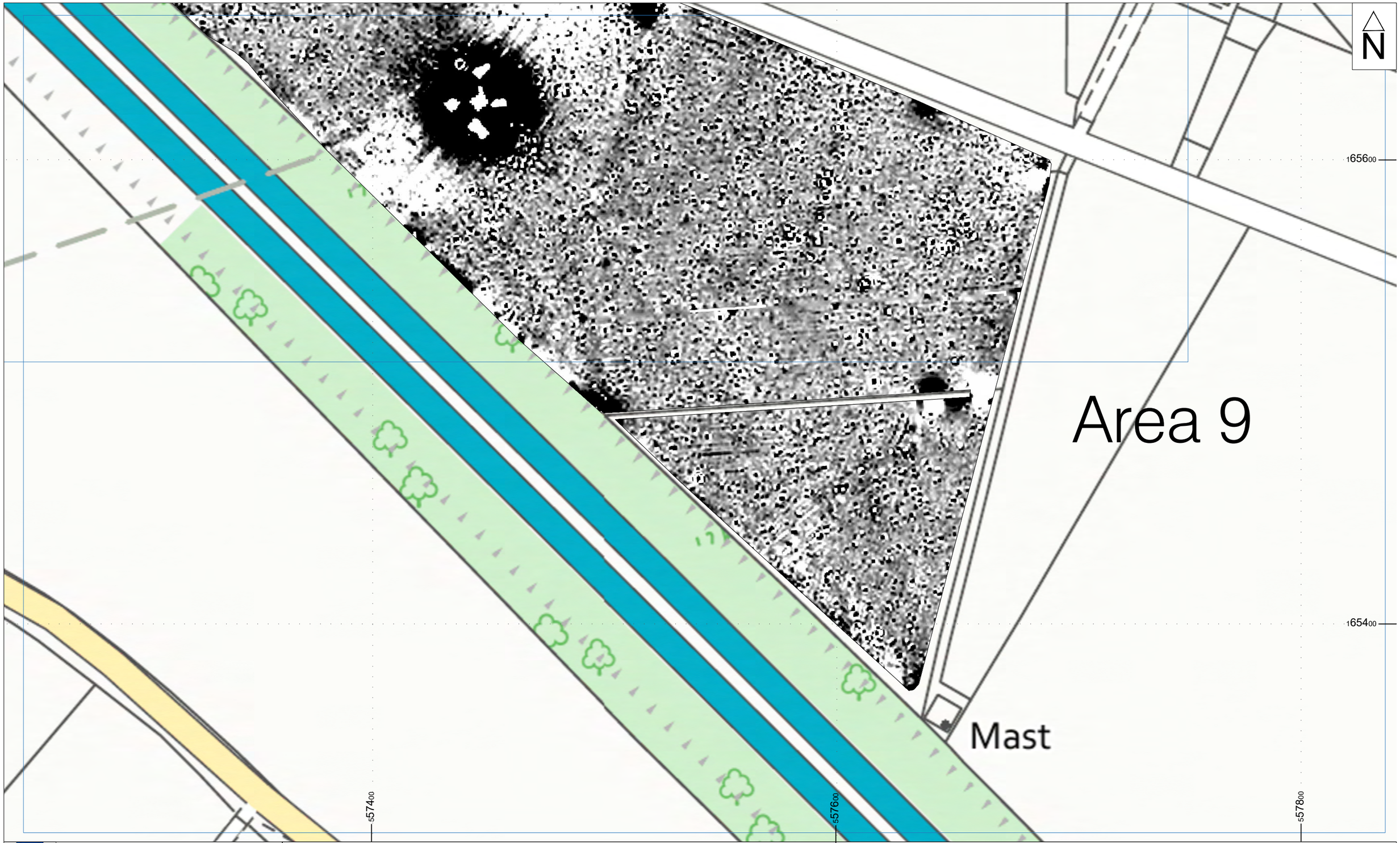
- SECTOR BOUNDARY

Interpretation

- FERROUS
- SERVICE PIPE
- MAGNETIC DISTURBANCE
- OVERHEAD CABLES
- AGRICULTURAL
- FORMER FIELD BOUNDARY
- GEOLOGY
- UNCERTAIN

0 50m

1:1500 @ A3



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Project ID: XJ72_SFG

Processed greyscale magnetometer data; Sector 11

Fig. 34

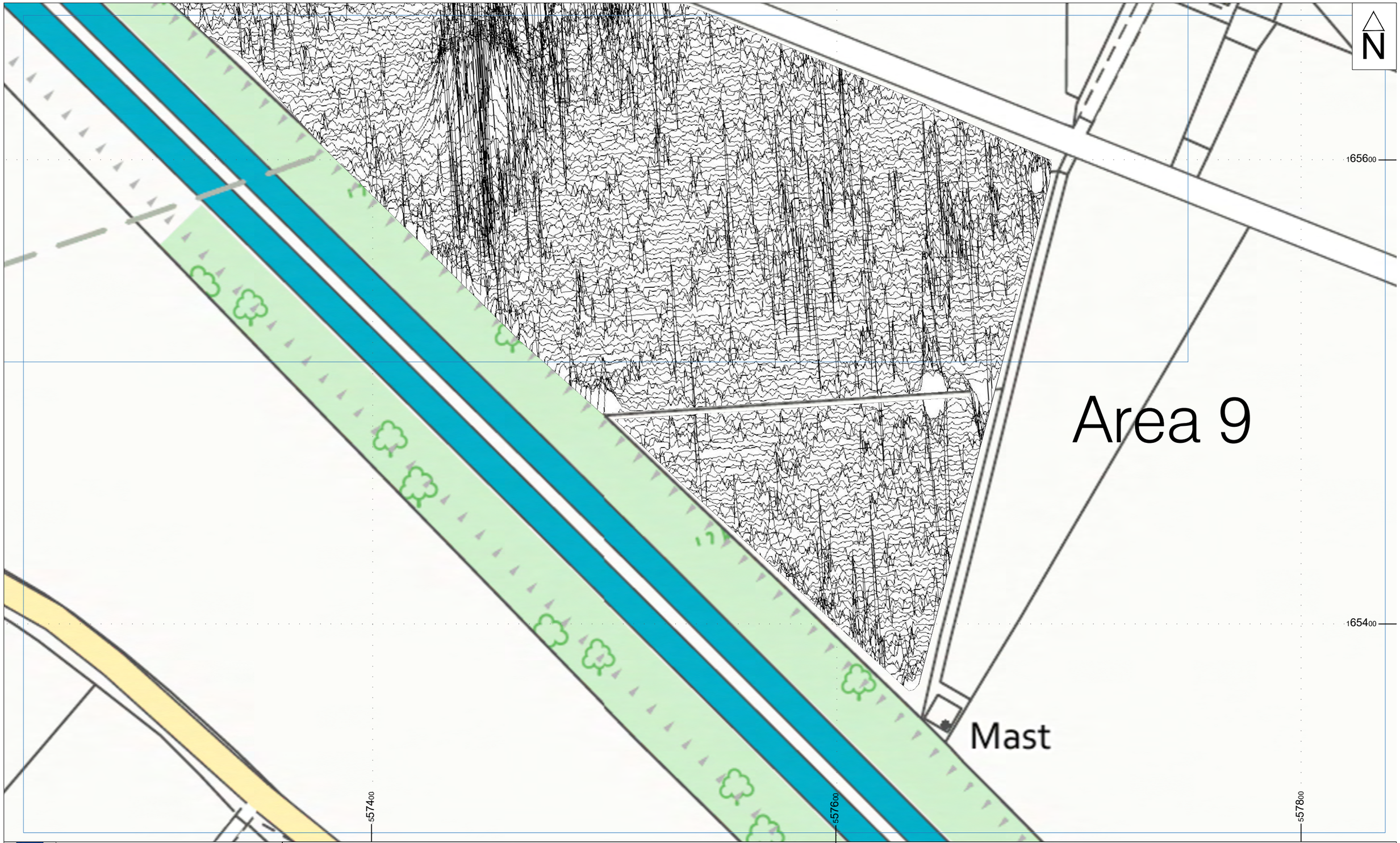
Title

SECTOR BOUNDARY

-1.0 2.0
nT

0 50m

1:1500 @ A3



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Project ID: XJ72_SFG

XY trace plot of minimally processed magnetometer data; Sector 11

Fig. 35

Title

SECTOR BOUNDARY

15.0 nT/cm

0 50m

1:1500 @ A3

N

1656 00

1654 00

Area 9

Mast

5574 00

5576 00

5578 00

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Project ID: XJ72_SFG

Interpretation of magnetometer data; Sector 11

Fig. 36

Title

- SECTOR BOUNDARY

Interpretation

- FERROUS
- MAGNETIC DISTURBANCE
- OVERHEAD CABLES
- AGRICULTURAL
- GEOLOGY
- UNCERTAIN

0 50m

1:1500 @ A3

Plate 1. General view of Area 1, looking north

Plate 2. General view of Area 1, looking northwest

Plate 3. General view of Area 2, looking southwest

Plate 4. General view of Area 2, looking northeast

Plate 5. General view of Area 3, looking northwest

Plate 6. General view of Area 3, looking northwest

Plate 7. General view of Area 4, looking northwest

Plate 8. General view of Area 4, looking southeast

Plate 9. General view of Area 4, looking north

Plate 10. General view of Area 5, looking west

Plate 11. General view of Area 5, looking east

Plate 12. General view of Area 6, looking east

Plate 13. General view of Area 7, looking southwest

Plate 14. General view of Area 8, looking north

Plate 15. General view of Area 9, looking west

Plate 16. General view of Area 9, looking west

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 the majority of this survey an eight channel Sensys MX V3 system containing eight FGM650 sensors was also used which was towed across the area using an ATV. Readings were taken every 20MHz (between 0.05 and 0.1m). Data was be recorded onto a device, using a Carlson GNSS Smart antenna, for centimetre accuracy. These readings were stored in the memory of the instrument and downloaded for processing and interpretation.

A Bartington Grad601 magnetic gradiometer was used in Area 8, 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

For the handheld survey, 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. During the cart survey, data was recorded onto a device, using a Carlson GNSS BRx7 Smart antenna, for centimetre accuracy. These readings were stored in the memory of the instrument and downloaded for processing and interpretation. The accuracy of the BRx7 is between 0.15cm – 0.8cm. The BRx7 has a built-in tilt sensor to correct collected point coordinates to within 2cm.

The survey grids and survey data were then super-imposed onto a base map provided by the client to produce the displayed block locations. However, it should be noted that Ordnance Survey positional accuracy for digital map data has an error of 0.5m for urban and floodplain areas, 1.0m for rural areas and 2.5m for mountain and moorland areas. This potential error must be considered if 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 and metadata

The geophysical archive comprises:-

- an archive disk containing compressed (WinZip 8) files of the raw data, report text (Microsoft Word 2003), and graphics files (Adobe Illustrator CS6 and AutoCAD 2017) 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 Kent Historic Environment Record).

Appendix 4: Oasis form

OASIS Summary for archaeol11-518692

OASIS ID (UID)	archaeol11-518692
Project Name	Geophysical Survey, Magnetometry Survey at Chimmens Solar Farm, Fawkham, Kent
Sitename	Chimmens Solar Farm, Fawkham, Kent
Sitecode	SFG23
Project Identifier(s)	XJ72
Activity type	Geophysical Survey, Magnetometry Survey, MAGNETOMETRY SURVEY
Planning Id	
Reason For Investigation	Planning requirement
Organisation Responsible for work	Archaeological Services WYAS
Project Dates	15-May-2023 - 18-Aug-2023
Location	Chimmens Solar Farm, Fawkham, Kent NGR : TQ 56863 66869 LL : 51.379203645683795, 0.252579422485221 12 Fig : 556863,166869
Administrative Areas	Country : England County : Kent District : Sevenoaks Parish : Horton Kirby and South Darenth
Project Methodology	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 the majority of this survey an eight channel Sensys MX V3 system containing eight FGM650 sensors was also used which was towed across the area using an ATV. Readings were taken every 20MHz (between 0.05 and 0.1m). Data was be recorded onto a device, using a Carlson GNSS Smart antenna, for centimetre accuracy. These readings were stored in the memory of the instrument and downloaded for processing and interpretation. A Bartington Grad601 magnetic gradiometer was used in Area 8, 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.

Project Results	Anomalies of both a definite and a possible archaeological origin have been detected including an enclosure, ditches and pits of a likely Roman date. The location of a possible medieval settlement has also been recorded. Uncertain anomalies throughout the dataset have proved difficult to assign a definite interpretation. Former field boundaries and modern ploughing have been recorded throughout. Large areas of ferrous disturbance within some of the areas may be a result of green waste as they have produced a ‘speckled’ appearance within the data. Magnetic disturbance around the periphery of the fields is due to metal fencing within the boundaries and adjacent buildings. Service pipes have been recorded in a number of the fields. Small-scale geological anomalies have been recorded throughout due to variations within the soils. Larger areas of geological responses are associated with the topography of the site and are likely to be associated with a former water channel. Based on the geophysical survey, the archaeological potential of the Site is deemed to be high in the central areas where the archaeological anomalies have been recorded and low elsewhere.
Keywords	Enclosure - ROMAN - FISH Thesaurus of Monument Types Pit - ROMAN - FISH Thesaurus of Monument Types
Funder	Private or public corporation Pegasus Group
HER	Kent HER - unRev - STANDARD
Person Responsible for work	Emma Brunning
HER Identifiers	
Archives	

Report generated on: 29 Aug 2023, 14:30

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Planning (Listed Buildings and Conservation Areas) Act 1990
Town & Country Planning Act 1990 (as amended)
Planning and Compulsory Purchase Act 2004

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Suite 4 Pioneer House, Vision Park, Histon, Cambridge, CB24 9NL
T 01223 202100
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