eas

Engineering Archaeological Services Ltd.

Land Adjacent to Bryn Hyfryd, Llanrwst, LL26 0HU:

Geophysical Survey

Commissioned by

CR Archaeology

Analysis by

I.P. Brooks

Engineering Archaeological Services Ltd

EAS Client Report 2020/08

Engineering Archaeological Services Ltd is

Registered in England No 286978

CONTENTS

List of Illustrations

NGR

Centred on: SH 80266 61605

Location and Topography (Figures 1 and 2)

The survey area lies either side of the track leading to Bryn Hyfryd, School Bank Road, Llanrwst, LL26 0HU. The largest of the survey areas (Area 1) lies to the north of the track, whilst the smaller survey area (Area 2) is to the south. Both fields were under pasture at the time of the survey, with the grass in the southern field being slightly longer. Both fields slope down to the south west with a plateau at the top of the northern field and a low lying, slightly reedy area in the south west sector of the field.

The survey took place on 12th September 2020.

Archaeological Background

It is intended to construct sixteen new houses and associated facilities on the field immediately to the north of Bryn Hyfryd, School Bank Road, Llanrwst, LL26 0HU (Planning Application 0/47526). As part of the planning process the Gwynedd Archaeological Planning Service recommended an initial evaluation comprising a geophysical survey and desk-top study.

Aims of Survey

1. To investigate, define and record any potentially archaeological features within the survey areas.

SUMMARY OF RESULTS

A Fluxgate Gradiometer Survey was undertaken in the fields either side of the track leading to Bryn Hyfryd, School Bank Road, Llanrwst, LL26 0HU on 12th September 2020. Two areas were surveyed, with the larger area being to the north of the track. There is a concentration of magnetic anomalies in the western part of Area 1 with a potential building, three areas of mixed magnetic response and possible field boundaries having been located.

Gwnaethpwyd Arolwg Graddiomedr Fluxgate yn y caeau bob ochr i'r trac sy'n arwain at Bryn Hyfryd, School Bank Road, Llanrwst, LL26 0HU ar 12fed Medi 2020. Arolygwyd dwy ardal. Yr ardal fwy oedd yr un i'r gogledd o'r trac. Mae crynodiad o anomaleddau magnetig yn rhan orllewinol Ardal 1 gydag adeilad posib. Mae tair ardal o ymateb magnetig cymysg a ffiniau caeau posibl wedi'u lleoli.

Methods

The survey was based on a series of thirty, 20 x 20 m squares laid out as in Figure 2. Readings were taken with a Geoscan FM256 Fluxgate Gradiometer at 0.25 m intervals along transects 1 m apart. The surveys were downloaded onto a laptop, on site, and processed using Geoscan Research "Geoplot" v.4.00. The X - Y plots were produced by exporting the data and processing it using Golden Software "Surfer" v. 10.7.972

A limited number of soils samples were taken to access the Magnetic Susceptibility on the site. These were dried out in a warming oven, sieved and processed using a Bartington MS2 Magnetic Susceptibility Meter.

Survey Results:

Area

Area 1: 0.83 Ha.

Area 2: 0.16 Ha

Display

The results are displayed as grey scale images (Figures 3 and 6) and as X-Y trace plots (Figures 4 and 7). The interpretation plots are shown as Figure 5 and 8. The Magnetic Susceptibility results are summarised on Figure 9 and the survey, as a whole, is summarised on Figure 10.

Results:

Fluxgate Gradiometer Survey

Area 1 (Figures 3 – 5)

The effect of the fences and other modern metal objects, which surround the field, can be shown as a series of ferromagnetic responses, shown in blue on Figure 5. Anomalies A and B can be related to the proximity of metal fencing whilst Anomaly C relates to the depth gauge and its associated fencing and equipment just outside the survey area. Further modern disturbance is shown by Anomaly D, in the eastern corner of the survey which is related to the farm buildings in this part of the site. The disturbance is partly from a demolished brick building and a metal sheep race, but also to the general level of disturbance around the buildings.

There is a distinctive group of magnetic anomalies in the south western end of the field. Anomaly E forms a distinct rectangle, approximately 15 x 10 m in size, which appears to be subdivided into three cells. Given the size and form of this anomaly it is likely to be a building. The relatively high readings in part of this anomaly (+21 nT) may suggest the use of ceramic material such as brick may have been used for the construction. There are two large areas of magnetic disturbance (Anomalies F and G). Anomaly F is approximately 13 m in diameter and Anomaly G is 16 m in diameter. Both have quite mixed responses with readings varying between +26 and – 17 nT in almost a random arrangement. The origins of these anomalies are uncertain, whilst they may be infilled ponds or other hollows, they could also be the magnetic response to such archaeological features as burnt mounds. A third area of magnetic disturbance (Anomaly H) forms a crescent approximately 17 x 5 m in size. It has a magnetic signature similar to Anomalies F and G and may have a similar origin.

Anomaly I is a rough "L" shaped anomaly approximately 47 m long with its long axis aligned NE – SW. In such, it is roughly parallel with the possible building (Anomaly E) to which it may be contemporary. Each leg of this anomaly is approximately 4 m wide with the short leg being

approximately 12.5 m long. Assuming this anomaly represents a field boundary, the width of each leg of the anomaly may suggest a major boundary such as an earthen bank or clawdd type boundary. Anomaly J is a linear anomaly that runs at right angles to the long leg of Anomaly I and may therefore be contemporary.

The three, parallel, feint, linear anomalies (Anomalies K, L and M) are probably the result of drainage features within the field.

Area 2

Only a limited number of magnetic anomalies were located within Area 2. The ferromagnetic response along the north western side of the survey area (Anomaly N) diverges from the field boundary and is therefore likely to be a modern service. The only anomaly of possible archaeological origins (Anomaly O) is in the centre of Area 2. This is a roughly oval anomaly approximately 7 x 5 m in size of unknown origins.

The feint, parallel, linear anomalies (Anomalies P and Q) are likely to be the response to modern drainage within the field.

Magnetic Susceptibility (Figure 9)

Twelve, small, soil samples were taken for Magnetic Susceptibility analysis. It was not possible, however, to obtain a subsoil sample for comparison. Both volume susceptibility (direct reading of the samples) and mass susceptibility (reading compensated for the varying mass of the samples) is given below. The location of the samples is shown on Figure 2 and the results on Figure 9.

Sample	Volume susceptibility χ_v	Mass susceptibility χ_m
Grid 1	23	30.4
Grid 3	84	130.2
Grid 5	51	61.7
Grid 7	71	84.7
Grid 9	30	41.8
Grid 11	58	84.4
Grid 13	35	45.6
Grid 17	82	113.6
Grid 19	70	103.6
Grid 24	107	136.1
Grid 27	111	151.0
Grid 30	76	112.6

The samples, as measured, are generally of moderate to high values suggesting that, the conditions for magnetic survey were suitable.

Assuming a consistent geological regime across the survey area the magnetic susceptibility can be used as a proxy for the level of archaeological activity (Clark, 1996, 99). Those recorded from the survey area, however have a range of values that do not necessarily follow the distribution of anomalies within the survey. It would seem likely that the geology is not consistent within the survey area with soils with a higher magnetic susceptibility on the slopes and upper parts of the field. Within each of the broad zones, however, the values, as recorded generally follow the density of magnetic anomalies recorded.

Conclusions (Figure 10)

It is a fundamental axiom of archaeological geophysics that the absence of features in the survey data does not mean that there is no archaeology present in the survey area only that the techniques used have not detected it.

There would appear to be a concentration of potential archaeological activity in the western half of Area 1 with a potential building aligned approximately NE – SW. This is at a different alignment than the current field system and possibly relates to the similar alignment of Anomalies I and J.

The origins of the mixed magnetic responses in Anomalies F G and H is not known, however given their location in the lower part of the survey area it is possible that they are infilled hollows or pools. Another possible interpretation is that they contain randomly aligned magnetic objects, such as heated stones, and may therefore be the response to a feature such as a burnt mound.

References

Clark, A. 1996. *Seeing beneath the soil prospecting methods in archaeology.* Routledge, London

Acknowledgements

This survey was commissioned by CR Archaeology, based on recommendations made by Tom Fildes of the Gwynedd Archaeological Planning Service.

Techniques of Geophysical Survey:

Magnetometry:

This relies on variations in soil magnetic susceptibility and magnetic remanence which often result from past human activities. Using a Fluxgate Gradiometer these variations can be mapped, or a rapid evaluation of archaeological potential can be made by scanning.

Resistivity:

This relies on variations in the electrical conductivity of the soil and subsoil which in general is related to soil moisture levels. As such, results can be seasonally dependant. Slower than Magnetometry this technique is best suited to locating positive features such as buried walls that give rise to high resistance anomalies.

Resistance Tomography

Builds up a vertical profile or pseudo-section through deposits by taking resistivity readings along a transect using a range of different probe spacings.

Magnetic Susceptibility:

Variations in soil magnetic susceptibility occur naturally but can be greatly enhanced by human activity. Information on the enhancement of magnetic susceptibility can be used to ascertain the suitability of a site for magnetic survey and for targeting areas of potential archaeological activity when extensive sites need to be investigated. Very large areas can be rapidly evaluated and specific areas identified for detailed survey by gradiometer.

Instrumentation:

1. Fluxgate Gradiometer - Geoscan FM256

2. Resistance Meter - Geoscan RM15

3. Magnetic Susceptibility Meter - Bartington MS2

4. Geopulse Imager 25 - Campus

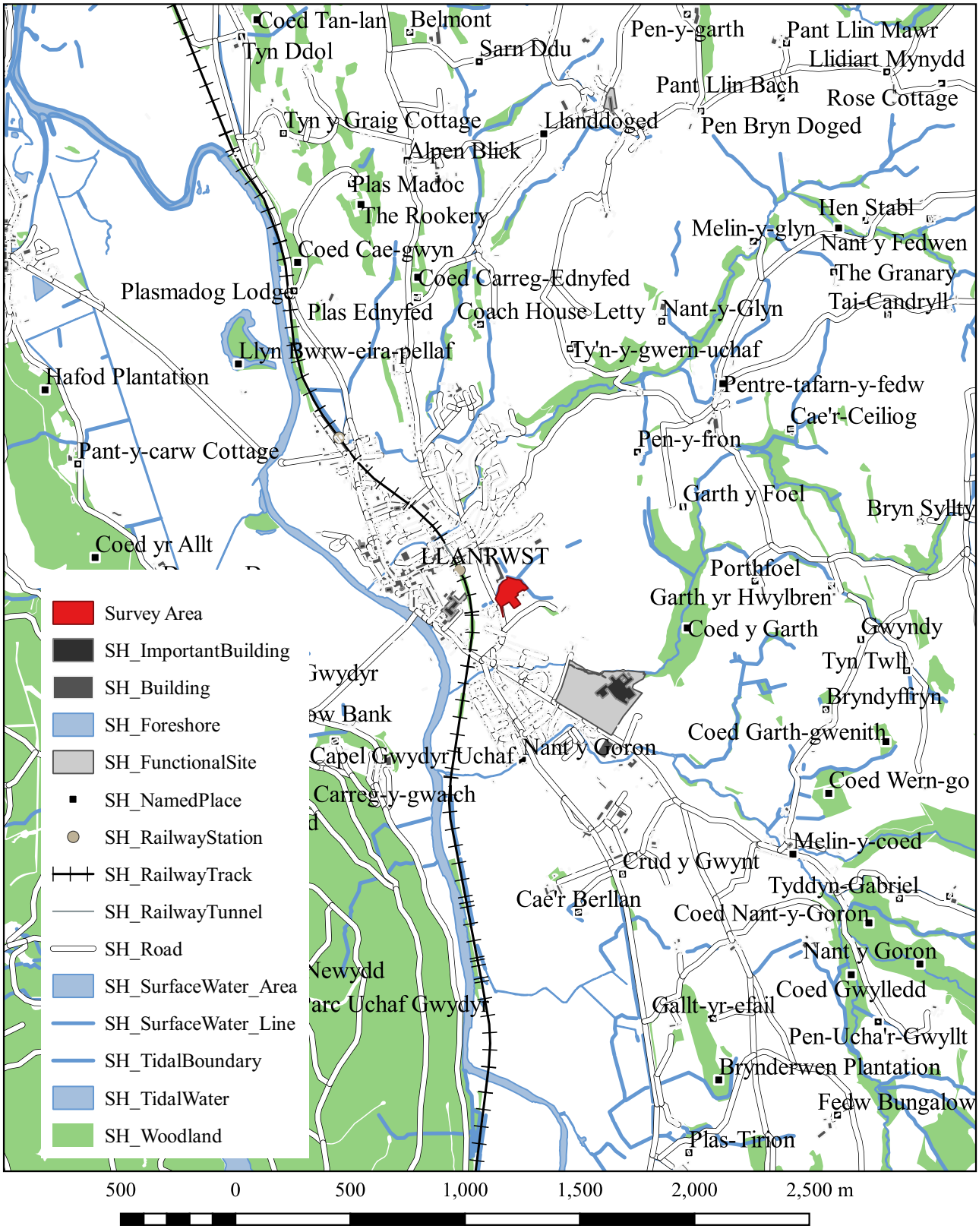
Methodology:

For Gradiometer and Resistivity Survey 20m x 20m or 30m x 30m grids are laid out over the survey area. Gradiometer readings are logged between 0.25m and 1m intervals along traverses 1m apart. Resistance meter readings are logged at 0.5m or 1m intervals. Data is down-loaded to a laptop computer in the field for initial configuration and analysis. Final analysis is carried out back at base.

For scanning transects are laid out at 10m intervals. Any anomalies noticed are where possible traced and recorded on the location plan.

For Magnetic Susceptibility survey, a large grid is laid out and readings logged at 20m intervals along traverses 20m apart, data is again configured and analysed on a laptop computer.

Copyright:



Based on Ordnance Survey Open Source Data

Figure 1: Location
Scale 1:25,000

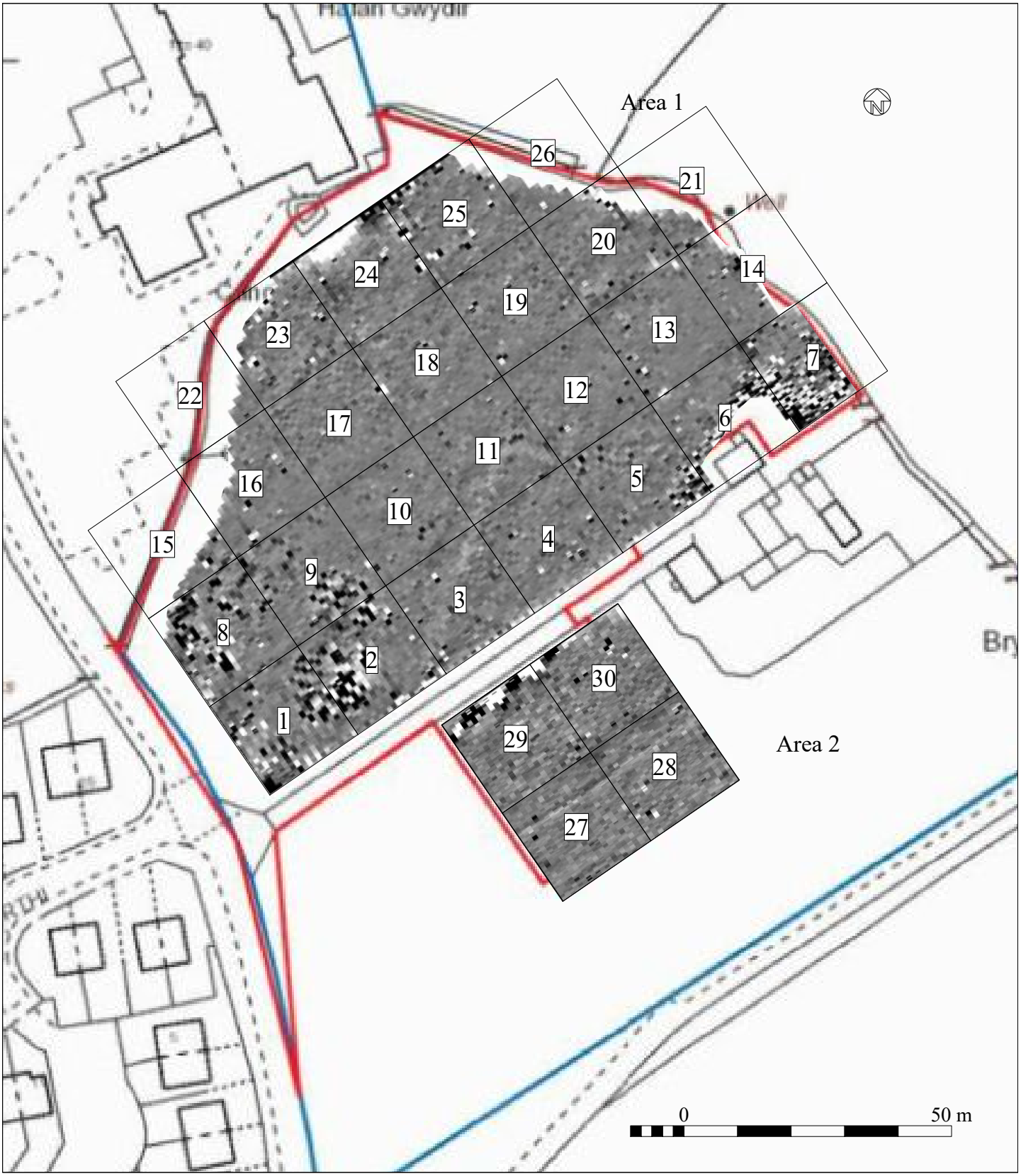


Figure 2: Location of the Survey Area
Scale 1:1000

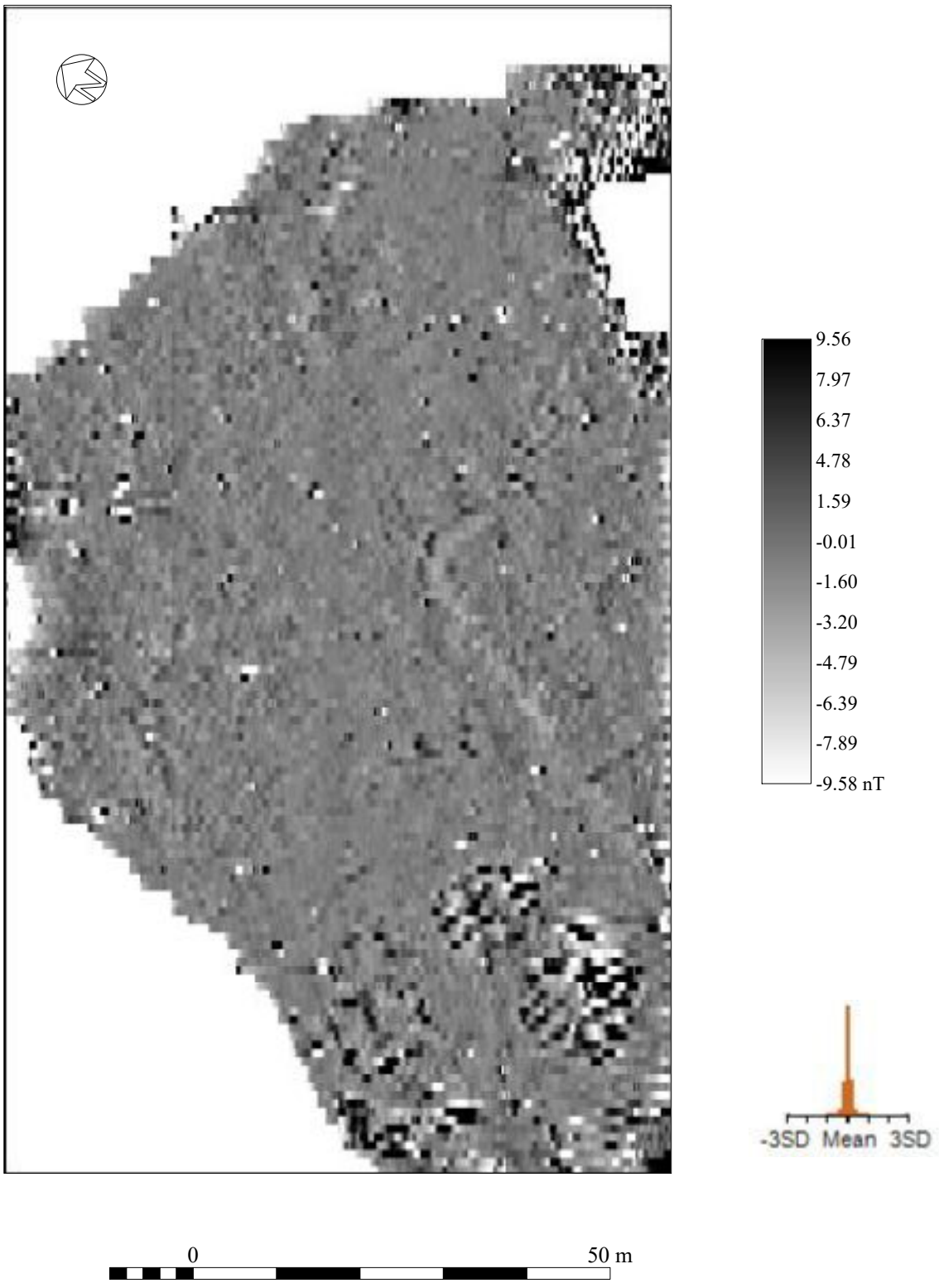


Figure 3: Area 1, Grey Scale Plot
Scale 1:750

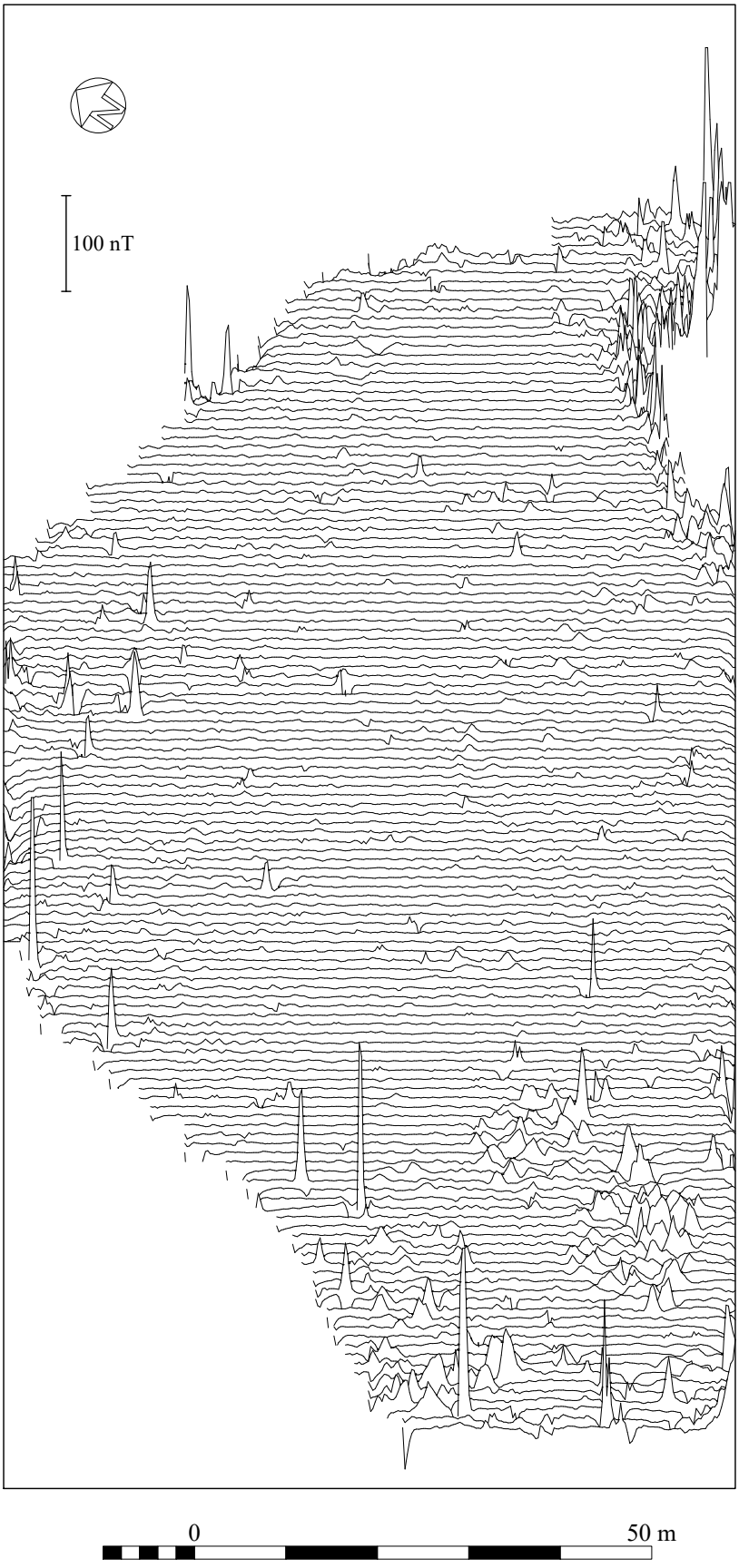
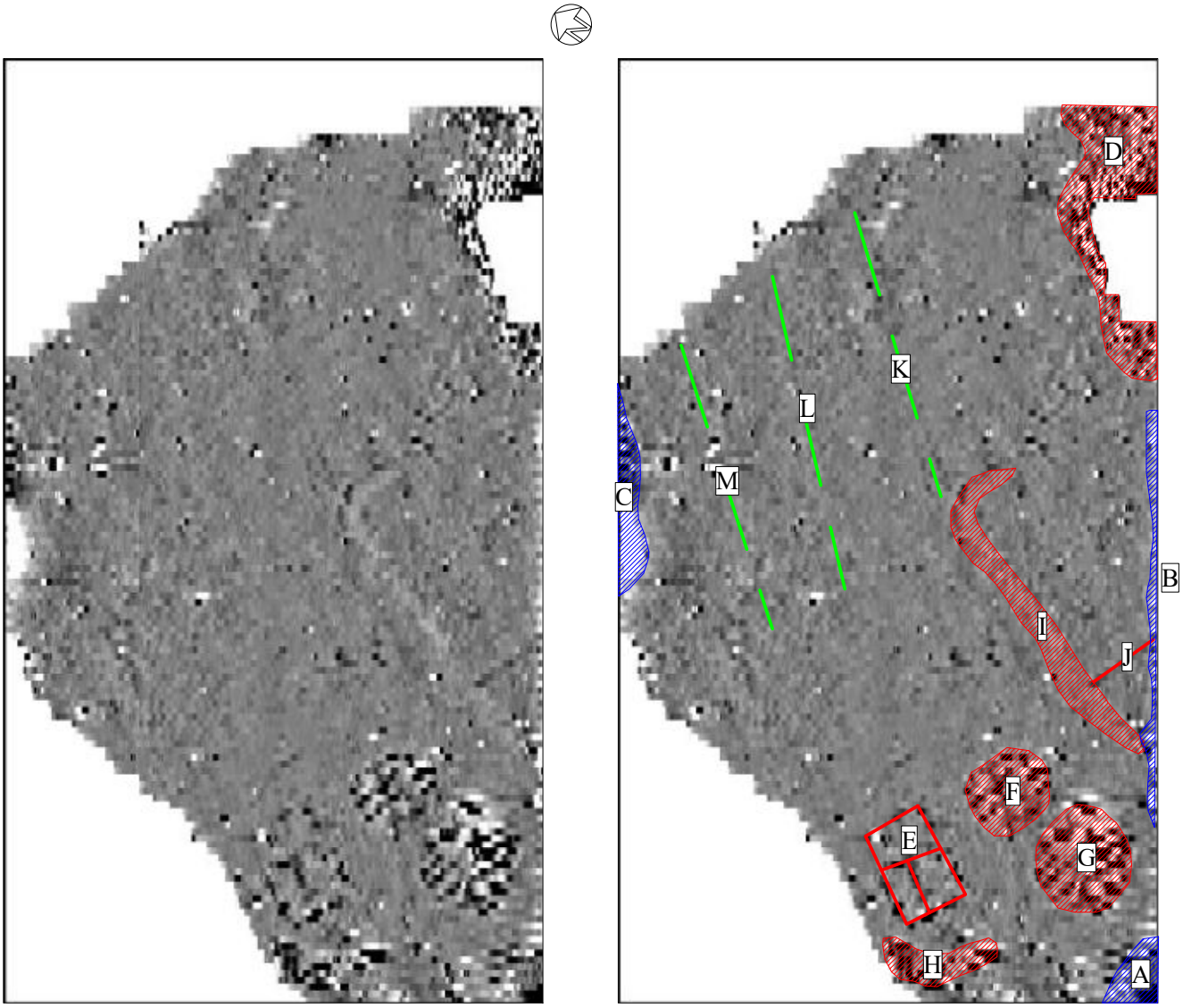


Figure 4: Area 1, X-Y Plot
Scale 1:750



Area of magnetic disturbance
Linear Anomaly
Ferromagnetic response
Feint linear anomaly (probably drainage)

Figure 5: Area 1, Interpretation
Scale 1:1,000

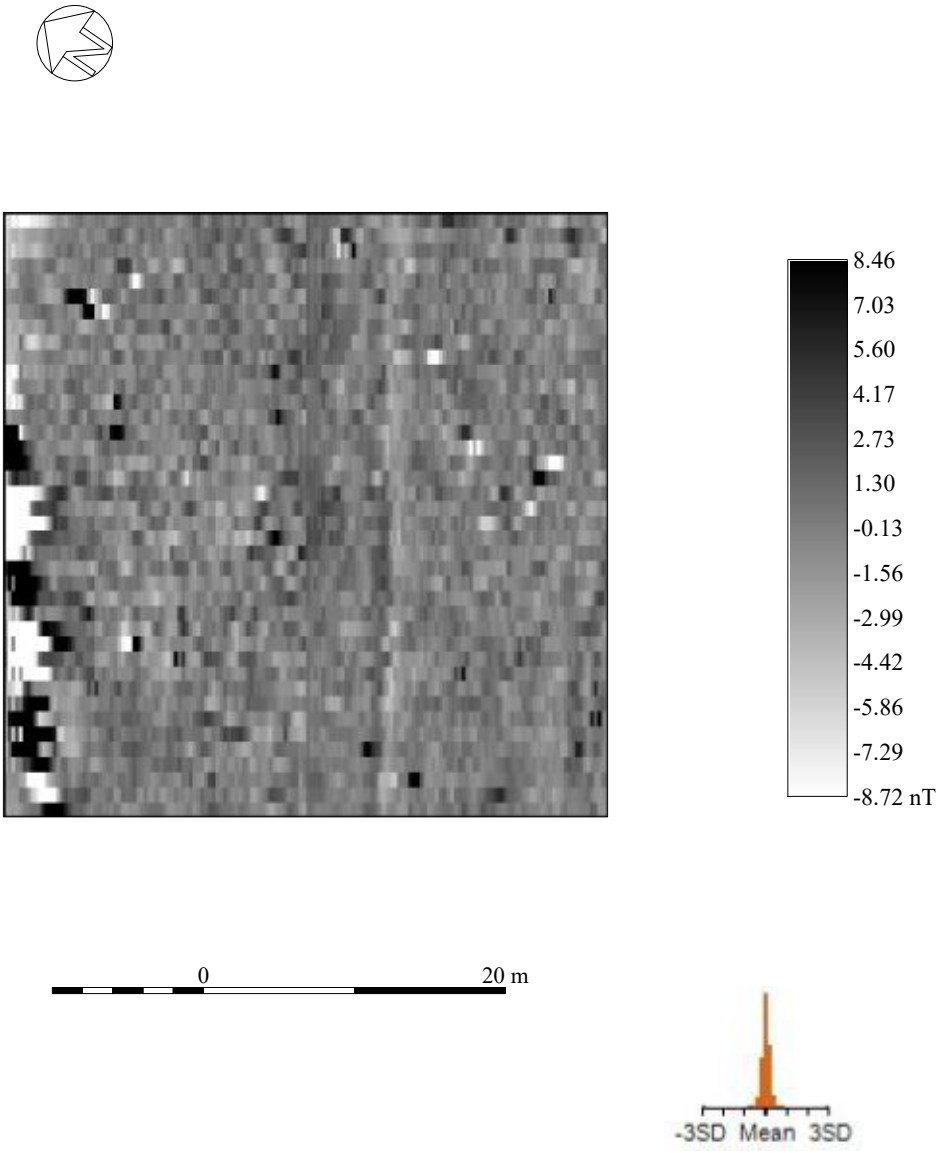


Figure 6: Area 2 Grey Scale Plot
Scale 1:500

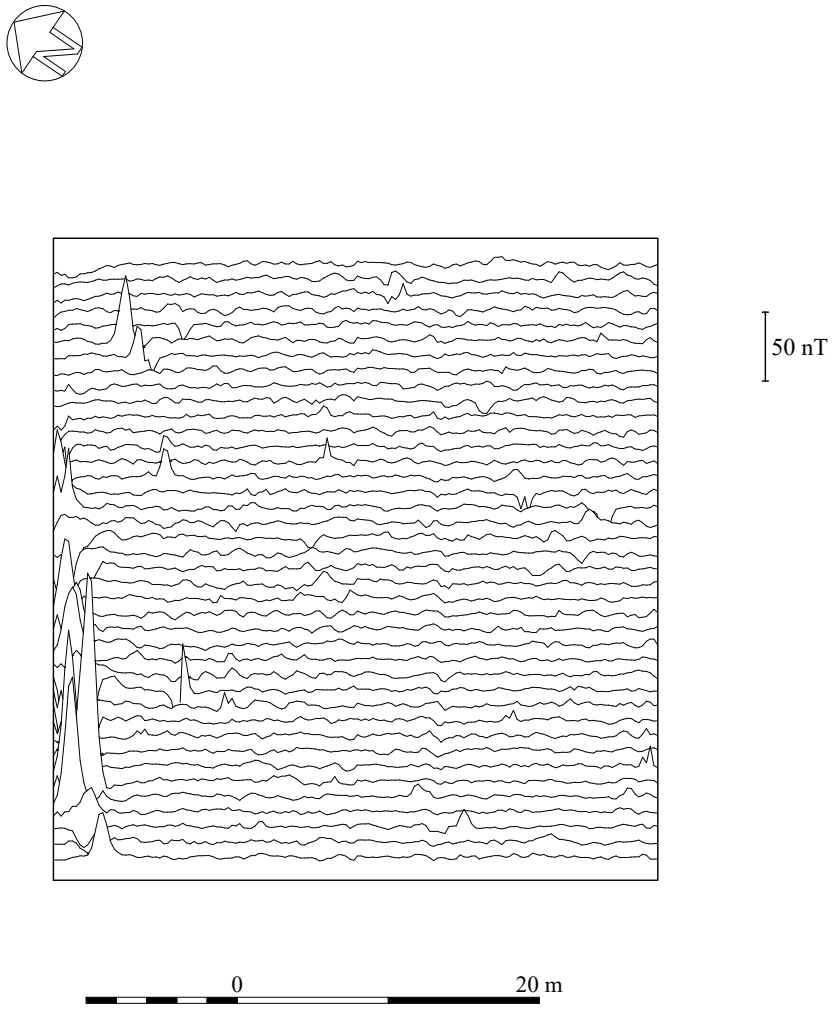
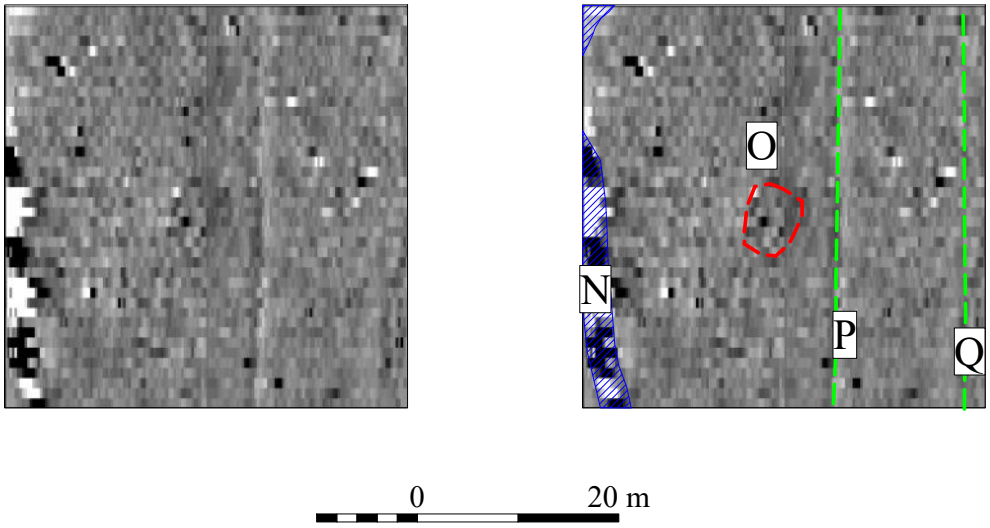


Figure 7: Area 2, X-Y Plot
Scale 1:500



Ferromagnetic response

Possible Linear Anomaly

Feint linear anomaly (probably drainage)

Figure 8: Area 2, Interpretation
Scale 1:750

Figure 9: Magnetic Susceptibility
Scale 1:1,000

Figure 10: Summary
Scale 1:1,000