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Engineering Archaeological Services Ltd.

Caerau Farm, Llandewi Velfrey, Pembrokeshire: Geophysical Survey 3

Analysis by
I.P. Brooks

EAS Client report 2018/14

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Commissioned by Trysor

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Engineering Archaeological Services Ltd is

Registered in England No 286978

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December 2018

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Technical Information:

NGR

Centred on: SN 13804 16267

Location and Topography (Figures 1 and 2)

The survey area was approximately 280 m NNW of Caerau Farm, Llanddewi Velfrey, Narberth, Pembrokeshire and 450 m east of Henllan Farm. It was located at the north eastern end of a field and was in effect an extension of the previous survey in this field (Brooks 2018b). The survey area had a slight slope down to the south which became slightly steeper towards the western end of the survey area. The northern side of the survey area is defined by the field boundary and to the east is the Stepin Plantation defined by a distinct wood bank.

At the time of survey, the field was under permanent pasture, although there was marked poaching in places, particularly along the eastern boundary of the field.

The survey took place on 4th December 2018.

Archaeological Background

It is intended to construct a stable complex within the survey area (Pembrokeshire Planning number 18/0422/PA). This is the third fluxgate gradiometer survey associated with this development (Figure 1) each looking at different potential sites for the stables. The first survey (Brooks 2018 a) was in a field approximately 185 m to the south west (Figure 1, Area 1), which revealed a set of magnetic anomalies which have been interpreted as part of an extended settlement, probably associated with the Caerau Gaer defended enclosure https://www.archwilio.org.uk/arch/query/page.php?watprn=DAT4905&dbname=dat&tbname=core). The second survey too place in the north western corner of the same field as the current survey (Figure 1, Area 2), locating a series of linear anomalies which appeared to represent a series of rectilinear enclosures and other anomalies (Brooks 2018b). Mike Ings of the Dyfed Archaeological Trust, acting as advisers to Pembrokeshire County Council, has recommended an archaeological field evaluation, to include the current geophysical survey and a desk-top study, before any works are undertaken.

The current survey was commissioned by Trysor as part of the field evaluation.

Aims of Survey

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

SUMMARY OF RESULTS

The survey continues the series of magnetic anomalies revealed in the previous survey. The range of anomalies recorded form a less clear pattern than the previous survey, but include a range of linear anomalies extending the line of the previously record anomalies, a possible lane and areas of magnetic disturbance. These anomalies concentrate in the eastern two third of the survey area with a markedly quieter area along the western side of the survey. The magnetic susceptibility readings suggests variable archaeological activity across the survey area, but generally corresponds with the fluxgate gradiometer survey.

Methods

The survey consisted of fourteen 20 x 20 m grid squares laid out as in Figure 2. Readings were taken at 0.25 m intervals along transects 1 m apart using a Geoscan FM256 Fluxgate Gradiometer. Grey scale plots were produced using Geoscan Research "Geoplot" v.3.00v and X - Y plots were produced using Golden Software "Surfer" v. 10.7.972.

Small soil samples were taken for Magnetic Susceptibility analysis from the grid squares (Figure 6). These were dried, sieved through a 2mm sieve and analysed using a Bartington MS2 Magnetic Susceptibility meter and MS2B detector

Survey Results:

Area

0.56 Ha

Display

The results are displayed as a grey scale image (Figure 3) and as X-Y trace plot (Figure 4). Interpretation plots are shown as Figure 5 and the data is summarised in Figure 7. A summary of the magnetic anomalies recorded from all of the three surveys is shown on Figure 8.

Results:

Fluxgate Gradiometer Survey

The Fluxgate Gradiometer Survey revealed a series of linear magnetic anomalies together with areas of general magnetic disturbance. Two of these anomalies are of sufficiently high values to suggest they are ferromagnetic responses. Anomaly A (Figure 5) marks the proximity of the fence in this part of the survey, whilst Anomaly B correlates with Anomaly G of the previous survey (Brooks 2018b, Figure 6) an is of an unknow origins.

A linear anomaly crosses much of the survey area (Anomalies C, D and E) and continues the line of one of the anomalies recorded in the previous survey (Anomaly J, Brooks 2018b). There appears to be a possible in turned entrance through this anomaly between Anomalies D and E. There is no obvious sign of the northern, parallel linear anomaly (Anomaly I, Brooks 2018b) from the previous survey, however this would have run into the area near to the gateway into the field and Anomaly A.

A second, southern, linear anomaly, however, runs along the southern edge of the survey area (Anomalies M, I and J) and is roughly parallel with the previous anomaly group at a distance of approximately 22 m. Crossing across this anomaly and approaching, but not crossing the initial linear anomaly is a double linear anomaly (Anomaly H) with a splayed entrance at its northern end. This is generally2.5 m wide, but widens to approximately 9 m at its northern end and probably represents a lane or trackway crossing the survey area. Given its alignment and relationship to the two major linear anomalies it is probably of a different date, although whether this is earlier or later is not known. It is, however, possibly related to an oval anomaly (Anomaly P) to the east which appears to be attached to a linear anomaly (Anomaly Q) which runs roughly east west for approximately 35 m

The central area of the current survey has a large cross shaped anomaly (Anomaly F and G) with relatively high value readings varying between +10 and -11 nT. Whilst this is probably the result of archaeological activity similar responses have been recorded from lighting strikes producing localised magnetic distortion (Crew 2008).

There are two areas of general magnetic disturbance within the survey. Anomaly N occupies the south western corner of the survey area and appears to be bounded to the south by the linear anomaly (Anomaly M); which forms part of the southern major anomaly. It covers an area of approximately 27 x 13 m. The second area of magnetic disturbance (Anomaly O) is to the north of the possible entrance through the northern linear anomaly (Anomalies D and E) and is approximately 27 x 9 m in size. The function of neither of these areas of magnetic disturbance is known.

The three other possible linear anomalies (Anomalies K, L and R) are of unknown origins.

Magnetic Susceptibility (Figure 6)

It was possible to take soil samples in order to assess the magnetic susceptibility of the soils. It was not possible, however, to obtain a subsoil sample for comparison. The location of the magnetic susceptibility samples is shown on Figure 6.

Sample	Volume susceptibility χ_v	Mass susceptibility χ_m
Grid 18	24	29.3
Grid 19	48	62.3
Grid 20	67	80.7
Grid 21	22	29.7
Grid 22	20	25.0
Grid 23	20	27.0
Grid 24	33	43.4
Grid 25	15	23.1
Grid 26	35	46.1
Grid 27	39	56.5
Grid 28	58	79.5
Grid 29	48	58.5
Grid 30	34	41.5
Grid 31	44	54.3

In general, the susceptibilities, as measured, are of moderate values, suggesting that magnetic conditions are suitable for magnetic survey. There is a degree of variability within the measured values with high values particularly in Grid Squares 19, 20 and 28 and lower values towards the eastern end of the survey (Grids 18 and 25). Magnetic susceptibility can be used as a proxy for the level of archaeological activity within the general area of the sample (Clark 1996, 106), thus the increased values from the survey would suggest increased activity in Grid Squares 19, 20 and 28. These would roughly correlate with the results of the fluxgate gradiometer survey with the area of magnetic disturbance (Anomaly O) in Grid Squares 19 and 20 and Grid Square 28 containing the centre of the cross shaped anomaly (Anomalies F and G).

Conclusions (Figures 7 and 8)

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. The current survey continues the area covered by the survey which took place in October 2018 (Brooks 2018b) and to some degree appears to extend the range of anomalies recorded in that survey (Figure 8). There is general band of activity which runs between two roughly parallel anomalies each running ENE – WSW at a distance of approximately 22 m. This band appears to have at least one in turned entrance (between Anomalies D and E), but does not have the dividing, cross boundaries, recorded in the previous survey.

There is, however, a group of anomalies which possibly represent a lane or track with a funnel entrance (Anomaly H) with an oval enclosure to one side (Anomaly P). These do not appear to be contemporary with the main alignment of the site, although whether they are later or earlier is not possible to determine. The major, cross-shaped, anomaly (Anomalies F and G) is of unknown origins, but possibly is the result of a lightning strike in the field, although an archaeological origin cannot be ruled out.

There is a good correlation between the fluxgate gradiometer survey and the magnetic susceptibility samples. Both of these suggesting that there is less archaeological activity at the eastern end of the field, adjacent to the Stepin Plantation.

References

Brooks, I.P 2018a *Caerau Farm, Llandewi Velfrey, Pembrokeshire: Geophysical Survey*. EAS Client Report 2018/11

Brooks, I.P. 2018b *Caerau Farm, Llandewi Velfrey, Pembrokeshire: Geophysical Survey 3*. EAS Client Report 2018/12

Clark, A. 1996. *Seeing Beneath the Soil. Prospecting Methods in Archaeology.* Routledge, London

Crew P. 2008 Lightning never strikes twice in the same place - except at Crawcwellt. *Archaeology in Wales 48* 63-67

Acknowledgements

This survey was commissioned by Trysor and the help of Jenny Hall and Paul Sambrook for commissioning the survey and for providing background information is gratefully acknowledged. Access to the field was permitted by Mr. Benjamin Lewis.

Techniques of Geophysical Survey:

Magnetometry:

This relies on variations in soil magnetic susceptibility and magnetic remenance 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 RM4/DL10

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 at either 0.5m or 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.

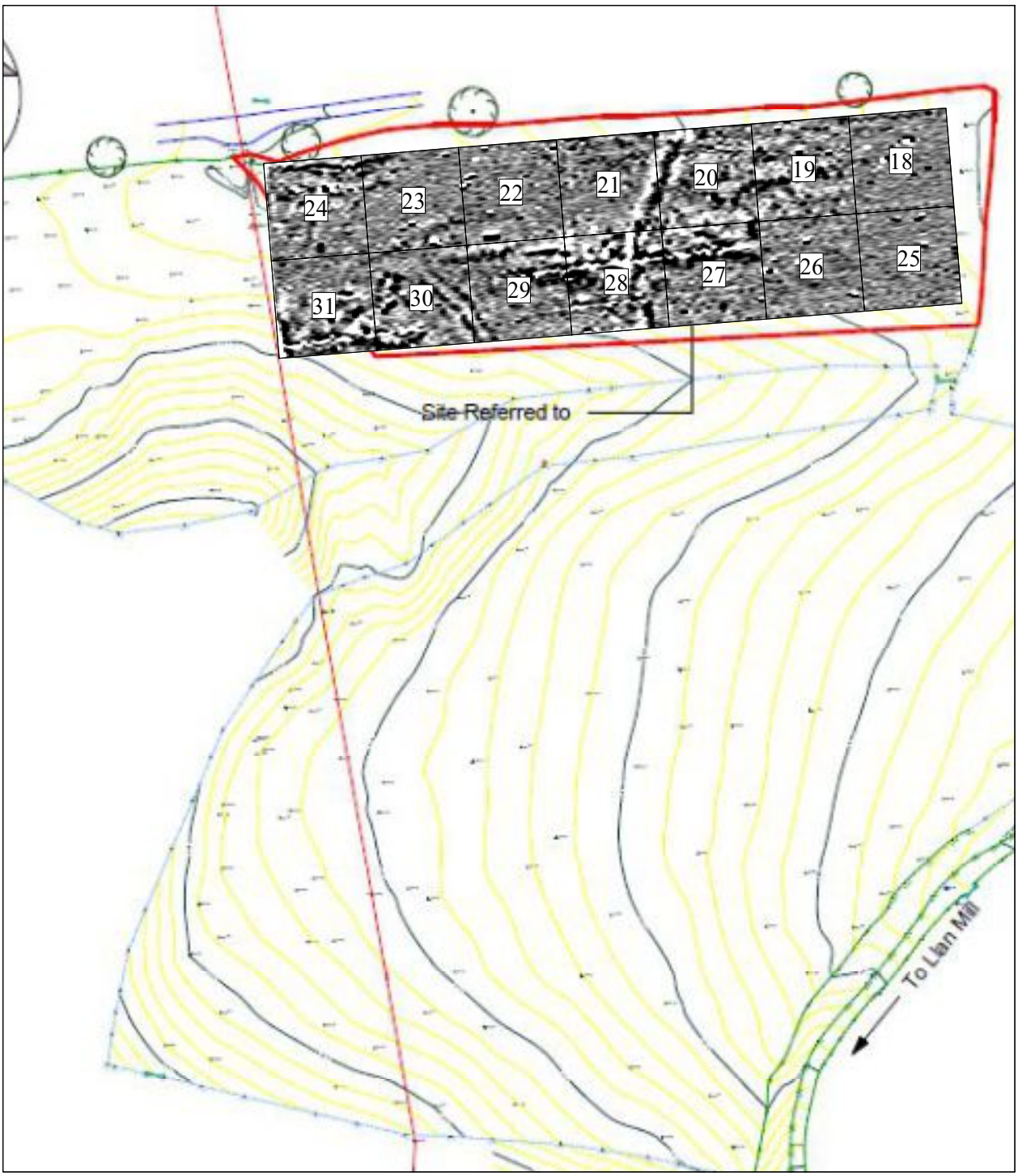
For scanning transects are laid out at 10m intervals. Any anomalies noticed are where possible traced and recorded on the location plan.

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:

Extract from the 1953 Ordnance Survey Pembrokeshire XXIX.NE map

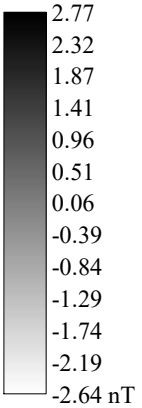
Figure 1: Location
Scale 1:5,000



Based on drawing 01A by
Ken Morgan Design and
Building Management Ltd

0 50 m

Figure 2: Location of the Survey Area
Scale 1:1,250



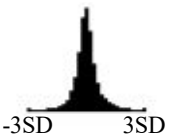


Figure 3: Grey Scale Plot
Scale 1:500

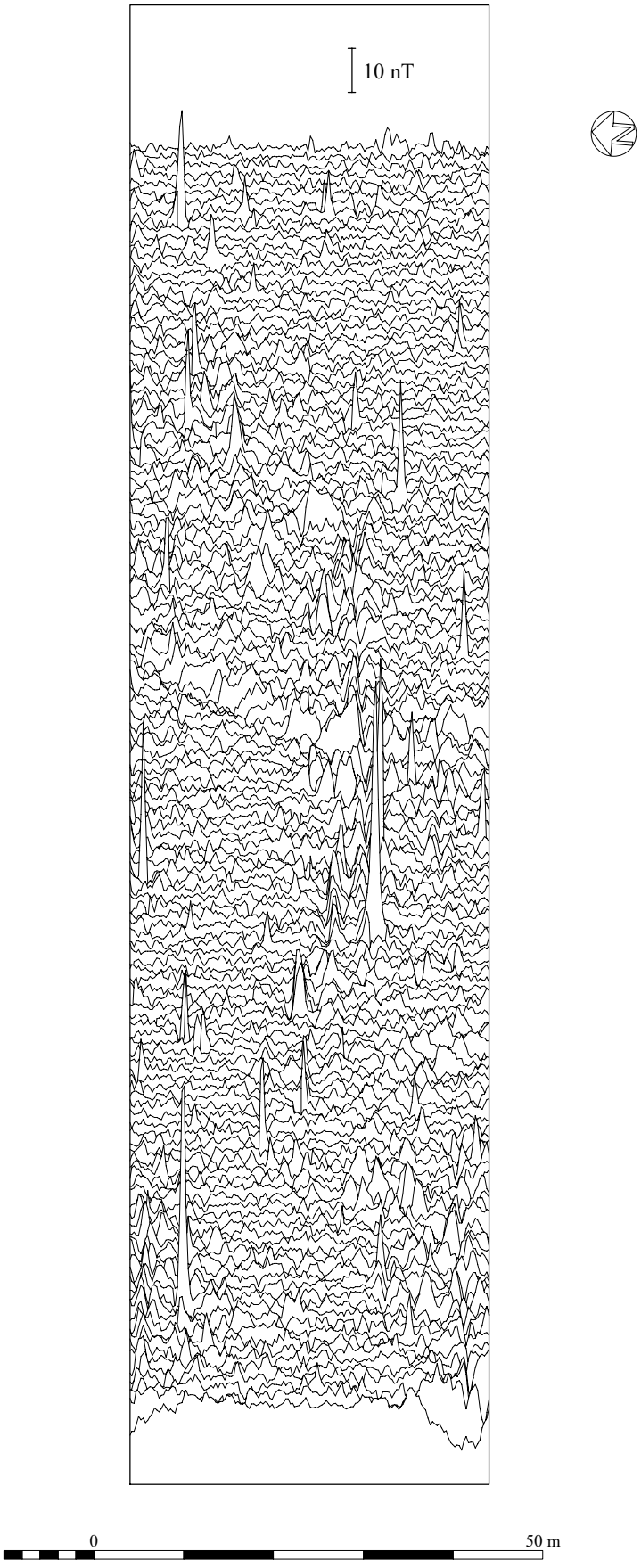


Figure 4: X-Y Plot
Scale 1:750

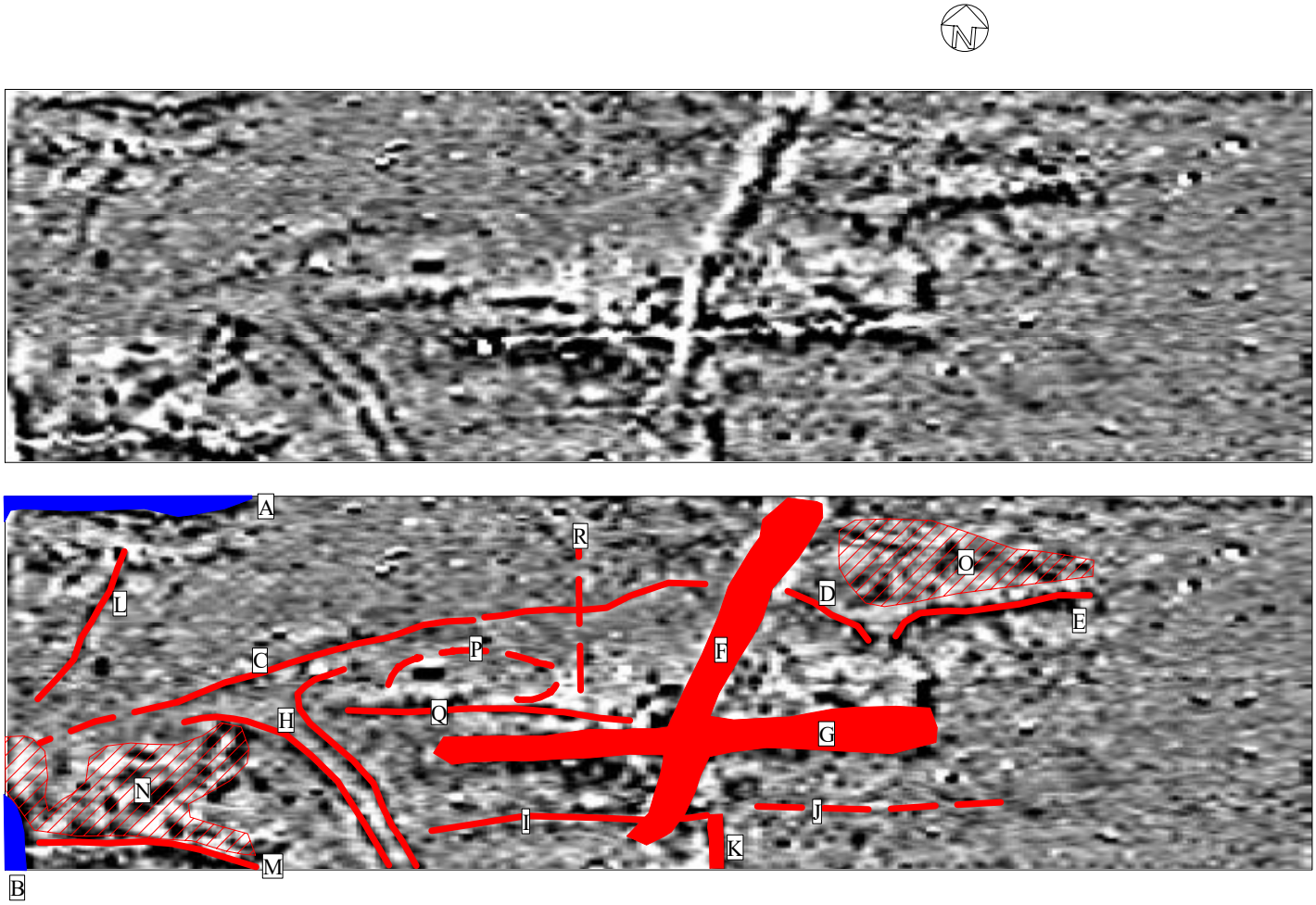
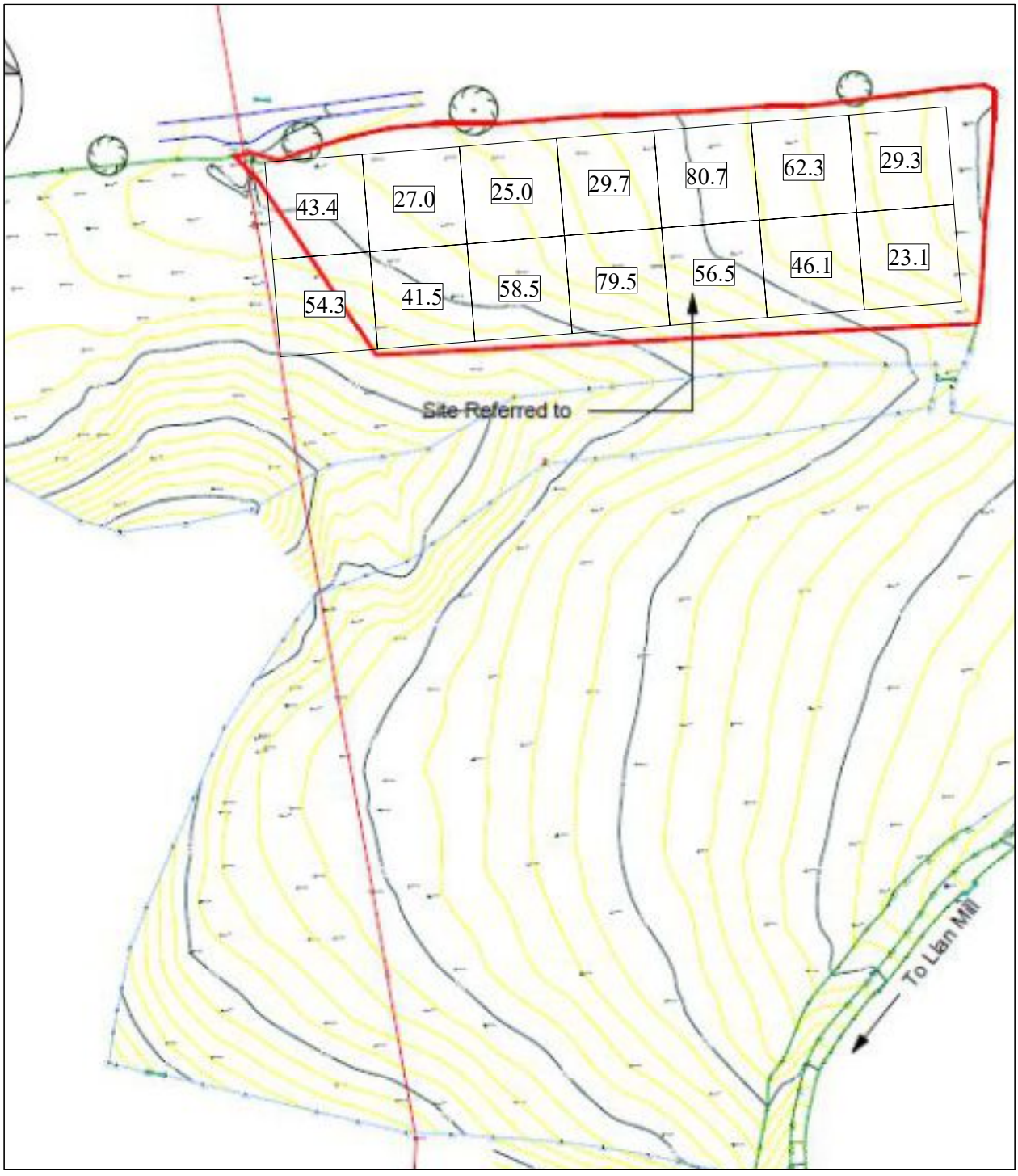
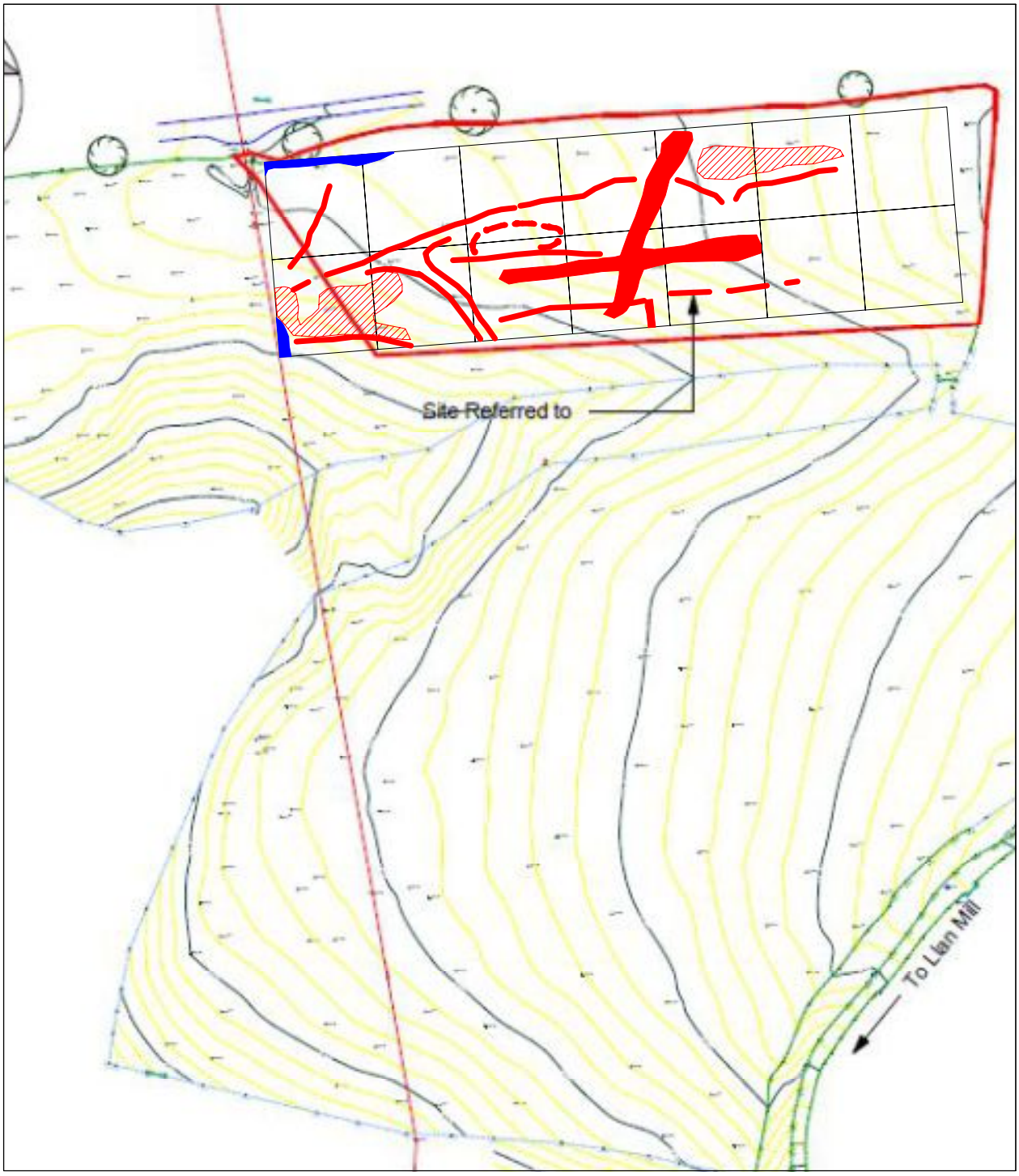


Figure 5: Interpretation
Scale 1:750



Based on drawing 01A by Ken Morgan Design and Building Management Ltd

Figure 6: Magnetic Susceptibility Results
Scale 1:1250



0 50 m

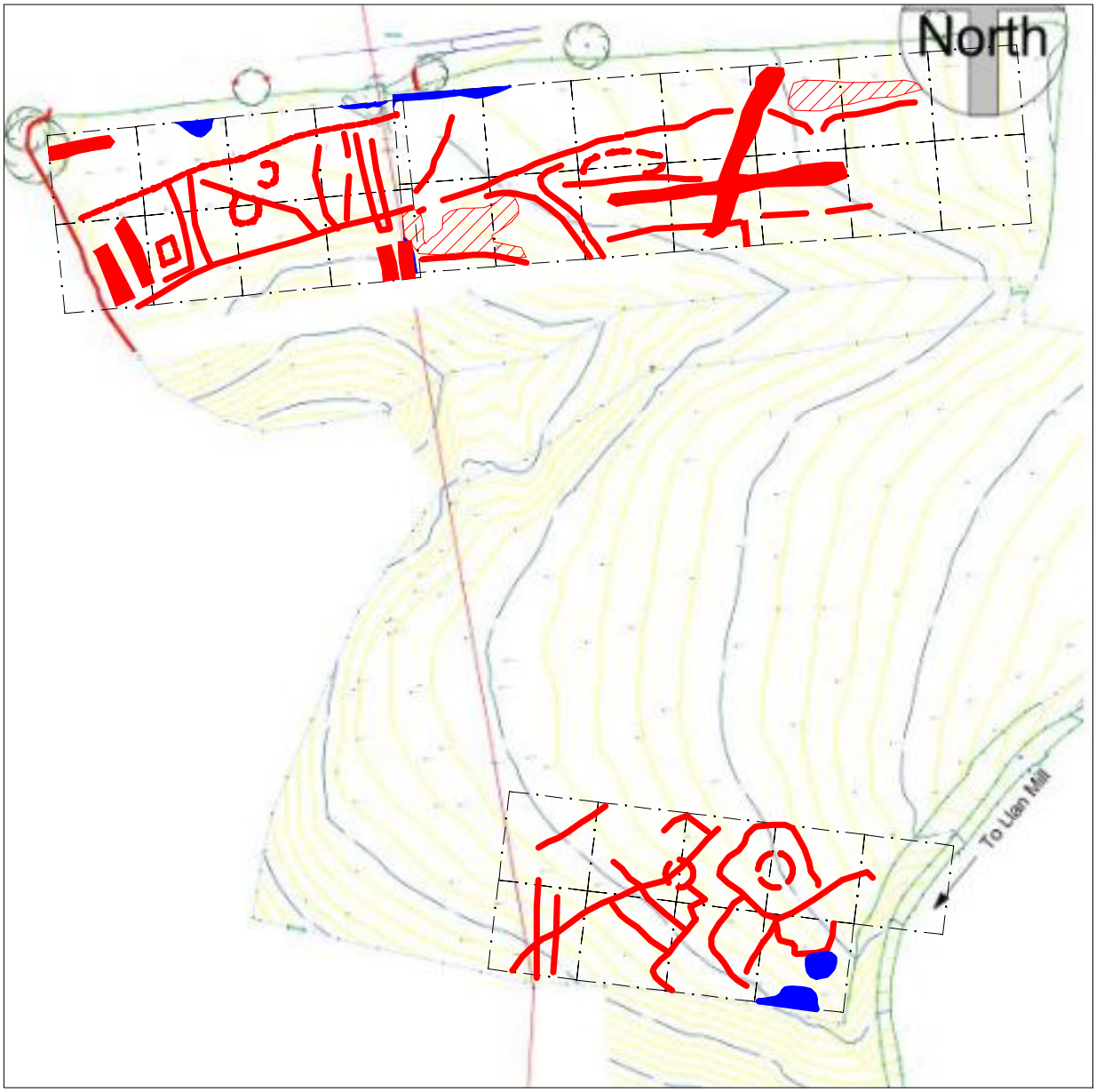
Based on drawing 01A by Ken Morgan Design and Building Management Ltd

Linear anomaly (archaeology)

Possible linear anomaly (archaeology)

Ferromagnetic response

Figure 7: Summary
Scale 1:1,250



Based on drawing 01A by
Ken Morgan Design and
Building Management Ltd

0 100 m

Linear anomaly (archaeology)

Possible linear anomaly (archaeology)

Ferromagnetic response

Figure 8: Project Summary
Scale 1:1,500