Cothelstone Hill, Somerset
Gradiometry Survey, January 2022

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Quantock Landscape Partnership Scheme
Reimagining the Manor

Made possible with Heritage Fund

Quantock Hills Area of Outstanding Natural Beauty

Contents

Acknowledgements

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1.0 Introduction

The gradiometry survey took place at Cothelstone Hill on the southwestern side of the Quantock Hills in Somerset (NGR 318900 132650) on behalf of the Quantock Hills Landscape Partnership. Cothelstone Hill is situated approximately 1km northeast of the village of Cothelstone (fig 1), 9km northwest of the county town of Taunton. The purpose of the survey was to investigate a number of upstanding earthworks following excavations in summer 2021 of a long, linear earthwork which encloses the eastern and southern areas of the site (Brunning, R. and Grove, J. 2002. *Cothelstone Hill hilltop fortifications excavations 2021*. South West Heritage Trust Report).

Cothelstone Hill is the site of a scheduled barrow cemetery (for details of all monuments see Somerset HER ref no. 43292). The survey covered an area of approximately 2.5ha of open heath and scrubland to the west of the crest of the hill (fig 2). The geology of the site is Leighland Slates Member – Slate

The work was carried out by GeoFlo – Southwest Geophysical and Flotation Services.

1.1 Equipment

Fluxgate gradiometer – Bartington Grad 601-2

The Bartington Grad 601-2 is a dual system gradiometer, a form of magnetometer. It comprises two sensor rods carried on a rigid frame, each sensor including two fluxgates aligned at 90° to each other, one set 1m above the other. It measures variations in the magnetic field between the two fluxgates, recorded in *nanoTesla* (nT) at each sampling point within a grid. The manufacturer claims a depth range of approximately three metres. The instrument is most effective when carried at a consistent height, not exceeding 0.3m above the ground.

Magnetometers are especially effective for discovering thoroughly decayed organic materials, such as those which accumulate in ditches and pits, and matter exposed to intensive firing, including industrial areas, hearths and larger ceramics. All of these are likely to give a positive magnetic response, sometimes with a negative halo, giving a dipolar effect. Non-igneous stone features, such as walls and banks, are usually perceived as negative anomalies against a background enhanced by decayed organics.

Software – Geoscan Geoplot 4.00

Geoplot 4.00 allows the presentation of data in four graphical forms: dot-density, grey scale, pattern and X-Y (or *trace*) plots. The latter are particularly effective when used in conjunction with other graphical modes to emphasise ferrous magnetic anomalies or other distortions which show as accentuated peaks or troughs. The programme supports statistical analysis and filtering of data.

1.2 Field method

The area covered by the survey was divided into 20m squares and tied into the OS grid using the Reach RS2 RTK GNSS Receiver (figs 2 and 5).

Readings were logged at 0.25m intervals along northeast to southwest traverses set 1m apart, in a zig zag pattern.

1.3 Processing method

Preliminary processing revealed some interference from modern ferrous magnetic features, characterised by sharp dipolar fluctuations ranging from approximately 30nT to over 3000nT. The first two processing sequences were carried out to mitigate the impact of modern ironwork.

1. Readings exceeding 30nT either side of 0 were replaced by null (dummy) entries.
2. Any anomalous isolated readings were similarly replaced.
3. Typical regular error due to the zig zag operation of the gradiometer was removed.
4. The mean reading for every traverse was reset to 0.
5. The asymmetric data collection pattern was mitigated by the positive interpolation of data points along the Y axis using the calculation of sin(x)/x.

2.0 The survey area *(figs 2 & 5)*

The grid comprises sixty two contiguous whole and partial 20m squares covering approximately 2.5ha of the west side of the hilltop. It is bounded by a scrub hedge to the north and hedging to the west. The eastern and southern survey limits were specified by the client. Several small areas were not surveyable due to dense patches of brambles and scrub. These areas are highlighted in fig 5.

Visible ferrous magnetic disturbance was provided by a substantial fence around three sides of a barrow to the west of the site (**Z**, fig 5).

3.0 The survey results *(figs 3, 4 & 5)*

The survey results reveal a speckling of amorphous non-linear anomalies across the site (fig 3). The fact that these are consistent across the whole survey area suggests this could possibly be due to natural anomalies in the local geology, although slate usually produces good results in magnetometry surveying (Gafney & Gater 2006). Soil formation and processes could also have an impact on the survey. These fluctuations have resulted in a speckled data set which can limit confidence in interpretation of any weaker anomalies. This is particularly evident in the highlighted survey results (fig 4) where readings higher than 10nT are included in the maximum red colour band.

It is also worth noting that whilst setting up for the survey, the surveyors encountered problems finding a magnetically "quiet" area in which to calibrate the gradiometer.

Most of the survey area is crossed by a series linear anomalies. There is a strong northwest – southeast linear trend **H**, fig 5), with an additional sequence of linears running northeast – southwest (**M,** fig 5), particularly in the north-eastern part of the site. Appearance could suggest ploughmarks. The Somerset HER includes a record of medieval and/or post medieval ridge and furrow visible as earthworks on aerial photographs on the southwest facing slope of the hill (HER ref no. 26872), plus a further record of ridged cultivation marks in the north-eastern part of the survey area (HER ref no.44250).

There are also a small number of other linear anomalies on differing alignments which could possibly represent different phases of activity.

The strength of the readings in the identified anomalies is generally high, which can be suggestive of extended anthropogenic activity. However, if the magnetic susceptibility of the soil strongly contrasts with underlying subsoil and/or bedrock that could also explain the overall strength of the readings.

All major anomalies are discussed in ***3.1*** and ***3.2*** below.

3.1 Positive magnetic anomalies *(fig 5)*

A Irregular anomaly within a range of 10 to 30+ nT. Location corresponds with a bowl barrow (Somerset HER ref no. 43031). Readings are within the range for highly thermo remanent/ferrous magnetic material. Whilst carrying out the survey the surveyors noted that a fire had been lit on top of this barrow.

B Two amorphous anomalies within a range of 6 to 17nT. Within normal range for cut features/ deposits of thermo remanent material.

C Major curvilinear anomaly, generally within a range of 10 to 18nT. Corresponds with the location of a circular earthwork identified by the Somerset HER as a post-medieval tree ring circle (HER ref no. 43028).

D Irregular anomaly within a range of 25 to 30+ nT. Corresponds with the location of a bowl barrow (Somerset HER ref no. 43029).

E Long linear anomaly with readings generally above 30nT which is within the range for strongly thermo remanent/ferrous magnetic deposits. Corresponds with part of a system of medieval and/or post medieval boundary banks identified in the Somerset HER (ref no. 17911).

F Linear anomaly running parallel with negative linear **L**. Generally within a range of 9 to 23nT. Within normal range for a ditch containing thermo remanent material. The alignment of **F** and **L** differs noticeably from dominant linear trends **H** and **M** (see **M** below). Somerset HER reference number 43025 records parallel linear earthworks terminating at the present day barrow and folly ruins (HER ref 43025) which appear to correspond with the location of **F** and **L**.

G Irregular linear within a range of 9 to 18nT. Within the range for a ditch containing thermo remanent deposits. Alignment differs from all other major linears.

H Major northwest – southeast linear trend. Readings are suggestive of ploughmarks. **H** appears to be intersected by linear trend **M**, particularly in the north-eastern area of the site.

3.2 Negative magnetic anomalies *(fig 5)*

I Short linear anomaly within a range of -12 to -21nT. Runs adjacent to a small ditch/gully visible in the field.

J Irregular linear, generally within a range of -5 to -11nT. Roughly corresponds with the line of a path across the site.

K Long, irregular linear generally within a range of -11 to -22nT. Corresponds with a pathway across the site.

L Linear anomaly running parallel with positive linear **F**. Within a range of -10 to -14nT. Within normal range for a bank or a ditch containing deposits of non-magnetic stone. Both **F** and **L** differ from the dominant linear trends **H** and **M** suggesting a different phase of activity. (See **F** above).

M Major northeast – southwest linear trend. Readings are suggestive of ploughmarks. Corresponds with an area of ridged cultivation marks recorded in the Somerset HER (ref no.44250).

4.0 Conclusion

The degree of confidence in identified anomalies ranges from moderate to fairly high.

The locations of the existing earthworks can clearly be seen, although the apparent lack of any trace of a ditch around the two bowl barrows is disappointing.

The purpose of the survey was to gain additional information about the site, particularly in relation to the slight curvilinear bank and ditch partially enclosing the site. It is possible that the domineering linear trends in **H** and **M** (fig 5) coupled with the speckled data set could have obscured any weaker anomalies, but generally speaking apart from a small number of linears on differing alignments, the survey has not significantly added to what is already known about the site.

Cothelstone Hill obviously has a significant prehistoric presence (HER ref 43292) but any anomalies possibly contemporary with or subsequent to the earthworks tends to be obscured by the domineering linear trends.

Bibliography

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Fig 1: Location of survey

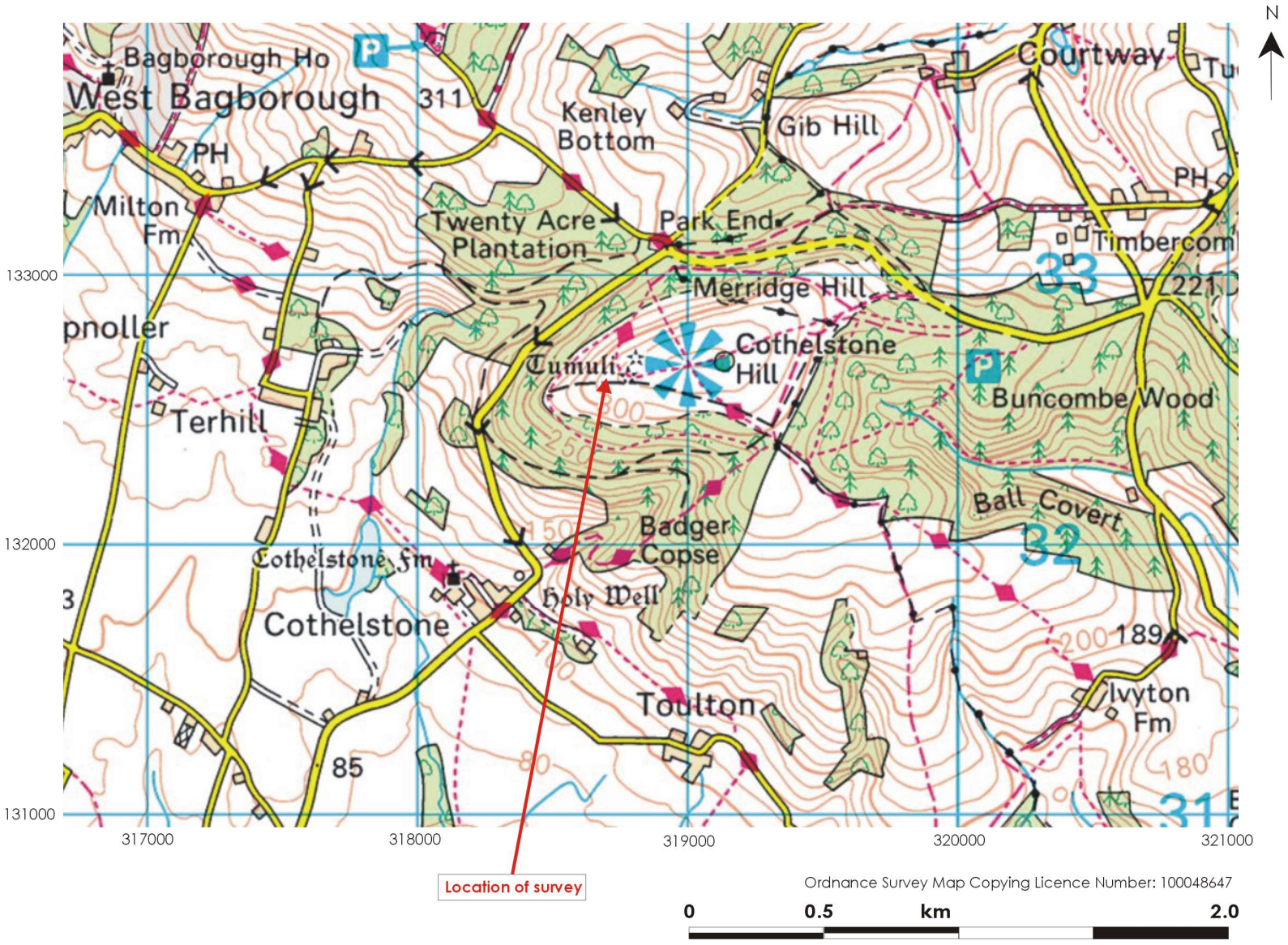
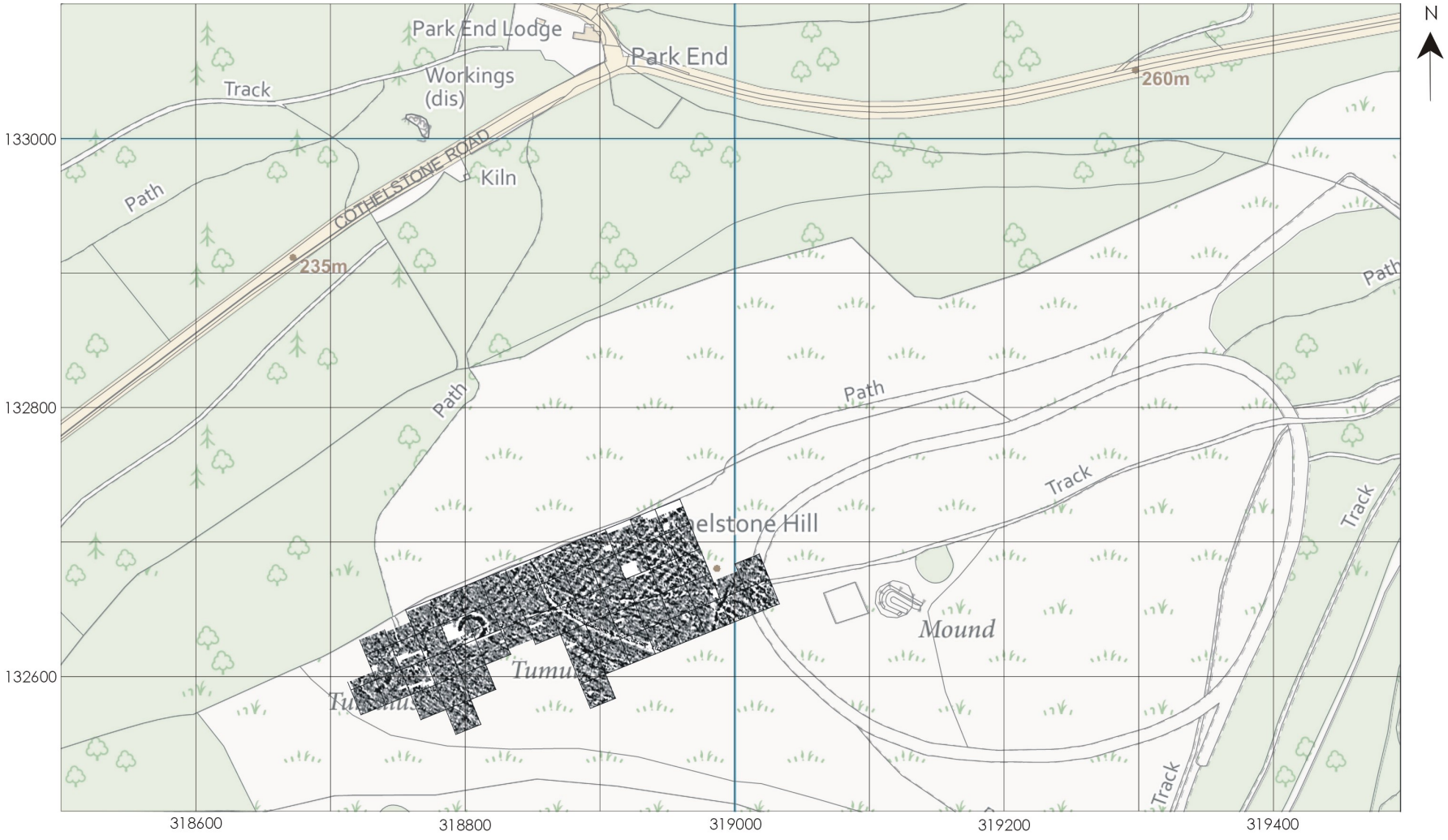


Fig 2: Location of survey - detail



0 100 metres 400

Fig 3: Survey results

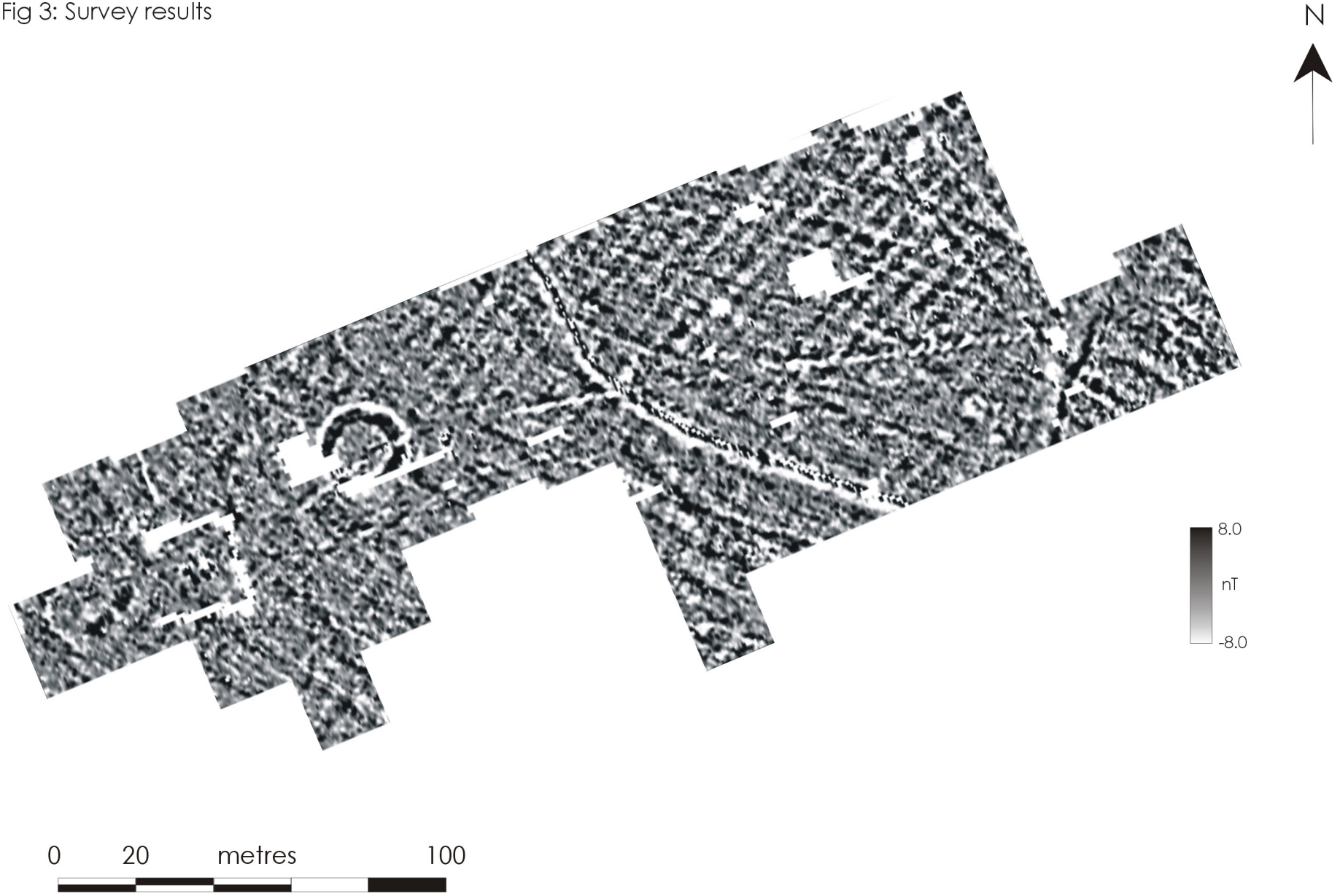


Fig 4: Highlighted survey results

Fig 5: Interpretation

Report prepared by Liz Caldwell of GeoFlo – Southwest Geophysical and Flotation Services.
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