



**NORTON DISNEY,
LINCOLNSHIRE**

GEOPHYSICAL SURVEY

Work undertaken for
Norton Disney History
and
Archaeology Group

February 2019

Report compiled by
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1. SUMMARY

A detailed magnetic gradiometer survey was undertaken for Norton Disney History and Archaeology Group at three sites near Brills Farm Norton Disney, Lincolnshire.

The results recorded two main areas of archaeological activity. The first possibly shows two periods of activity along the hill edge in Area A. Towards southwest corner of the area the feature forms possible animal enclosures or field systems likely to be connected to occupation. The shape of the features suggest they date to the Roman period. Aligned just off these ditches and just north are a second set of ditches. These contained magnetic material possibly from a close by furnace. The shape of these ditches suggest they may have been used for water management and could date to the medieval date; however, an earlier or later date cannot be ruled out.

The second location of activity (Area C) forms evidence of a possible roundhouse and enclosures. The shape and locations suggest this may date to the Iron Age, although an early Roman date cannot be ruled out.

Two areas of smelting were identified across the three areas. The reading from Area A suggest there is a furnace located in the middle of the orange hatching. Whereas, the readings from Area C suggest the furnace is in close proximity and not within the survey area.

2. INTRODUCTION

2.1 Definition of an Evaluation

Geophysical survey is a non-intrusive method of archaeological evaluation. Evaluation is defined as ‘*a limited programme of non-intrusive and/or intrusive fieldwork which determines the presence or absence of archaeological features, structures, deposits, artefacts or ecofacts within a specified area or site. If such archaeological remains are present Field Evaluation defines their character and extent, quality and preservation, and it enables an assessment of their worth in a local, regional, national or international context as appropriate*’ (ClfA 2014a).

2.2 Background

Contour Geophysics was commissioned by Norton Disney History and Archaeology Group to undertake a detailed magnetometer survey totalling some c.16ha across three sites at the Norton Disney, Lincolnshire. The survey was carried out between the 7th and 24th January 2019.

2.3 Topography and Geology

Norton Disney is located 13.5km southwest of Lincoln and 9.5km northeast of Newark, in the county of Lincolnshire (Fig. 1). The survey is split into three areas, the first, known as Area A, is located just north of Newark Road, site grid reference SK 8559 8363, and is 11ha in size. The second location (Area B), comprising of 3ha, is located 850m to the west of Area A just south of the A46, grid reference SK 8559 0168. The third site (Area C) is located just north of Area A and comprises of 2ha of land just off Folly Lane, grid reference SK 8560 8714.

The solid geology consists of Scunthorpe Mudstone Formation which formed approximately 191 to 210 million years ago in the Jurassic and Triassic Periods. This is overlaid by Balderton Sand And Gravel Member which formed up to 3 million years ago in the Quaternary Period (BGS 2018).

3. GEOPHYSICAL SURVEY

3.1 Methods

The site at the time of the survey was in use as agricultural. The weather was overcast and the overall conditions for the survey were good.

The survey was undertaken in accordance with English Heritage (2008) and ClfA (2014b) guidelines and codes of conduct.

The magnetic survey was carried out using a dual sensor Grad601-2 Magnetic Gradiometer manufactured by Bartington Instruments Ltd. This records subtle changes in the magnetic field resulting from differing features in the soil. Changes as small as 0.2 nanoTesla (nT) in an overall field strength of c. 49,000nT can be accurately detected using this instrumentation, although in practice instrument interference and soil noise can limit sensitivity.

The mapping of anomalies in a systematic manner allows interpretation of the type of material present beneath the surface. Strong magnetic anomalies are generated by buried iron-based objects or by kilns or hearths, usually resulting in a bipolar (positive/negative) response. More subtle positive anomalies representing pits and ditches can be seen where these contain more topsoil which is normally richer in magnetic iron oxides and provides a contrast with the natural subsoil (but this can vary depending on the nature of the underlying deposits). A negative anomaly may result from upcast bank material. Wall foundations can also show as negative anomalies where the stone is less magnetic than the surrounding soil, or as stronger positive and negative anomalies if of brick, but are not always responsive to the technique. It should be noted that not all features will be responsive and absence of anomalies does not necessarily indicate absence of archaeological features (Clark 1996).

Magnetometers measure changes in the Earth's magnetic field. With two sensors configured as a gradiometer the recorded values indicate the difference between two magnetic measurements separated by a fixed distance. The Grad601-2 consists of

two high stability fluxgate gradiometers suspended on a single frame with a 1m separation between the sensing elements giving a strong response to deep anomalies.

Sampling interval and data capture

Readings were taken at 0.25m centres along traverses 1m apart. This equates to 6400 sampling points in a full 40m x 40m grid. The Grad 601 has a typical depth of penetration of 0.5m to 1.0m although a greater range is possible where strongly magnetic objects have been buried in the site.

Readings are logged consecutively into the data logger which is downloaded daily either into a portable computer whilst on site or directly to the office computer. At the end of each survey, data is transferred to the office for processing and presentation.

Processing and presentation of results

Processing is performed using specialist TerraSurveyor software. This can emphasise various aspects contained within the data but which are often not easily seen in the raw data. Basic processing of the magnetic data involves flattening the background levels with respect to adjacent traverses and adjacent grids (Destripe or zero mean traverse). Despiking is also performed to reduce the effect of the anomalies resulting from small iron objects often found on agricultural land. Further processing can then be carried out if necessary.

The following are the processing techniques carried out on the processed gradiometer data used in this report:

1. DeStripe (sets the background mean of each traverse within a grid to zero and is useful for removing striping effects)
2. Despike (useful for display and allows further processing functions to be carried out more effectively by removing extreme data values)
Parameters: X radius = 1; Y radius = 1; Threshold = 3SD; Spike replacement = mean
3. Clip (excludes extreme values allowing better representation of detail in the mid-range): -3 to 3nT.

3.2 Results

The presentation of the data for the site includes a print-out of the raw or minimally processed data as greyscale plots (Fig. 4; clipped for display but otherwise unprocessed), together with greyscale plots of the processed data (Fig. 5). Magnetic anomalies have been identified and plotted onto an interpretative drawing (Fig. 6) and are described below.

Positive linear anomalies (Red Lines)

Area A:

Sixteen positive anomalies of a possible archaeological origin have been identified. Fifteen of these are located in the south west part of the field. In this area there appears to be two alignments of features, the first on a north-south alignment consist of 8 possible ditches which appear to form field boundary's and enclosures. The shape

would suggest a possible Roman date and may form fields surrounding a settlement or farmstead.

The second set are aligned northwest-southeast and consist of 7 ditches. Six of these are aligned parallel to each other and they all contain large quantities of ferrous material. To the northeast of these ditch there is a possible furnace, which would explain the ferrous material if they date to the same period. With multi period furnaces know in the area it is difficult to suggest a date from the results alone.

The final possible ditch is located next to the northern boundary and may resolve as evidence of this boundary shifting or the remains of a trackway along the edge of the field.

Area C:

positive anomalies of a possible archaeological origin have been identified in the western part of the field. One of these possible ditches is circular in shape with a circumference of c.13m which suggest it may evidence of a roundhouse, with the ditch forming it drainage gully. Parts of a second curvilinear ditch can also be seen just to the north of the ring ditch, suggesting a possible connection. The two remaining ditches possibly form field boundary's or parts of enclosures most likely associated with the ring ditch.

Discrete positive anomalies (Blue Circles) All Areas

Examples of discrete positive anomalies are highlighted and possibly represent pit like features. However, it is also possible that they have a more natural resolve.

Iron spikes/Ferrous Responses (discrete bipolar anomalies) (Red Circles) All Areas

Iron items within the topsoil give a distinctive localised bipolar (strong positive with associated strong negative) response.

Possible furnace area (Orange Hatching)

Areas A: Within the area of this high bipolar spike there is large quantities of other magnetic material suggesting that this may be the location of a furnace.

Area C: An area of magnetic material in the north-eastern part of the field may suggest there is a furnace in close proximity.

4. DISCUSSION

The results recorded two main areas of archaeological activity. The first possibly shows two periods of activity along the hill edge in Area A. Towards southwest corner of the area the feature form possible animal enclosures or field systems likely to be connected to occupation. The shape of the features suggest they date to the Roman period. Aligned just of theses ditches and just north are a second set of ditches. theses contained magnetic material possibly from a close by furnace. The shape of these ditches suggest they may have used for water management and could date to the

medieval date; however, an earlier or later date cannot be ruled out.

The second location of activity (Area C) forms evidence of a possible roundhouse and enclosures. The shape and locations suggest this may date to the Iron Age, although an early Roman date cannot be ruled out.

Two areas of smelting were identified across the three areas. The reading from Area A suggest there is a furnace located in the middle of the orange hatching. Whereas, the readings from Area C suggest the furnace in in close proximity and not within the survey area.

5. ACKNOWLEDGEMENTS

Contour Geophysics wishes to acknowledge Norton Disney History and Archaeology Group who commissioned the project.

6. PERSONNEL

Project coordinator: Neil Jefferson
Geophysical Survey: Neil Jefferson and Jordan Dannett
Survey processing and reporting: Neil Jefferson

7. BIBLIOGRAPHY

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8. ABBREVIATIONS

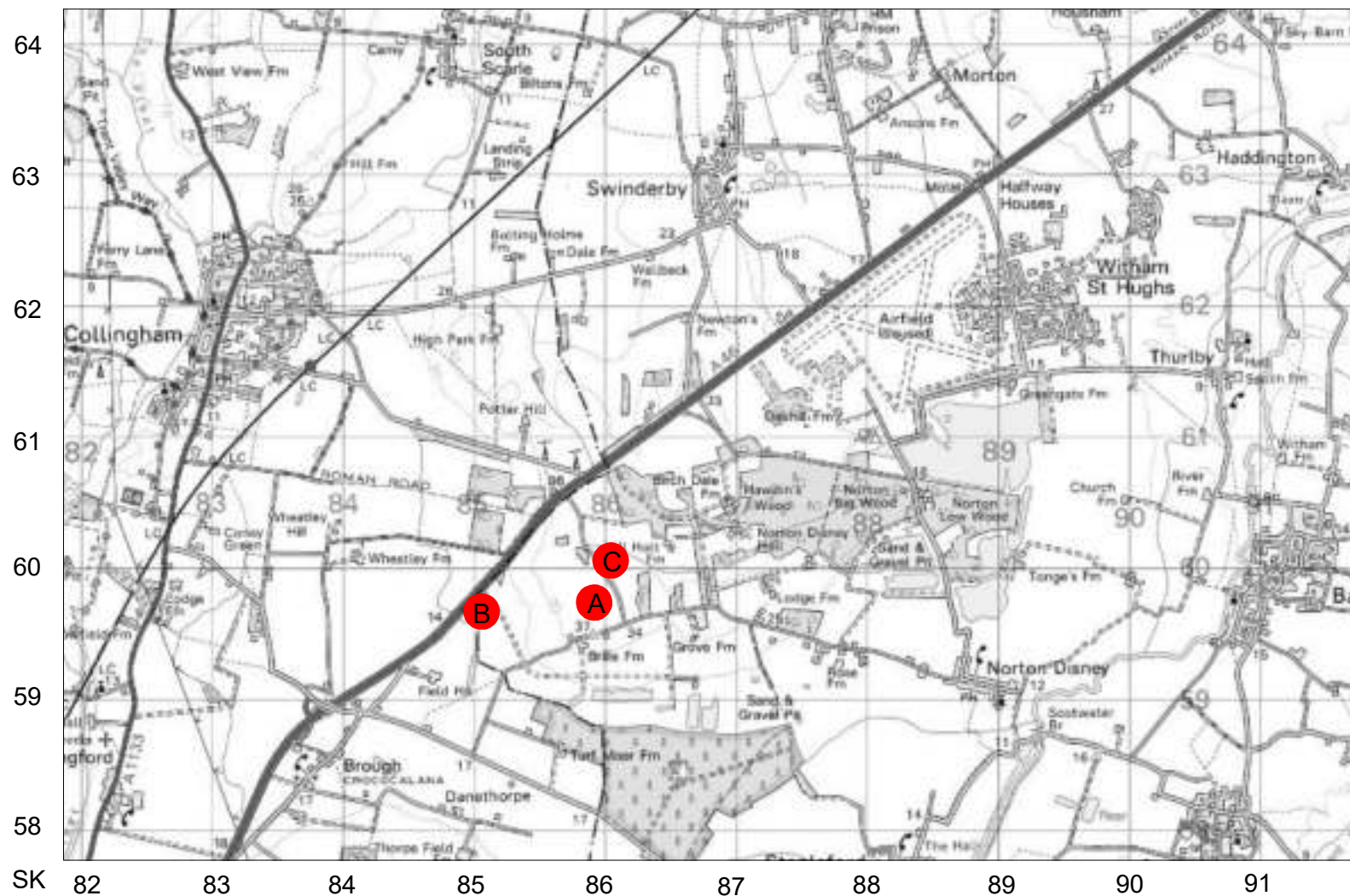
BGS British Geological Survey

ClfA Chartered Institute for Archaeologists



Figure 1 General location plan

Ordnance Survey Licence No: 100058440



● Site Locations

0 1000m

Figure 2 Site location map

Scale 1:50,000 @A4

Area A



Ordnance Survey Licence No: 100058440

Figure 3 Greyscale plot ($\pm 50\text{nT}$)

Contour
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Scale 1:2000 @A3

Drawn by: NMJ



Ordnance Survey Licence No: 100058440

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Figure 4 Processed data greyscale plot

Scale 1:2000 @A3

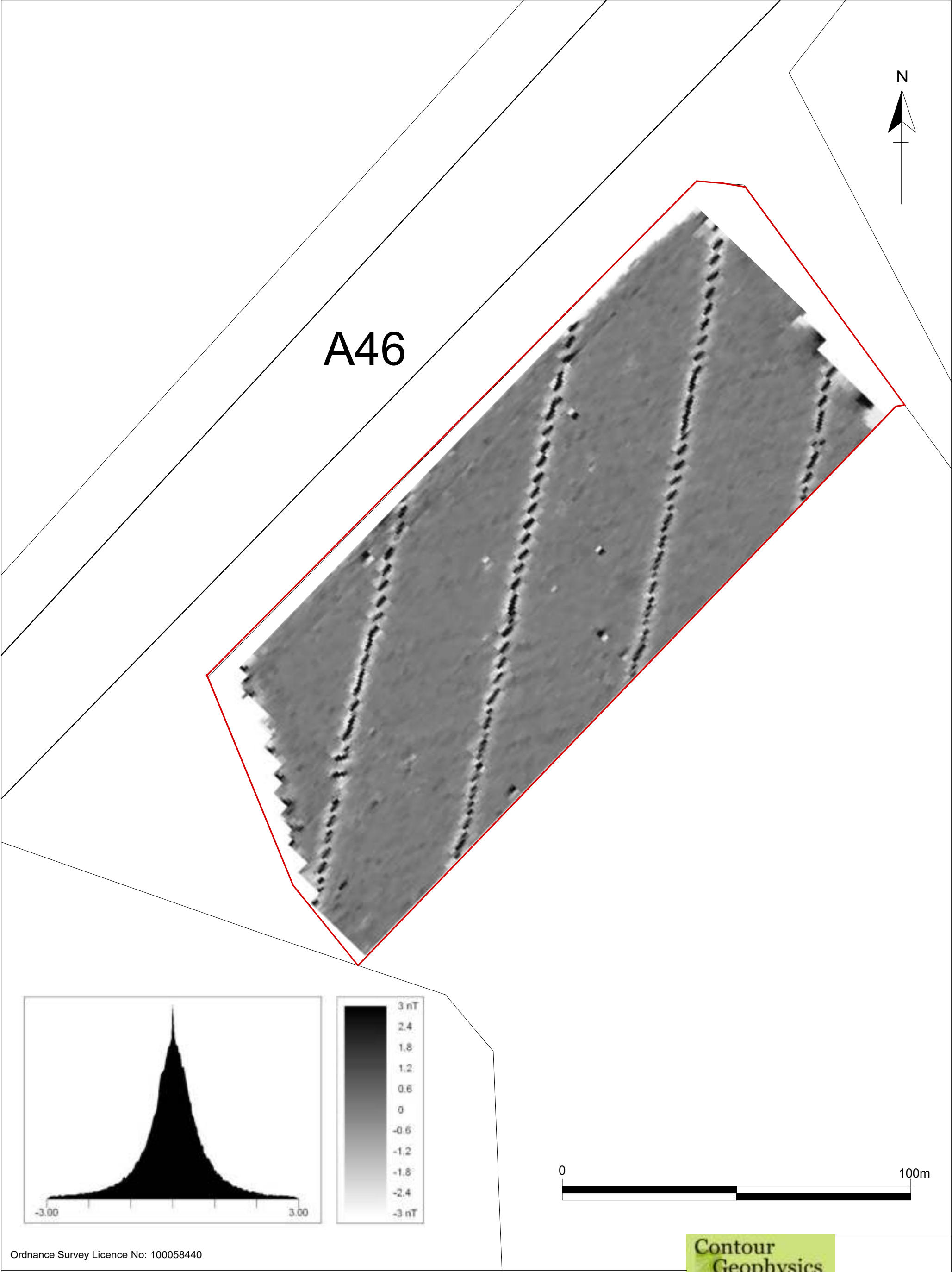
Drawn by: NMJ



Figure 5 Interpretative plot

Area B





Ordnance Survey Licence No: 100058440

Contour
Geophysics

Figure 7 Processed data greyscale plot

Scale 1:1000 @A3

Drawn by: NMJ

Area C

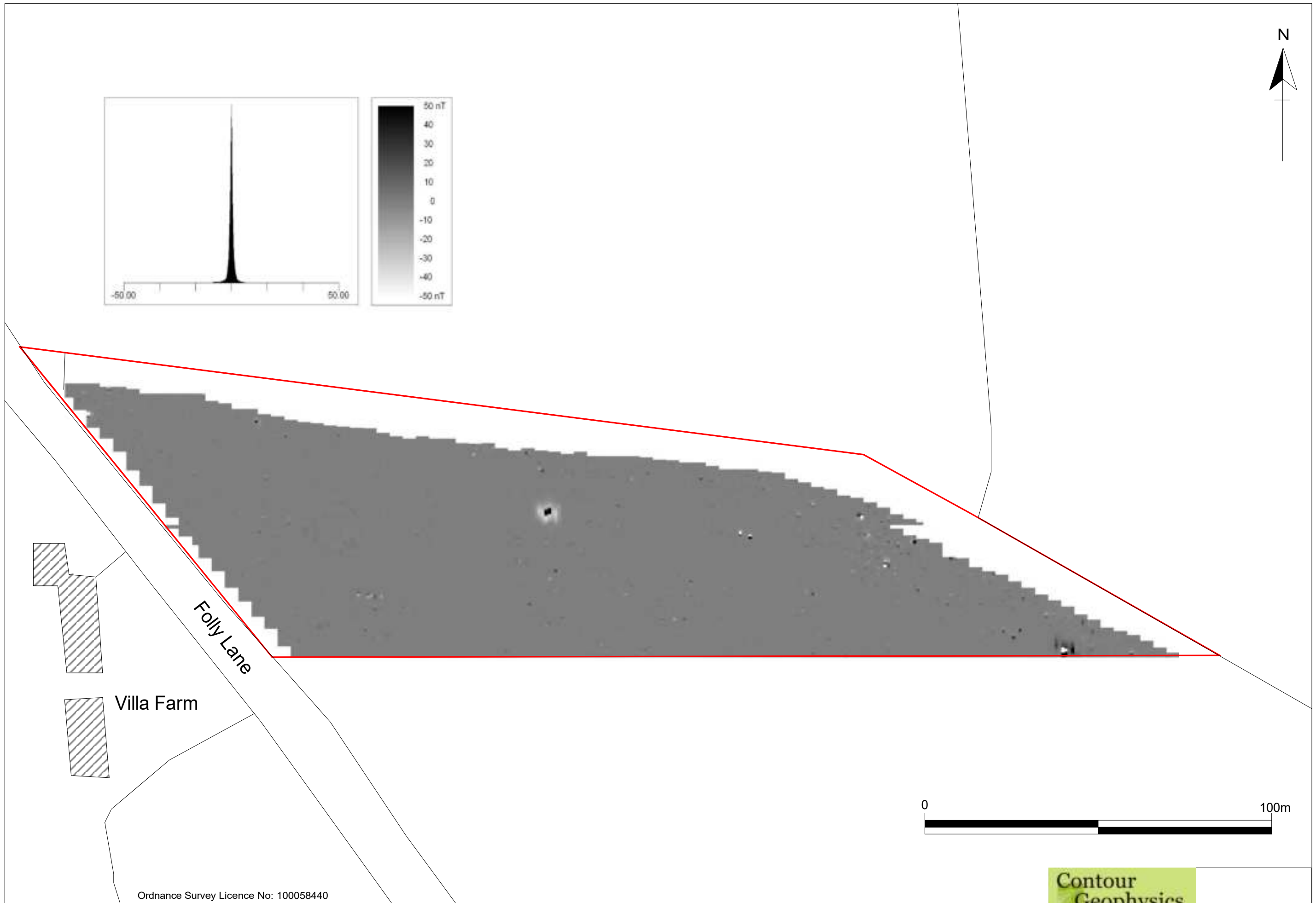


Figure 9 Greyscale at ± 50

Contour
Geophysics

Scale 1:1000 @A3

Drawn by: NMJ

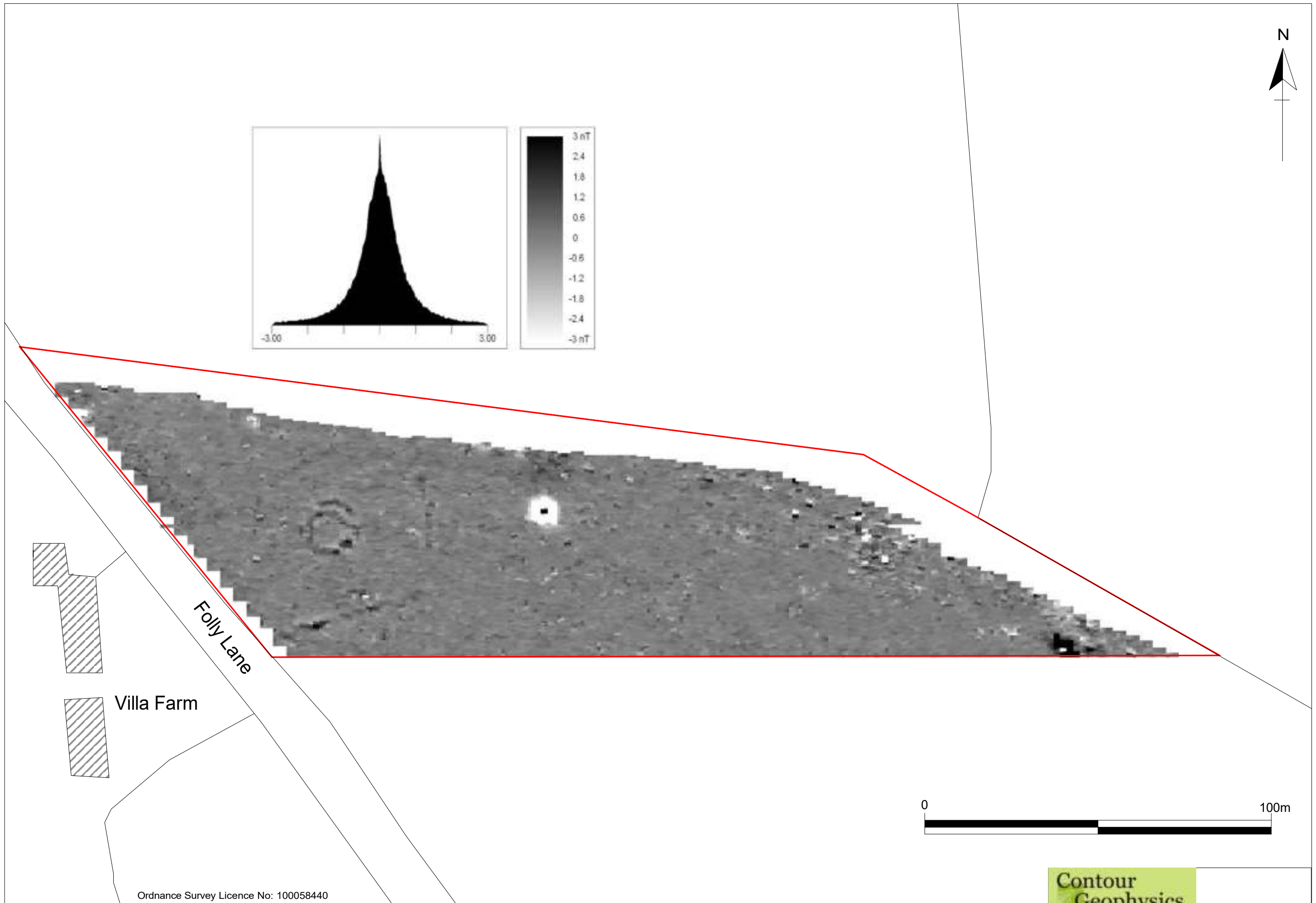


Figure 10 Processed data greyscale plot

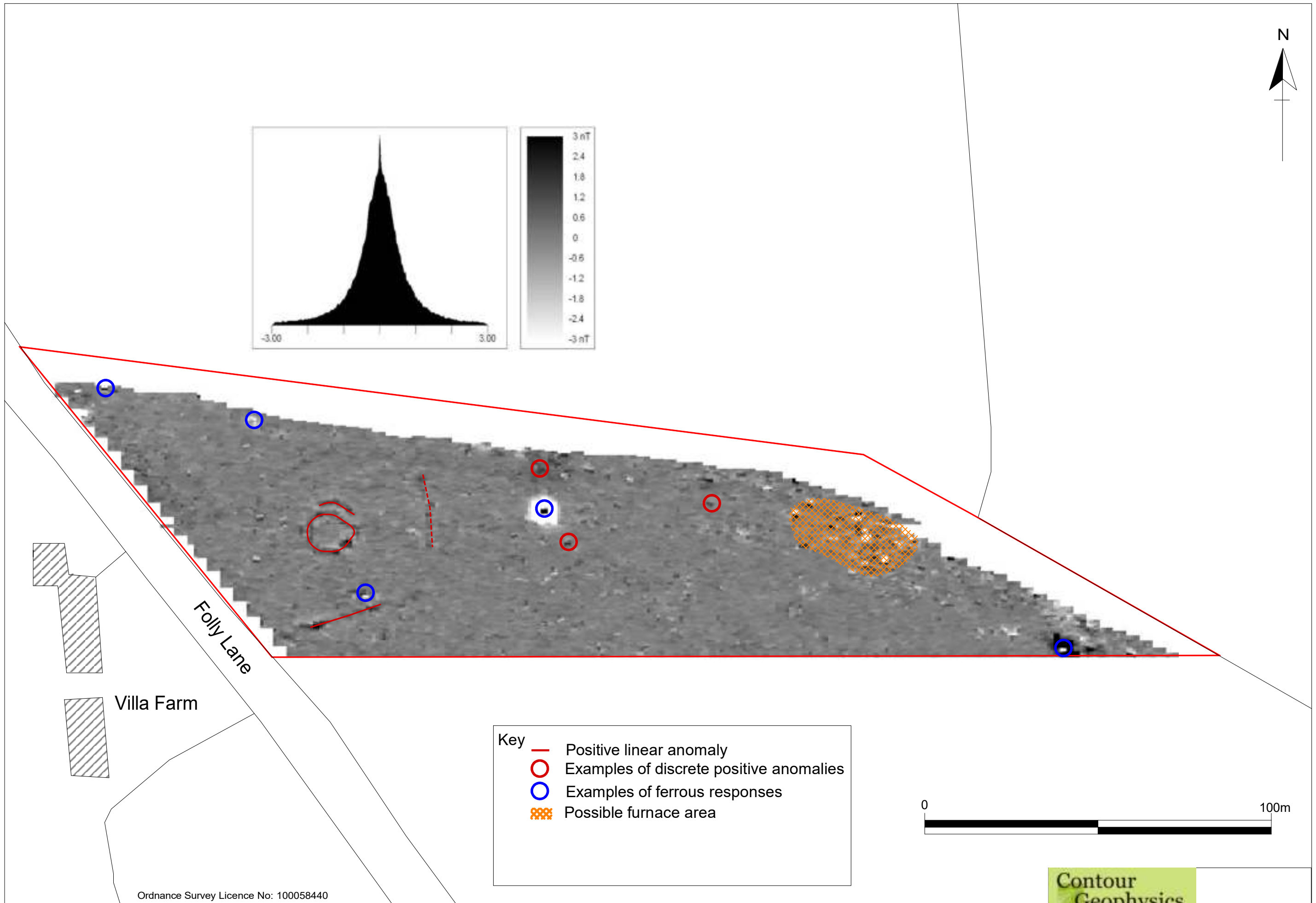


Figure 11 Interpretative plot