ARCHAEOLOGICAL EVALUATION REPORT:

FLUXGATE GRADIOMETER SURVEY OF LAND AT MAREHAM HOUSE, SPANBY, LINCOLNSHIRE

Planning Reference: S08/1406/12 and S08/1410/12
Ordnance Survey NGR: TF 10326 20481
Site Code: SPMH 09
OASIS Reference: allenarc1-57929

Report prepared for

Ms Everard and Mr Reddish

by

Allen Archaeological Associates and Grid Nine Geophysics

AAA Report Number: 2009.014

April 2009

GRID NINE
FREELANCE ARCHAEOLOGICAL GEOPHYSICS
(FLUXGATE GRADIOMETER & RESISTANCE)

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Element	**Name**	**Date**
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Cover image: Surveying the site, with Mareham House in the background.

Summary

- A fluxgate gradiometer geophysical survey was undertaken on land at Mareham House in Spanby, Lincolnshire by Grid Nine Geophysics, in partnership with Allen Archaeological Associates on the behalf of Ms Everard and Mr Reddish. The survey was undertaken following recommendations by the Heritage Officer for North Kesteven District Council.

- The survey has detected a wealth of anomalies adjacent to Mareham Lane that may be of potential archaeological interest. These include probable enclosures of later prehistoric or Romano-British date in the western half of the survey that may reflect roadside settlement associated with Mareham Lane Roman road. Further linear, curvilinear and pit-like anomalies may also reflect former anthropogenic activity on the site.

- There are many dipolar responses which are likely to have been caused by modern ferrous detritus or other highly fired material.

Figure 1: Site location outlined in red at scale 1:25,000

1.0 Introduction

1.1 Allen Archaeological Associates and Grid Nine Geophysics were commissioned by Ms Everard and Mr Reddish to undertake a geophysical survey in advance of a planning application for construction of two fishing ponds on land at Mareham House in Spanby, Lincolnshire.

1.2 The site works and reporting conform to current national guidelines, as set out in the Institute for Archaeologists '*Standards and guidance for archaeological evaluations*' (IfA 2001) and the English Heritage document '*Geophysical Survey in Archaeological Field Evaluation*' (English Heritage 2008), a project brief prepared by the Heritage Officer who advises North Kesteven District Council (Young 2009) and also in the specification for the works (Allen 2009).

2.0 Site location and description

2.1 The site is situated in the administrative district of North Kesteven in the parish of Threekingham, approximately 2km east of Osbournby and 7.75kn south-east of Sleaford. The site lies in the south-west corner of a sub-rectangular field and comprises two irregular-shaped proposed ponds of approximately 1.7 ha, to the east of Mareham Lane. The site is centred on NGR TF 09122 37815.

2.2 The local geology is the solid geology of Oxford Clay (Peterborough Member, comprising dark grey fissile and bituminous mudstone), with no drift geology recorded (BGS 1996). The local pedology comprises slow permeable, seasonally wet basic loams and clays (NSRI 2009).

3.0 Planning background

3.1 The client is proposing to construct two fishing ponds on the site, although as yet no planning application has been submitted. Prior to submitting an application, the Heritage Officer who advises North Kesteven District Council has requested a programme of archaeological works to initially comprise a geophysical survey of the site.

4.0 Archaeological and historical background

4.1 The site lies adjacent to the Roman road Mareham Lane (Margary 1957: Road Number 260) and to the north of its junction with a second Roman road, the Salters Way (Margary 1957: Road Number 58A), now the modern day A52.

4.2 Records held at the Archaeological Data Service (hereafter ADS) show previous activity in the area including a Neolithic stone axe, Roman pottery and a brooch, and medieval pottery, found immediately to the west of the site (ADS Reference NMR_NATINV-348596).

4.3 Further evidence of prehistoric activity has been forthcoming from the area with prehistoric worked flints having been recovered (Young 2009).

4.4 Pottery found around Mareham House to the north of the proposed ponds suggests Iron Age and Romano-British activity, with aerial photographs showing a complex of settlement remains of prehistoric or Romano-British date to the north of Spanby. Further cropmarks show possible ridge and furrow on the site and an enclosure in Hillside Plantation that may extend into the site itself.

4.3 The place name Spanby is first mentioned in the Domesday Survey of 1086 as *Spanesbi,* probably from the Old Norse 'spánn' and the Old Danish 'by', meaning 'the farmstead, village where shingle for tiling is obtained' (Cameron 1998). The Domesday Record indicates that there were two main landowners at the time of the survey; Kolsveinn and Odger the Breton (Morgan and Thorn 1986).

4.3 To the east of the site is Spanby medieval moated manor site; comprising a moat with raised island and a number of fishponds (ADS Reference NMR_NATINV-348591). Although this site was originally scheduled it was subsequently ploughed sometime during the 1980s (Young 2009).

4.4 An archaeological watching brief at the adjacent Manor Farm in 1999 did not reveal any significant archaeological deposits or artefacts (ADS Reference EHNMR-1348115).

5.0 Methodology

5.0.1 A Level II Evaluation geophysical survey (Gaffney and Gater 2003) using fluxgate gradiometer was chosen as the most appropriate type of survey for the site. Although there can be no preferred recommendation of which technique to use until the merits of the individual site have been assessed, magnetometer survey should usually be the prime consideration (English Heritage 2008).

5.0.2 The response from superficial sand and gravel deposits to magnetic surveying is very variable, but usually good on materials derived from Jurassic limestones. The response over a solid geology of clay (in this case Oxford Clay) is average to very variable, although magnetometer surveying can be recommended over most sedimentary parents (English Heritage 2008; Gaffney and Gater 2003; Clark 1996).

5.0.3 The geology of the site is common and results from geophysical surveys over these geologies are well represented in the English Heritage Geophysical Survey Database (hereafter EHGSD). A search of the EHGSD for surveys over these geologies in the general area and further afield provided surveys reporting conditions well suited to magnetometer surveying. In particular a survey just to the south of the site, at Dowsby, reported conditions well suited to magnetometer surveying (Cole 1995).

5.0.4 Magnetic surveying measures very small changes in the Earth's magnetic field which can be created by man-made or geological changes in the magnetic properties of the soil and/or underlying geology. Magnetic surveying can usually detect magnetically enhanced features such as areas of anthropogenic activity (for example pits, ditches, hearths and kilns), but also will react to buried 'modern' items such as nails, agricultural equipment fragments, wire fences and generally any ferrous material in the immediate area.

5.0.5 The geology of the site can play an important role in how successful a magnetic survey will be. If the local geology is inherently magnetic then it may not be practicable or possible to undertake a magnetic survey. Similarly, buried services can have an adverse effect on the data. The magnetic 'signature' from certain anomalies, for example from a ditch or kiln, is often very characteristic to that type of known feature. This can assist with providing an informed, but quantative rather than qualitative interpretation to certain anomalies. It should be noted that geomorphological features can give both positive and negative responses.

5.0.6 The magnetic survey was carried out using a Bartington Grad601-2 Dual Fluxgate Gradiometer with an onboard automatic DL601 data logger. This instrument is a highly stable magnetometer which utilises two vertically aligned fluxgates, one positioned 1m

above the other. This arrangement is then duplicated and separated by a 1m cross bar. The 1m vertical spacing of the fluxgates provides for deeper anomaly detection capabilities than 0.5m spaced fluxgates. The dual arrangement allows for rapid assessment of the archaeological potential of the site. Data storage from the two fluxgate pairs is automatically combined into one file and stored using the onboard data logger.

5.1 Summary of survey parameters

5.1.1 Fluxgate magnetometer

Instrument:	Bartington Grad601-2 Dual Fluxgate Gradiometer
Sample interval:	0.25m
Traverse interval:	1.00m
Traverse separation:	1.00m
Traverse method:	Zigzag
Resolution:	0.1 nT
Processing software:	ArchaeoSurveyor 2.4.0.X
Surface conditions:	Cultivation (part-ploughed and rolled, some pasture to the south)
Area surveyed:	1.89 ha.
Surveyors	David Charles Hibbitt AIfA and Angela Hazel Hibbitt
Data interpretation:	David Charles Hibbitt AIfA and Mark Allen BSc MIfA
Date of survey:	21st March 2009

5.2 Data collection and processing

5.2.1 The site was marked out with a series of 30m x 30m grids broadly north-south. A north-south grid alignment is preferable for a magnetic survey as enhancements to the magnetic field caused by buried features is mapped increasingly stronger the closer the traverse direction can get to a magnetic north–south direction (Scollar et al. 1990). Data was collected by making successive parallel traverses across each grid in a zigzag pattern, as close to a magnetic north – south alignment as practicable. The survey grid south-east corner and south-west corner were tied in to permanent ground markers emplaced on the site by Grid Nine and also to two of the four points marking the edges of the ponds (located by the client).

5.2.2 The data collected from the survey has been analysed using the current version of ArchaeoSurveyor 2 (2.4.0.X). The resulting data set plots are presented with positive nT values as black and negative nT values as white.

The data sets have been subjected to processing using the following filters:

- De-spike
- De-stripe (also known as Zero Mean Traverse or ZMT)
- Clipping

5.2.3 The de-spike process is used to remove spurious or extremely high intensity anomalies or datapoint values in magnetic data. These are often caused by small ferrous objects (for example modern surface or sub-surface ‘rubbish’, ferrous fence posts or buried services) which may affect subsequent filter use, data enhancement and interpretation.

5.2.4 The de-stripe process is used to equalise underlying differences between grids or traverses. Differences are most often caused by directional effects inherent to magnetic surveying instruments, instrument drift, instrument orientation (for example off-axis surveying or heading errors) and delays between surveying adjacent grids. The destripe process is used

with care however as it can sometimes have an adverse effect on linear features that run parallel to the orientation of the process.

5.2.5 The clipping process is used to remove extreme datapoint values which can mask fine detail in the data set. Excluding these values allows the details to show through.

5.2.6 Plots of the data are presented in raw linear greyscale, processed linear greyscale and trace plot form with any corrections to the measured values or filtering processes noted, and as a separate (English Heritage 2008) simplified graphical interpretation of the main magnetic anomalies detected.

6.0 Results (See Figures 2 – 6; anomalies in square brackets are shown on Figure 4)

6.1 Most noticeable in the plot is a series of positive linear and curvi-linear anomalies close to the western boundary of the survey, and adjacent to Mareham Lane. The majority of this activity appears to be concentrated in an area approximately 60 metres east – west by 60 metres north – south, but with the responses becoming subdued to the south. It is likely that these will continue through the western boundary of the survey area towards Mareham Lane and also to the south.

6.2 Anomalies [1] and [2] appear to represent two sides of a possible enclosure, with a termination or truncation in both, possibly representing an entrance or more recent plough damage. The magnitude of [1] is around 3nT, but anomaly [2] has a relatively high magnitude of around 8nT. This increased magnitude would suggest a fill of greater magnetic susceptibility than the surrounding soil, possibly as the result of refuse dumping associated with settlement remains, or nearby industrial process, rather than a geomorphological cause.

6.3 Within the possible enclosure formed by [1] and [2] are an assortment of strong and ephemeral linear and curvilinear ditch-like responses [3] to [10]. These are also likely to have an anthropogenic origin, although a geomorphological cause, such as palaeochannels or natural variations in the geology or pedology should not be completely ruled out. If these features do reflect human activity then it suggests that there are several phases of activity on the site.

6.4 Anomaly [11] has a very high magnitude peaking at around 60nT. There is a very slight suggestion in the trace data for a 'double-peak' which is often associated with thermoremnant features such as kilns, corn driers or other highly fired structures. The high magnitude of around 60nT would also suggest such a feature, although such an interpretation should be treated with caution.

6.5 A pattern of discrete positive linear anomalies [12] likely to be relating to previous agricultural practices can be seen as a series of parallel striations running on an approximate north – south alignment. These probably represent ridge and furrow remains of medieval date. Evidence for the current ploughing regime is also represented in the data [13], aligned approximately east – west. These anomalies usually arise from the subtle topsoil voids and the resulting irregular topography of the surface. These striations exhibit a weak magnetic signature of generally around 2nT or less. Other non-archaeological features detected include an extant trackway [14] running approximately east – west across the northern end of the survey and several linear responses [15] likely to be associated with former boundaries depicted on the early OS maps. A series of perpendicular anomalies [16] have been detected in the south-east corner of the survey; these may also be the responses to previous boundaries or land management, for example narrow strip fields. A similar arrangement can be seen to the north of the site on early OS maps of the area. The sub-annular form of anomalies [17] – [20] may be a result of anthropogenic activity, but the

magnitudes of these, at generally less than 2nT would suggest a geomorphological cause to be more likely.

6.6 Throughout the data there is a feint, ephemeral pattern of linear, curvilinear and pit-like anomalies. The vast majority have weak peak magnitudes of between 0.5nT and 2nT which suggests that subtle geomorphological variations are being mapped, although the possibility that they may be anthropogenic in origin should not be ruled out as they may have become filled with a material which is only slightly more magnetically enhanced than the surrounding soil.

6.7 A number of strong dipolar responses have been recorded scattered randomly throughout the data. The characteristic dipole response of pairs of positive and negative 'spikes' suggests near-surface ferrous metal or other highly fired material (Clarke 1996).

6.8 Scattered throughout the data is a plethora of weak dipolar responses giving an overall 'speckled' visual effect to the plot. The peak magnitude of these is generally around 10nT, with most being much weaker at around 2nT. These responses are likely to be caused by 'modern' magnetically enhanced detritus scattered across the field as well as subtle variations in the near-surface geology.

7.0 Conclusions

7.1 The geophysical survey has shown the site of the proposed ponds lies within an area containing anomalies of potential archaeological significance.

7.2 Of perhaps most interest is a series of probable enclosures within the footprint of the proposed western pond. These are likely to be of later prehistoric or Romano-British date; possibly evidence of roadside settlement adjacent to Mareham Lane Roman road.

7.3 Further more ephemeral linear and curvilinear anomalies may also be of archaeological significance, although without intrusive investigation their interpretation remains tentative.

8.0 Effectiveness of methodology

8.1 The non-intrusive evaluation methodology employed was appropriate to the scale, nature and time constraints of the proposed development. Magnetometry surveying was the prospection technique best suited to the investigation. Other techniques would have required justification (English Heritage 2008) and may have proved too time consuming or cost-prohibitive given the size and nature of the development area.

9.0 Acknowledgements

9.1 Allen Archaeological Associates and Grid Nine Geophysics would like to thank Ms Everard and Mr Reddish for this commission.

10.0 References

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The following Ordnance Survey maps of the area were viewed on-line at www.old-maps.co.uk (site accessed 10/03/09):
1889 Ordnance Survey map, Lincolnshire 1:2,500
1891 Ordnance Survey map, Lincolnshire 1:10,560
1905 Ordnance Survey map, Lincolnshire 1:10,560
1947 Ordnance Survey map, Lincolnshire 1:10,560

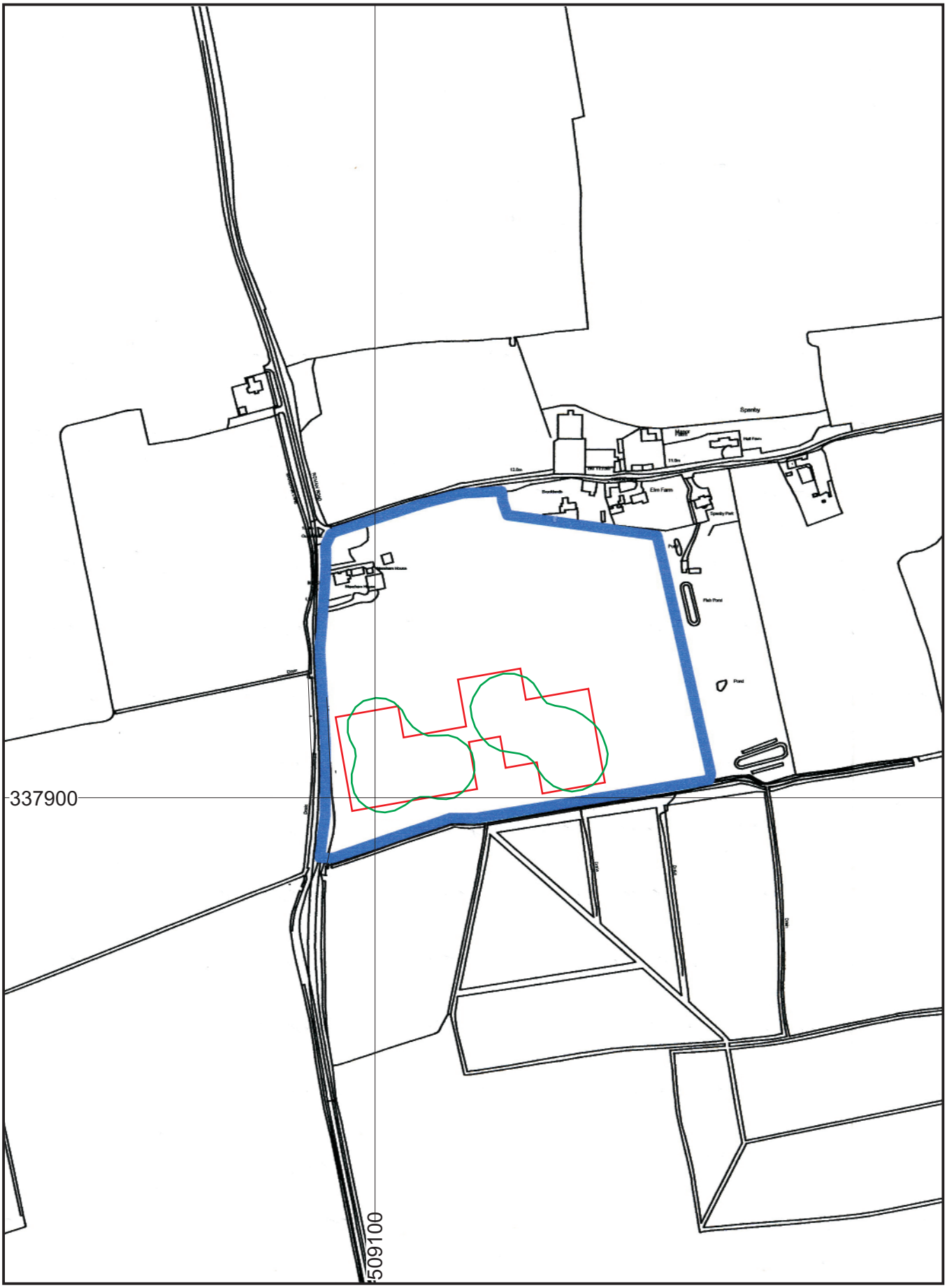

Figure 2: Survey location in red overlying proposed ponds in green at scale 1:5000.
Site boundary shown in blue.

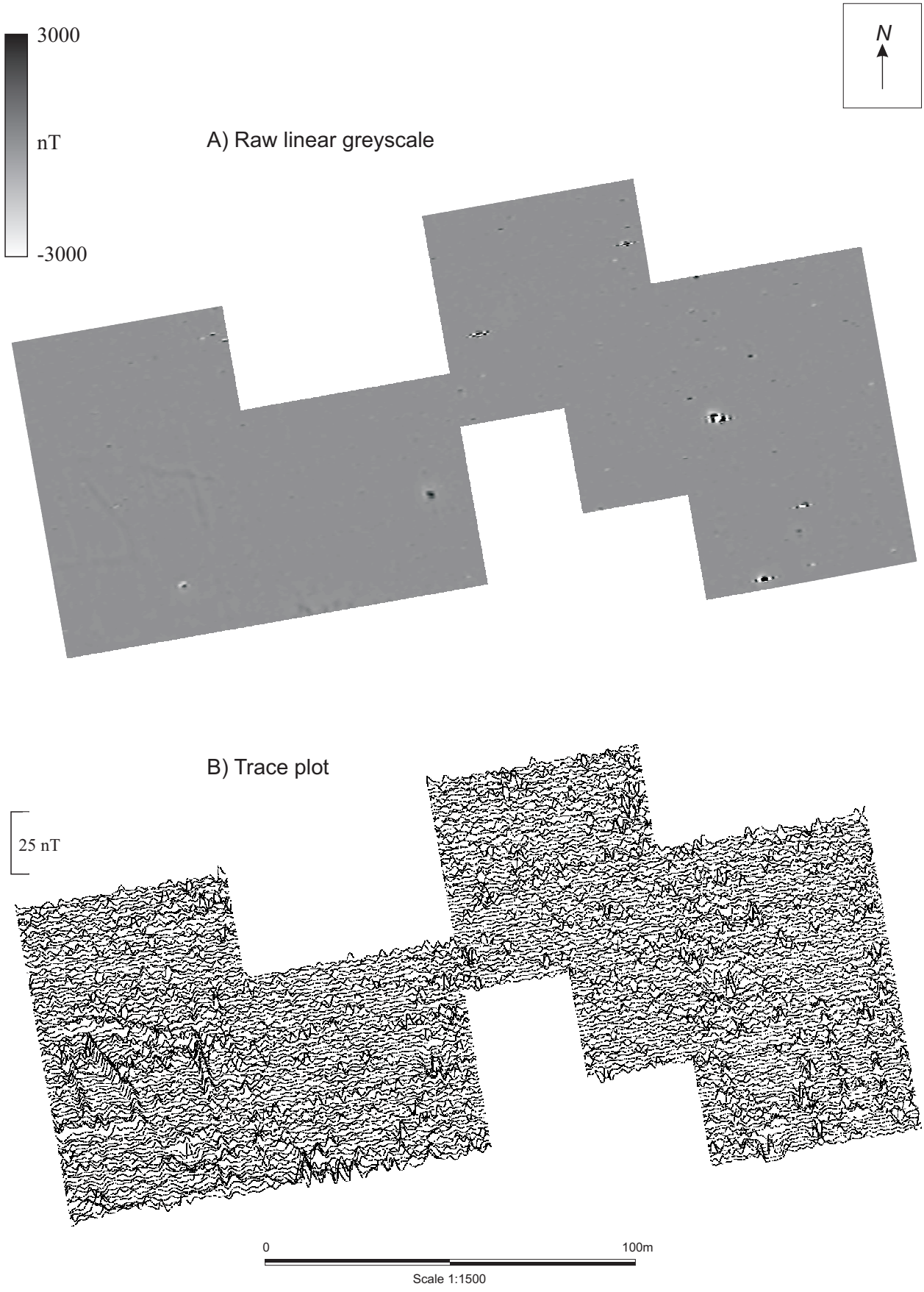

Figure 3: Raw greyscale and processed trace plot at scale 1:1500

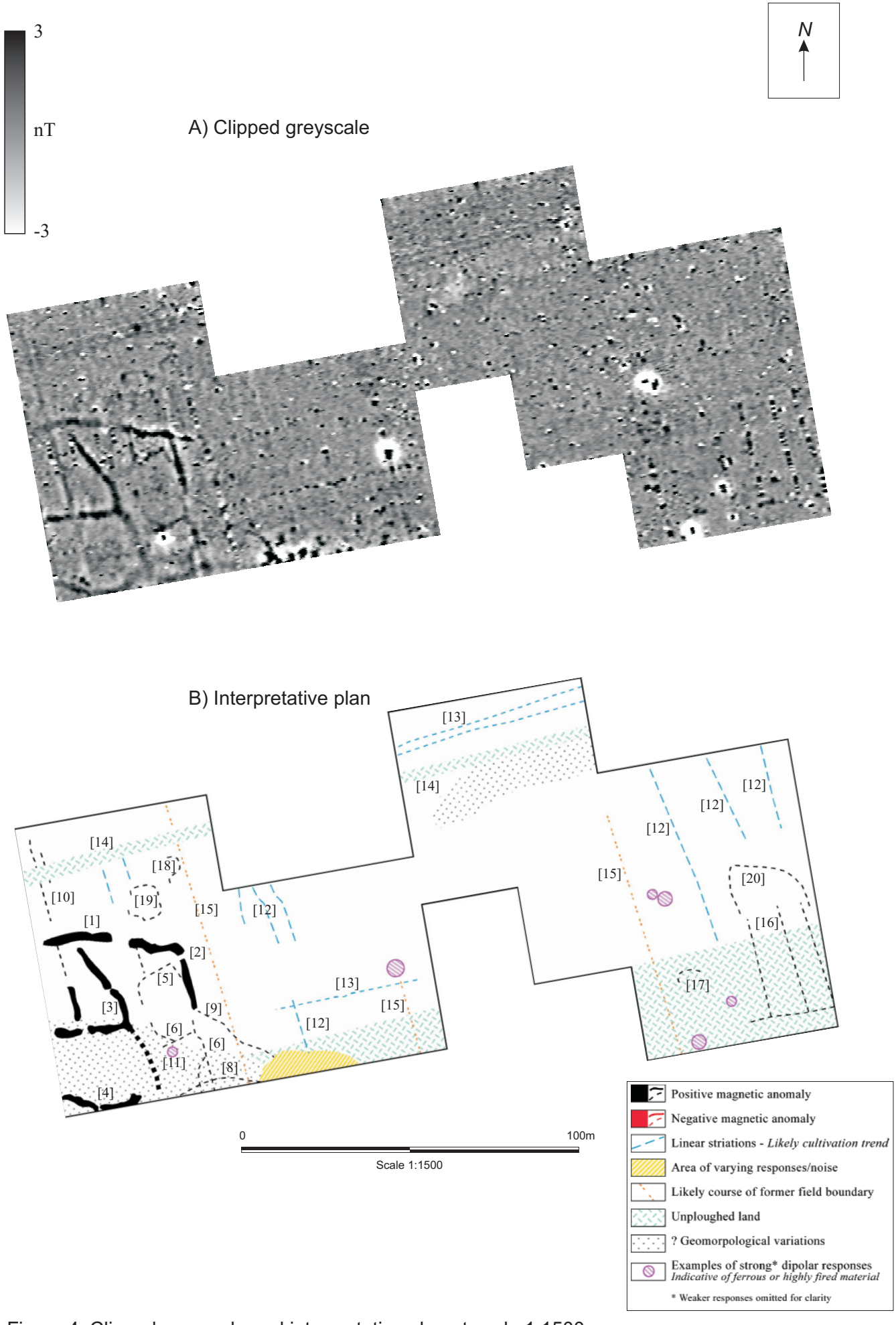

Figure 4: Clipped greyscale and interpretative plan at scale 1:1500

Figure 5: Clipped greyscale plot overlying proposed ponds in green at scale 1:5000. Site boundary shown in blue.

Figure 6: Interpretative plan overlying proposed ponds in green at scale 1:5000. Site boundary shown in blue.